INSTITUTE OF BUSINESS ADMINISTRATION (IBA) KARACHI

CONSTRUCTION OF RECREATIONAL AREA AT IBA AMAN TOWER

CITY CAMPUS KARACHI

VOLUME -II

TECHNICAL SPECIFICATION

STRUCTURAL STEEL FRAMING

Item No 1 STRUCTURAL STEEL FRAMING

This section of specification of Mild Steel (MS) building sections includes the material properties, dimensions, and manufacturing standards for various steel sections used in this construction. Below is a breakdown:

a) Material Properties of Mild Steel:

- 1. Built up Section from high tensile steel grade as per ASTM A572 Grade-50, 345MPa.
 - Hot rolled secondary members for channels, angles, pipes confirming ASTM A572, Grade36, 250MP
 - Cold formed secondary member conforming to ASTM A570M grade 50, 340Mpa
 - Primary connection bolts- High strength bolts, ASTM A325-ANSI 18.2.3.7/18.2.3.6 M.
 - Secondary connection bolts Machine bolts ASTM, A307
 - Self drilling self tapping screws AS3566.1-2202 corrosion resistance class 3 or equivalent.
 - Wind ties, if required, shall be minimum flat of size 40 mm x 6 mm.
 - Yield Strength: Typically around 250 MPa for ASTM A36.
 - Tensile Strength: 400–550 MPa.
 - **Elongation**: Minimum of **20%** for 200 mm gauge length.
 - Chemical Composition:
 - **Carbon** (C): 0.17% to 0.23% max
 - **Manganese (Mn)**: 0.60% to 0.90%
 - **Sulfur (S)**: $\le 0.05\%$
 - **Phosphorus (P)**: $\leq 0.05\%$
 - **Silicon (Si)**: 0.10% to 0.35%

b. Fabrication and Tolerances:

1. Main frame column base considered as pinned support.

2 Built up & Hot rolled sections to be designed as per Manual of Steel Construction, 9th edition, American Institute of Steel Construction (AISC)

3. Cold formed members to be designed as per 1996 Edition of Cold-Formed Steel Design Manual, American Iron and Steel, Institute (AISI)

4. Welding shall be applied in accordance with: American Welding Society (AWS D1.1.98)

c. Permissible Deflections

The permissible vertical deflection for structural steel members shall be as specified below:

a. For Primary Span / 180

b. For Secondary Span / 150

d. Corrosion Protection:

• **Coating**: Steel sections may also be painted with rust-resistant paints or coatings for additional protection.

e. Welding and Bolting:

- Mild Steel sections are typically welded or bolted together using standard welding techniques (arc welding, MIG welding) or bolted connections using high-strength bolts.
- Welding Specifications: Follow AWS D1.1.98 for welding procedures.

f. Finish:

- Hot Rolled Finish: Most mild steel sections are supplied with a hot-rolled finish, meaning they are rolled at a temperature above their recrystallization point.
- **Cold Rolled Sections**: In some applications, mild steel sections can be cold-rolled for precise dimensions and smooth surfaces.

g. Design Considerations:

- **Load-Bearing Capacity**: Structural sections are designed based on their moment of inertia and modulus of elasticity, following specific load-bearing design calculations.
- **Fire Resistance**: Mild steel has a relatively low fire resistance, and protective coatings or fireproofing may be applied to increase the structural integrity in case of fire.
- h QUALITY ASSURANCE PLAN (QAP) The Contractor shall adopt suitable quality assurance plan to ensure that materials and services under the scope of contract, whether manufactured or performed within the contractor's works or at the owner's site or at any other place of work are in accordance with the specifications. Such Plan shall be outlined by the contractor and shall be finally accepted by the owner/ consultant. QAP shall be submitted to owner/consultant for review and comment. Hard copies of final quality plans shall be submitted for stamping and approval
- i REVIEW OF SHOP DRAWING AND APRPOVAL GOOD FOR CONSTRUTION DRAWINGS Complete structural design and construction drawings shall get reviewed by Owner / Consultant in detail before taking up any fabrication / manufacturing activity.
 • For all structures, requisite number of prints of design calculation and working drawing shall be sent to Owner / Consultant for approval and site for construction

J PAINTING ON STRUCTURAL STEEL

Painting for structural members shall be one or more coat of Red Oxide primer and 2 or more coats of Synthetic Enamel Paint of approved brand having thickness of 90-100 micron DFT at site. 10.1 The following points must be observed for painting work:

a) Primer and paint shall be compatible to each other and should be from the same manufacturer.

b) The recommendation of the paint manufacturer regarding mixing, matching and application must be followed meticulously.

c). Paints and primers shall be supplied at site in original container with factory seal otherwise such paints and primers shall not be allowed to be used. Mode of application i.e. by spray, brush or roller shall be strictly as per recommendation of paint manufacturer. Painting materials must be used before the expiry date indicated on the containers. Number of coats and DFT per coat must be strictly followed as indicated above. If the desired DFT is not achieved for primer and finish paints in two coats (each), contractor shall be required to apply extra coat (s) to achieve the desired DFT without any extra cost to Owner / Consultant. Color shade for each coat of primer and finish paint must be different to identify the coats without any ambiguity. Shade for the final finish coat shall be decided by Owner / Consultant at site. All painting materials must be accompanied by manufacturers test certificates. However, Owner / Consultant has any doubt regarding quality of materials, he shall have the right to direct contractor to get the doubtful material tested or and provided (by contractor) testing agencies for which no extra payment shall be made to the contractor and the charges shall deemed to be covered in the unit rates quoted for fabrication and erection of structural work.

