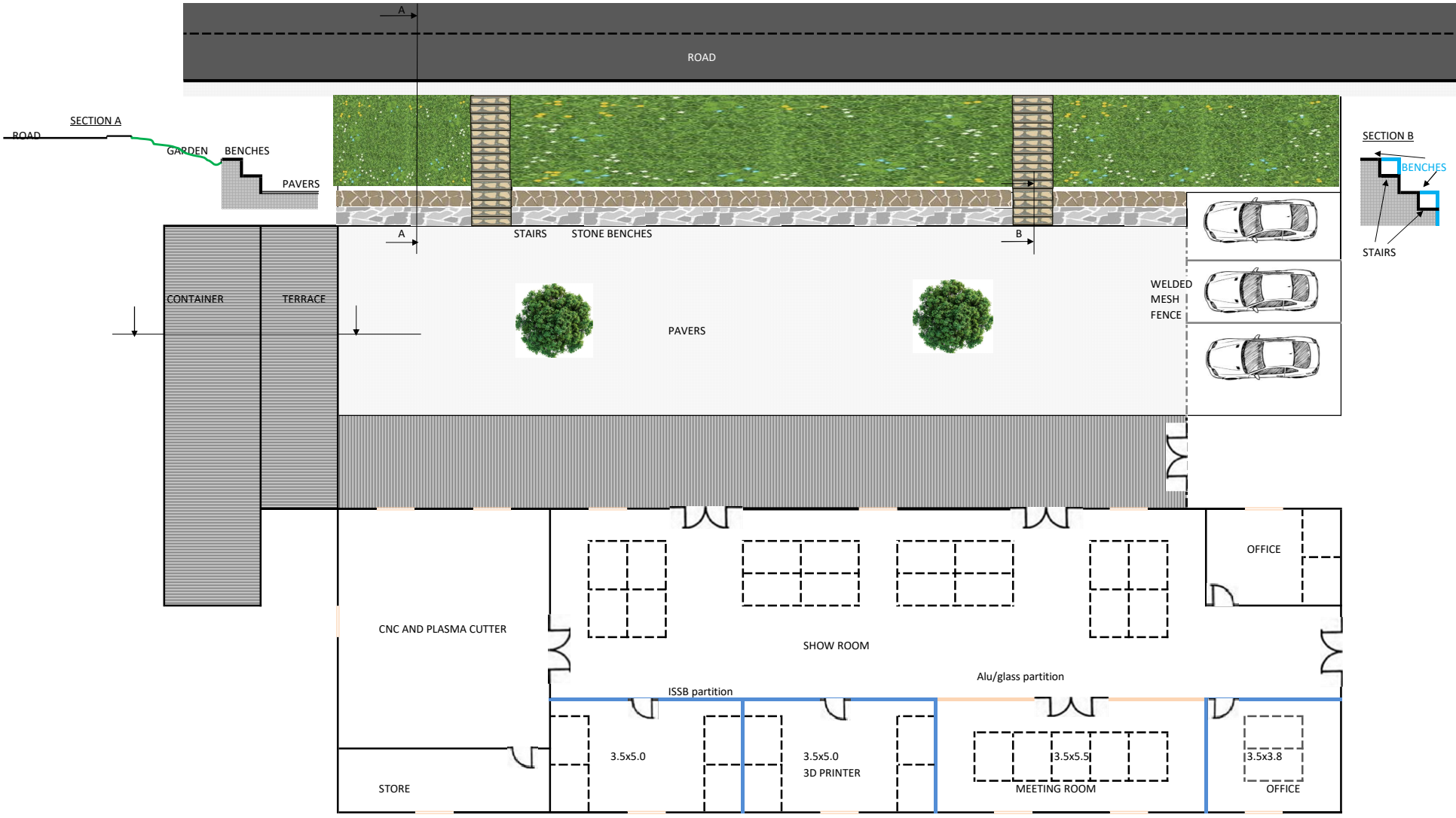
ROAD
A
SECTION A
ROAD
GARDEN
BENCHES
PAVERS
SECTION B
BENCHES
STAIRS
A
STAIRS
STONE BENCHES
B
CONTAINER
TERRACE
PAVERS
WELDED
MESH
FENCE
OFFICE
CNC AND PLASMA CUTTER
SHOW ROOM
Alu/glass partition
ISSB partition
3.5x5.0
3.5x5.0
3D PRINTER
3.5x5.5
3.5x3.8
STORE
MEETING ROOM
OFFICE

## 8.2. ANNEX - TECHNICAL GENERAL GUIDANCE

**8.2.1.** Specifications & Performance Requirements
**8.2.2.** General considerations

**From a technical viewpoint and before any execution**,

The Contractor in charge of the implementation of the works in the present project should have knowledge of all the specific parts of the work specified in the whole document that form a homogeneous and complete work. This implies that all works and supplies must be completed in accordance with the present tender document and specifications.

In a way to avoid other contentions the Contractor shall inform the Managing Official of the client, in a separate note to his/her Bid, of all mistakes, omission or contradiction sighted in the document during studies, for appreciation by the client. In case of omissions in the description of certain works, the Contractor shall, in all cases, execute all necessary works to the perfect completion.

#### 8.2.2.1.1. The unit prices of the Contractor

Prices for the replacement of damaged materials and/or equipment's must always include the dismantling and the evacuation of materials and /or the equipment's including the repair of the works damaged during the dismantling of work and other surroundings.

The descriptive bills of quantities in the technical clauses do not alone make up contractual statements. The Contractor shall not signal out any alterations in the present document, be it in the different sections or plans or other documents relating to this tender document.

The Contractor should be conscious and verify all quantities during the time of Bid preparation. If he finds out that some quantities indicated in the descriptive and quantitative clauses are improper or missing, the Contractor shall correct them in a separate note joined to his/her Bid and shall not in any way ask for any price modifications without the consent of both parties in a legally acceptable addendum to the contract.

#### 8.2.2.1.2. During work execution

The Contractor shall signal out all expenses, materials and other equipment's or plans and diagrams that he judges necessary for the perfect execution of the works. These documents shall be submitted to the Managing official for approval who replies in 8 days following the receipt of the requests.

All details of supplies leading to the performance of principle plans must be submitted inevitably for approval by the Managing Official before the beginning of works execution, he shall always make sure that he gives his reactions in 8 days' time.

The Contractor shall not ask for any prolongation or compensation in terms of time for any modification he will have been asked to make. The Contractor must always present to the client for testing and approval of any material or equipment before they are put to use.

#### 8.2.2.1.3. Security

The Contractor shall, at all times, be familiar with the working environment and comply with all applicable laws, as well as all health, safety, security, and police regulations. The Contractor shall be liable for any loss or damage caused by fire and is responsible for the overall security of the Site.

#### 8.2.2.1.4. Water and electricity

The Contractor shall be responsible for all theall water and electricity consumption at the site.

#### 8.2.2.1.5. Access to the Site

The utilization of the existing routes by trucks and by other equipment's should not cause any nuisances to the environment (dusts, noises, ruts etc.). All deterioration of surface caused to the adjacent works shall be repaired to the expense of the Contractor.

#### 8.2.2.1.6. Implantation of works

All the Works and parts of works implantations will be done by the Contractor and at his expenses. Before commencement of works execution or implantation, the Contractor shall begin by a sub – implantation in order to verify the levelling of the land and inform the client of any possible inaccuracy. The representative of the client should first verify the implantation before works execution commences. A statement to the implantation shall be pronounced and given to the Contractor.

Before all beginning of works, the Contractor must be precise in the presence of the Managing Official, the pegging defining the time of works on the basis of data provided by the Engineer: benchmark, origin of each intervention zone. He will be responsible for all accidents and should always endeavor to prevent them.

#### 8.2.2.1.7. Utilization of materials

Materials to be used should be in conformity with the norms and laws in Rwanda and should conform to the present tender document. The conditions stipulated here shall always be considered as the minimum requirements for the implementation of the works.

#### 8.2.2.1.8. Environment Protection

The Contractor must respect the norms and prescriptions in relation to environment protection. On this note, he is supposed to remove all garbage and unused materials from the site and deposited far away in conformity with environmental regimes.