K ERECTION AND SETTING OF STEEL STRUCTURE

• The erection of steel work shall be in accordance with AISC Standard.

• The contractor shall be responsible for the suitability, safety and capabilities of all plant and equipment used for erection.

• Prior to starting erection of fabricated structure, defects if any shall be rectified. The contractor shall give to the Owner / Consultant not less than 24 hours notice of his intention to set out or give levels for any part of works, in order that arrangements may be made for checking. The contractor shall provide all necessary arrangements and assistance, which the Owner / Consultant may require for checking the setting out.

• The contractor shall erect the structural steel members in position, to dimension, and levels, as in relevant drawings and shall take care to see that component parts are not interchanged. Girders, stanchions etc., must rest fairly on their beds and will not be taken as erected until completely plumbed, aligned leveled, bolted or welded and strengthened, in every respect. The camber, if any, is to be maintained as shown in relevant drawings.

• Particular care should be taken to ensure free expansion and contraction wherever provided in the relevant design / drawings or so directed on site.

• While erecting, the holes in different component parts of structure should be made concentric with the use of drifts before any service bolts are fitted. No drifting shall be allowed except for bringing together several parts forming a member but the drifts must not be driven with such force as to disturb or damage the metal above the holes. Hammering of bolts to make holes concentric shall in no case be allowed. No nuts should be allowed to become loose and no unfilled bolt-holes are to be left in any part of the structure unless otherwise specified in the relevant drawings. Welding should be adopted wherever specified in the drawings. Wooden rams or mallets shall be used in forcing members to position, in order to protect metal from injury or shocks, chipped edges shall be finished off smooth and all concave surface rounded off.

• All erection tools and plants viz. derricks, cranes etc. will have to be provided by the contractor as required in the erection work. All erection devices must be removed after the work is over, in such a way that no damage is done to the erected structures. Any damages, in this respect must be rectified by the contractor at his own cost.

• The maximum tolerance for line and level of the steel work shall be + 3.0 mm on any part of the structure. The structure shall not be out of plumb more than 3.5 mm on each 10 M. Section of height and not more than 7.0 mm per 30 meter section. These tolerances shall apply to all parts of the structure unless mentioned in the drawings issued for erection purposes

ITEM NO-2 CHEMICAL ANCHOR BOLT

This specification covers the chemical, mechanical, and dimensional requirements, and associated test methods for straight and bent, headed and headless anchor bolts (also known as anchor rods) made of carbon, carbon boron, alloy, or high-strength low-alloy steel and having specified yield strengths. The anchor bolts are furnished in three strength grades, two thread classes, and various sizes, and are intended for anchoring structural supports to concrete foundations such as building columns, column supports for highway signs, street lighting and traffic signals, steel bearing plates, and similar applications. The bolts shall adhere to specified elemental chemical compositions as examined by heat and product analysis. They shall also be tested for their conformance with mechanical properties such as tensile strength, yield strength, elongation, reduction of area, and stress area. The anchor bolts shall also meet specified values for nominal size, body diameter, bend section, length, bend angle, and coated length.

Materials

- Anchor Bolt: Typically made of stainless steel, galvanized steel, or other corrosionresistant materials.MS A-36, low carbon Steel having 36 KSI yield strength and are commonly used for residential and commercial buildings.
- **Chemical Resin**: The chemical anchor uses a two-component resin system (epoxy, polyester, or vinyl ester), depending on the application.

Technical Specifications

Feature	Specification
Bolt Diameter	6mm – 20mm (varies)
Bolt Length	60mm – 300mm (depending on application)
Resin Type	Epoxy, polyester, vinyl ester
Minimum Embedment Depth	80mm – 200mm (depends on bolt size)
Tensile Strength	36 kN – 105 kN (varies)
Shear Strength	5 kN – 25 kN (varies by product)
Curing Time	30 minutes to 2 hours (depends on resin)
Temperature Resistance	-40° C to $+80^{\circ}$ C (resin-dependent)
Resistance to Chemical Attack	Excellent resistance to oils, solvents, and other chemicals (depending on resin type)

Installation Instructions

- 1. **Drill the Hole**: Use the correct drill bit size based on the bolt diameter and anchor type.
- 2. **Clean the Hole**: Thoroughly clean the hole to remove dust, debris, and moisture. This ensures proper adhesion of the resin.
- 3. **Insert the Resin**: Inject the chemical resin into the hole.
- 4. **Insert the Bolt**: Insert the anchor bolt into the resin-filled hole, turning slightly to ensure full coverage.
- 5. Allow Curing: Allow the resin to cure as per the specified time in the product data sheet.
- 6. **Torque**: Apply the specified torque to the bolt after curing to achieve the full load capacity.