#### 8.2.2.1.9. Consistence of unit prices

The Contractor should be well versed with the conditions that would influence the execution of the works especially:

- The nature and the quality of soils and grounds,
- The conditions of transport and access to the site,
- The water and rain regimes in the region,
- The conditions of accessing water to the site,
- Any other particular conditions relative to the present site.

He should not, therefore, raise any claims relative to the difficulty or other eventualities except in case of a major unexpected situation, fully recognized by all parties. He should therefore calculate all the unit prices on the basis of the complete execution of the works and in accordance with the techniques of high labor intensity.

The unit prices of the present tender covers all the contractors' expenses, without any exceptions, in order to achieve the total completion of the foreseen works, this includes, the profit as well as other rights, taxes, general expenses, and all expenses done in Rwanda as a result of this work, mainly ,:

- All expenses (wages, social security funds, holidays, lodgings, transport etc), of supplies, renting, depreciation of equipment's and upkeep of the material,

- All expenses for the consumables bought in Rwanda or abroad, materials for site implantation and quarries

- All insurances of any nature, access to quarries, repair of roads, laboratory expenses, storage of materials.

Prices also include the expenses of site debarking and any other costs that are not incurred by the client.

#### 8.2.2.2. Specifications of materials

##### 8.2.2.2.1. General information

All materials shall be new and in full conformity with the present tender specifications and the Bill of Quantities (BOQ). They shall be supplied, installed, and maintained in accordance with the rules of good workmanship and industry standards, free from any shortcomings that might compromise the solidity and durability of the work throughout its lifetime. The contractor must perform these obligations diligently and, in a manner, consistent with the highest professional standards of the trade.

The Contractor, at the request of the client, should justify their origin by presenting the invoice or any other document agreed upon by both parties. The Contractor must present the results of all tests or exams that were requested to the client.

All materials and tests requested will be done at the Contractor's expense and delivered to their designated places. If the quantity of materials refused exceeds 10% of the materials submitted for testing, then all the materials submitted will be disqualified. The Contractor should permanently facilitate easy access for the client's personnel to all quarries, factories, laboratories, and workshops, to closely follow up and monitor the execution of the tender document, particularly regarding the origin and quality of the materials.

The time allowed for tests is 10 days from the time of sample submission. However, if this time is exceeded due to the client's request, the time will be prolonged by an equal number of days to compensate for the delay. The Engineer can allow the use of similar products to those that are prescribed, if she judges that these products' value is equal in quality and efficiency. In case of doubt, she will proceed with tests.

##### 8.2.2.2.2. Description of materials

###### 8.2.2.2.2.1. Stone size and gravel

The density must be approximately 2500 kg/m³, and the resistance must be equal to or greater than 30 N/mm².

Before beginning, all stones must be curved to the required shape with uniform surfaces.

The quarry stones shall have a width that is twice their height, and a length that is twice the width. The minimal length is 20 cm, the other measurements varying according to the relative drawing.

###### 8.2.2.2.2.2. Gravels and sands

Gravels and sands will be extracted from the quarries meeting the required technical and quality standards. These gravels and sands can also be extracted from the bottom of the rivers, but should be well washed and purified to remove silt before their utilization. The prescriptions fix minimal qualities for their granular metric spindles and their applications. Their minimal resistance is 30 N/mm²s.

###### 8.2.2.2.2.3. Forged laminated Iron and steel griddles

Only iron and steel bars meeting the required technical specifications and verified by the contracting authority shall be used in the works; they should be strong, resistant to cold weather, and have the following min. characteristics:

- Apparent elasticity limit: 4200kg/cm2 (420mpa) (> 480 N/mm2)
- Tensile stress: 5000kg/cm2 (500mpa) (240 N/mm2)
- Compressive stress: 14% (< 10%)

Steels for reinforced concrete must be able to bend in cold weather without changing the diameter of the rod.

The griddle hovers must be united, shiny, of uniform thickness, without cracks or rips. Clippings must detach themselves without breaking.

The wavy griddle will be in sheets with measurements corresponding to those on the market.

The work of applying protective layers, such as galvanization and aluminum layers, is performed exclusively in the factory and according to the manufacturer's specifications.

#### 8.2.2.2.2.4. Description of materials for concrete

**a) Sand 0-4 mm:**

The sand for concrete must come from natural layers or a crushing station. It must be free from all foreign bodies like organic matter, dust, oxides, pyrites, silt, or adhesive clays. It must not contain grains bigger than 5 mm. The equivalent of sand must be greater than 75%. The Managing Official can, if necessary, prescribe the washing of the sands. The granulometric test should be continuous with the following picture:

| Sieve opening in mm (square mesh) | Percentage of weight passing through the sieve |
|---|---|
| 5 | 100 |
| 2 | 50 |
| 0.5 | 20 |
| 0.08 | 5 |

**b) Gravels 5-25 mm**

The intended gravel for the concrete must be free from foreign bodies, such as organic matter and dust. Layers shall be selected from sources meeting the required technical and quality standards mentioned in the tender documents, proposed by the Contractor and subject to verification by the Managing Official. Gravels should present a regular shape and should neither be long nor flat. Their toughness and origin should be from proven tests with the following granulometric picture:

| Sieve opening in mm (square mesh) | Percentage of weight passing through the sieve |
|---|---|
| 25 | 100 |
| 20 | 75 |
| 15 | 50 |
| 10 | 15 |
| 5 | 0 |

**c) The Cement**

The recommended cement is Portland type Cement, Class P 325 or an equivalent cement meeting the same technical and quality standards may be used, subject to verification by the Managing Official. In

the event of any doubt regarding the quality of the cement, the client shall request tests at the Contractor's expense.

The Managing Official reserves the right to exercise his control in the factory on the manufacture, conservation, and the expedition of the cements that will be provided for works. The cement will be delivered in intact sacks and stored in water-tight stores. The delivery of cement in a jumble, as well as the utilization of set cement, is forbidden.

In the case that there would be cements of several qualities or several origins, the different supplies should be stored separately. Sacks will rest on the stilted boards and will be stacked in approximate blocks of 20 tons. A rotation of stocks must be respected. All cement presenting traces of humidity or held at the time of work will be rejected.

**d) Water**

The water for concrete mixing must be clean, clear, and odourless. It must not contain matters in abeyance beyond 2 grammes of liter. It must not provoke any chemical reaction on the cement that would prevent it from holding.

**e) Reinforcement steel bars**

They should have a diameter of not less than the one found in calculations; the characteristics of the reinforcements with high binding are as follows:

- Apparent elasticity limit: 4200kg/cm2 (420MPa)

- Tensile stress: 5000kg/cm2 (500mpa)

- Compressive stress: 14%

The properties of round and smooth reinforcement bars are as follows:

- Normal elastic limit: 2200kg/cm2 (220 MPa)

- Tensile stress: 3400kg/cm2 (340mpa)

- Compressive stress: 25%

The reinforcement iron bars for concrete are the high tensile and high adherence type with a diameter of not less than 40mm, with the following characteristics:

- Elastic limit: 400 N/mm²

- Tensile stress: 480 N/mm²

They should always be free from any spot of oil, paint, or soil particles; they will be entirely rid of the adhesive rust. They will be stowed by ligatures of appropriate solidity and in sufficient number so that they can displace themselves during the setting up of the concrete.

For stirrups of Ø 6 mm, smooth steel will be used.

**f) Making and setting up concrete**

All concretes are made mechanically, except if the quantity of concrete to be made on the site is lower than 1 $m^3$. All precautions should be taken to ensure that the temperature at the time of concrete setting is not greater than 40 °C. The tightening should be tidy and without provoking the beginning of segregation. The casting of concrete should be completed in an hour following the mixing and before it begins to set. Concretes should be maintained in good condition with adequate humidity for at least 15 days and should be protected from direct sunshine.

**g) Casing frames and their removal**

All reinforced concrete will be made in casings of wooden frames. Framings will be strong enough to resist the weight and the thrust of the concrete works. The vertical part of the frames can be removed 48 hours after setting, but the horizontal ones should never be removed in less than 15 days. The Contractor is not permitted to remove the frames before the guarantee has been confirmed by the client's representative.

**h) Composition of concretes**

| **Type of concrete** | Dosage and application | **Composition of granulates (in litres)** | **Resistance to the compression in 28 days** |
|---|---|---|---|
| **Concrete B 150** | Reinforced concrete to be spread under the foundations and the base of excavation, with a dose of 150 kg/m3 | Cement: 200kg<br>Sand: 400 litres<br>Gravel: 800 litres | 10 N/mm² |
| **Concrete B 250** | Reinforced concrete for the slab at a dose of 250 kg/m3 | Cement: 250kg<br>Sand: 400 litres<br>Gravel: 800 litres | 16 N/mm² |
| **Concrete B 300** | Slightly reinforced concrete for pit covers, dose of 300 kg/m3 | Cement: 300kg<br>Fine Sand: 400 litres<br>Coarse Gravel : 800litres, Gros sable : 800 | 16 N/mm² |
| **Concrete B 350** | Reinforced concrete for columns, slabs, and lintels.<br>Dose at 350 kg/m³ | Cement: 350kg<br>Sand: 400 litres<br>Gravel: 800 litres | 16 N/mm² |

**8.2.2.2.2.5. Prescriptions of materials for mortar**

**a) Sand 0, 03–3 mm:**

The sand for mortar should come from natural layers or crushing stations. It should be free from all foreign bodies such as organic matter, dust, silt, or adhesive clays. Spindle granulometric is continuous, sieving through meshes between 0.03 mm and 3 mm

**b) Cement**

The cement must be sourced from factories meeting the required technical and quality standards, as proposed by the Contractor and verified by the Managing Official. The Contractor will provide a certificate showing the origin of the cement. Portland Cement, Class P 325, or an equivalent cement of similar quality is recommended.. In the event of any doubt regarding the quality of the cement, the client shall request tests at the Contractor's expense.

The Managing Official reserves the right to exercise his control in the factory on the manufacture, conservation, and the expedition of the cements that will be provided for works. The cement will be delivered in intact sacks and stored in water-tight stores. The delivery of cement in a jumble, as well as the use of set cement, is prohibited.

In the case that there are cements of several qualities or origins, the different supplies should be stored separately. Sacks will rest on the stilted boards and will be stacked in approximate blocks of 20 tons. A

rotation of stocks must be respected. All cement presenting traces of humidity or held at the time of work will be rejected.

**c) Water**

The water for concrete mixing must be clean, clear, and odourless. It must not contain matters in abeyance beyond 2 grammes of liter. It must not provoke, on the cement, any chemical reaction that would prevent it from holding.

**d) Composition and preparation of mortars :**

| **Destination** | **Cement Dosing (kg/m³)** | **Sand (litres)** |
|---|---|---|
| Masonry of quarry stones (gravel) | 300 | 1.200 |
| Block masonry | 300 | 1.200 |
| Roughcasting of walls (Plastering) | 350 | 1.200 |
| Joining works | 500 | 1.200 |

It is essential to protect the mixed mortar from wind, rain, and direct sunlight. The prepared mortar must be used within 45 minutes of mixing. The mortar that has set should not be used.

#### 8.2.2.2.2.6. Description of quarry stone masonry

##### 8.2.2.2.2.6.1. Stone masonry

The stones to be used for masonry are those without visible fissures. The masonry will be executed according to the rules of the art, and the prescribed mortar is the M 300. Bigger-sized stones will be put in the horizontal sense. At least not more than a third of the stones should protrude through the thickness of the wall.

The big volumes of mortar should be avoided; the spaces between quarry stones should not exceed 6 cm, and should be filled with mortar. All direct contact between quarry stone should be avoided.

Before the temporary receipt, all the masonry work will be cleaned, brushed, and washed with water. Joints and the masonry work will be revisited to ensure they are clean in appearance.

##### 8.2.2.2.2.6.2. Dry Masonry

The dry stone masonry is identical to masonry in stones, but their joints are not joined by mortar.

#### 8.2.2.2.2.7. Description of Interlocking Stabilized Soil Blocks (ISSB)

Blocks shall:

- Be manufactured from suitable soil stabilized with cement.
- Contain **5–10% Ordinary Portland Cement (OPC)** by weight, depending on soil characteristics and structural requirements.
- Be machine-pressed to achieve uniform dimensions and adequate strength.
- Be properly cured for a minimum of **21–28 days** before use.
- Be free from cracks, distortions, or other defects.

Typical block dimensions:

| Length | Width | Height |
|---|---|---|
| 230 mm | 100 mm | 125 mm |

Minimum performance requirements:

- Compressive strength: ≥ **5.0 MPa** for load-bearing walls.
- Water absorption: ≤ **15% by weight**.

#### 8.2.2.2.2.7.1. Motar

Horizontal Joints will be done with minimal mortar because of the interlocking system, with

  - 1 part cement and 3 parts fine sand
  - Water to workable consistency

No mortar shall be placed in vertical joints.

#### 8.2.2.2.2.7.2. Wall Construction

Setting Out: Walls shall be accurately set out in accordance with approved drawings, and corners and intersections shall be checked for squareness.

**Laying Blocks:**

- Blocks shall be laid in running bond.
- Interlocking keys shall fit tightly without forcing.
- Courses shall be laid level and plumb.
- Maximum deviation:
  - Verticality: 10 mm in 3 m height.
  - Alignment: 10 mm in 10 m length.

**Wall Thickness:** The walls will be single-leaf, 100 mm thick.

#### 8.2.2.2.2.7.3. Reinforcement

**Where specified by the structural engineer:**

**Vertical Reinforcement:**

- Reinforcing bars of 10 mm diameter shall be placed in designated block cavities, at least every 2 meters.
- Cavities shall be filled with grout of a minimum strength of 20 MPa.

**Horizontal Reinforcement:**

- Ladder mesh, hoop iron, or steel bars may be placed every 3–5 courses.
- Additional reinforcement shall be provided:
  - Around openings.
  - At wall intersections.
  - At ring beams.

#### 8.2.2.2.2.7.4. Lintels and Ring Beams

**Lintels**

- Reinforced concrete lintels shall be provided above all door and window openings.
- Minimum bearing length: 150 mm on each side.

**Ring Beam**

- A continuous reinforced concrete ring beam shall be installed at roof level.
- Typical dimensions:
    - Width: equal to wall thickness.
    - Depth: 150–250 mm.
- Reinforcement as specified by the structural engineer.

#### 8.2.2.2.2.7.5. Curing and Protection

- Newly constructed walls shall be protected from direct impact.
- Masonry shall be kept damp for at least 7 days.
- Walls shall not be loaded until adequate strength has been achieved.

#### 8.2.2.2.2.7.6. Quality Control

**The contractor shall ensure:**

- Dimensional tolerance of blocks within ±2 mm.
- Compressive strength testing in accordance with relevant national standards.
- Proper alignment, plumbness, and bonding of walls.
- Inspection of reinforcement before grouting.
- Verification of curing procedures and block age before installation.

### 8.2.2.2.3. PVC Pipes

Materials to be used of polyvinyl chloride (PVC) shall have the following characteristics:

- **Lightness and Flexibility:** Density range of 1.1 to 1.35g/cm3.
- **Resistance to water's corrosiveness:** they are not attacked by the chemical agents and offer the best known resistance, with respect to the ASTM D870 standard.
- **Locally Available:** They are produced locally.

### 8.2.2.2.4. Window Glasses

Window glass, clear or tinted as specified in the BOQ, must be flat and free of defects.

Recommended Glass Thickness vs. Pane Area:

| Glass Thickness | Maximum Recommended Area | Typical Maximum Dimensions |
|---|---|---|
| 3 mm | Up to 0.5 m² | 600 × 900 mm |
| 4 mm | Up to 1.0 m² | 900 × 1,200 mm |
| 5 mm | Up to 1.5 m² | 1,000 × 1,500 mm |
| 6 mm | Up to 2.0 m² | 1,200 × 1,800 mm |
| 8 mm | Up to 3.5 m² | 1,500 × 2,400 mm |

The partitions of the meeting room will be equipped with 6mm tempered glass, flat and free of defects.

### 8.2.2.2.5. Materials for electric installation

#### a) General

A proposal for a complete electrical installation, in accordance with the REG and RURA regulations and the plans, must be submitted to the Contracting Authority for approval. The installation should include circuit-breaker boxes, thermal fuses, switches, and sockets.

#### b) Precautions of use

In the event of control and receipt of works, and if REG is unable to supply electricity, the Contractor should have a standby generator capable of providing lighting throughout the entire process.

#### c) Uniformity of the electric installation

All the electric equipment supplied will be carefully selected and chosen to ensure a uniform installation. All points of connection, switches, sockets, and different lighting points shall first be submitted to the Managing Official for approval. All materials should be of the same model, color, and mark quality, and from the same manufacturer.

#### d) Wiring system,

All electric wires will be placed in PVC tubes, which should be embedded in the wall before plastering or installed in the ceiling. In the case of an apparent installation, tubes will be replaced by sheaths. Deviation boxes shall be made of plastic, in a square or round shape. Connections of wires must be well-tightened and insulated.

#### e) Mode of execution

The electrical installation shall conform to international standards, and all work should be conducted with consideration for public safety.

#### f) Electric Materials

Only electric materials that conform to the applicable REG and RURA regulations and the requirements set out in the present Terms of Reference. Their conformity shall be verified and accepted by the Managing Official before installation.

#### g) Electric Conductors (Wires)

All live electric conductors should be well insulated, and all of them shall be of the VOB type:

**Blue: Neutral**

**Brown, Black, Red: Live**

**Green yellow: Earth**

**Wires of Ø 1.5 mm² shall be used for lighting**

**Wires of Ø 2.5 mm² shall be used in sockets**

#### h) Earth wires

The earth wires must be of equal or bigger size than the live wires, and the resistance of the earth wires should be at least 10Ω or less.

#### i) Connections

Connections are executed consistently up to the level of the derivation boxes that enter the sockets or switches. It is prohibited to have wire connections or junctions between wires; all connections should be in derivation boxes.

### 8.2.2.2.6. Materials for painting

**General note**

One month prior to starting to paint, the Contractor shall submit to the contracting authority all types of paint proposed for use on each layer, for verification of their conformity with the present Terms of

Reference. The paint labels shall clearly indicate the origin, solvents, type of binder, and any other relevant information. Paints and varnishes shall not be applied on site until the required quality tests have been conducted and their conformity verified by the contracting authority.

The paint must be of a type suitable for a vaccine laboratory, meeting the required technical specifications for hygiene, chemical resistance, durability, and safety. A seamless, high-performance epoxy or polyurethane coating shall be used to ensure compliance with Good Manufacturing Practice (GMP) and relevant Biosafety Level (BSL) standards, specifically BSL-3 as specified in the present terms of reference.

Paints must possess a high stability to dyes, light, and the atmospheric agents (alkalis, water, $CO_2$, and other aggressive agents).

Before executing the painting works, the Contractor must clean wall surfaces and possibly repair zones affected by high humidity, rough, or cracked surfaces.

Two days before painting, the Contractor shall invite the contracting authority to inspect and approve the area ready for painting.

The Contractor should repair all areas showing specific malformations. Painting will be done in a minimum of 3 layers.

#### 8.2.2.2.7. Various connections

##### 8.2.2.2.7.1. Water and electricity

The Contractor shall endeavour to connect to the main water and electricity supply; all costs associated with this connection shall be at their expense. In the event that public water distribution is unavailable, he will need to install a permanent water storage system at the site.

##### 8.2.2.2.7.2. Telephone and radio

The Contractor shall ensure that a fixed telephone or mobile is available at the site to maintain a permanent link between the site, headquarters, and the client.

##### 8.2.2.2.7.3. Security and site protection

The Contractor is responsible for the site security. He must take all necessary measures to prevent accidents on the site and comply with all labor laws related to the protection of workers. He must protect the site against theft or damage to installations or materials. He will be responsible for all this until the temporary receipt of works.

##### 8.2.2.2.7.4. Water diversion

The Contractor shall take necessary measures to ensure the outflow of rainwater and other exhaust.

##### 8.2.2.2.7.5. Temporary enclosure

The Contractor shall ensure a temporary enclosure of the site up to the end of the works, which will be demolished and the surrounding area restored.