Safety and Handling

- **Precautions**: Follow the safety instructions provided with the product. Wear protective gear, such as gloves and safety glasses, when handling resin and bolts.
- Storage: Store in a cool, dry place, away from direct sunlight and high temperatures.
- Shelf Life: Check the expiry date for resin products, typically between 12-24 months.
- Waste Disposal: Dispose of used products in accordance with local regulations.

Certification

- **CE Marking**: Conforms to European standards.
- ICC-ES Approval: (for U.S. use) Certified by the International Code Council.

Item No 4 COMPOSITE METAL DECK

Metal deck Comflor 46 is used .Specification typically refers to the characteristics, materials, and requirements for metal decking used in construction. It is used for flooring or roofing systems and can be made from steel or aluminum. Following is its key specification:

1. Material Type

- Steel: Most common material, generally cold-rolled or galvanized steel.
 - Grade: ASTM A653 Standard deck material specification to BS EN 10346.
 - **Thickness**: 18 gauge (0.0478" or 1.2mm).
 - **Finish**: Galvanized (G60, G90), uncoated, or painted.

2. Type of Decking

• **Composite Deck**: Includes ribs or profiles that allow it to work in combination with a concrete slab for strength..

3. Deck Profile

- **Profiles**: The specific design and shape of the metal deck's ribs, which could include:
 - Cover Width : 900mm
 - Depth : 46mm
 - Pitch : 225mm
 - Trough Width : 105mm
 - Crown Width : 67mm
 - Profile weight : 0.13 KN/Sq M ~ 1.232 Kg/Sq ft
 - Cross sectional area : Sq mm/M
- **4.** Slab thickness : 110 mm .Concrete volume 0.091 Cu m/Sqm.

Normal wt. of Conc.(Wet) = 2400 Kg/ Cum

7. Fire Rating

- Fire ratings depend on material thickness, type, and coating.
- Can have a UL rating (Underwriters Laboratories) for fire-resistance (e.g., UL 263 or UL 790).

8. Corrosion Resistance

• **Galvanized Coating**: Zinc coating (G60, G90) for added corrosion protection, especially in outdoor or exposed conditions.

ITEM NO 4 REINFORING G-60 DEFORMED BAR

The **G-60 Deformed Reinforcement Bar** is commonly used in construction for reinforcing concrete structures due to its high tensile strength and good bonding characteristics. The general **technical specifications** for a G-60 Deformed Reinforcement Bar:

1. Grade:

- Grade: G-60 (or 60 Grade)
- Yield strength of 60,000 psi (414 MPa).

2. Material:

- **Material Type**: Carbon Steel (Typically low-carbon steel with specific alloying elements like manganese for strength)
- **Standard**: Generally conforms to ASTM A615 (Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement).

3. Mechanical Properties:

- Yield Strength: 60,000 psi (414 MPa) minimum.
- **Elongation**: Generally, the minimum elongation should be around 12% for bars with a diameter greater than 10 mm.
- Modulus of Elasticity: Approximately 200,000 MPa.

4. Chemical Composition (Typical):

- **Carbon**: 0.23% 0.30%
- **Manganese**: 0.60% 0.90%
- **Phosphorus**: $\leq 0.04\%$
- **Sulfur**: $\le 0.05\%$
- **Silicon**: 0.15% 0.30%
- **Other elements** (such as copper, nickel, chromium, etc.): In trace amounts for alloying and strengthening.

5. Standards and Compliance:

- ASTM A615: Standard specification for deformed and plain carbon steel bars.
- **BS 4449**: British standard for steel bars for the reinforcement of concrete.

6. Testing & Quality Control:

• The G-60 Deformed Bar undergoes various tests, including tensile tests, bend tests, and chemical composition analysis, to ensure it meets the required mechanical and physical properties.

ITEM NO 5 BRC D-83 Mesh Specifications

Product Description

- **Type**: BRC D-83 is a type of welded wire reinforcement used in reinforced concrete structures confirming to BS 4483.
- **Material**: Typically made from high-tensile steel wire with corrosion-resistant coating, which can vary depending on specific requirements.
- **Application**: Used for reinforcing concrete in slabs, pavements, walls, and other structural elements to prevent cracking and increase strength.

2. Standard Compliance

- **International Standards**: Complies with relevant standards such as BS 4483 (British Standard) or ASTM A1064 (American Standard).
- **Mesh Configuration**: Typically arranged in square or rectangular grids with specific spacing.

3. Product Specifications

Property	Specification
Mesh Size	150mm x 150mm
Wire Diameter	6.0mm
Nominal Yield Strength 500 MPa	
Wire Material	High-tensile steel
Weight per Unit Area	5.0kg/m ²
Length per Roll	Varies (e.g., 30 meters, 50 meters, etc.)
Width per Roll	Varies (typically 2 meters, 3 meters, etc.)
Load-Bearing Capacity	High, depending on design and reinforcement requirements
Wire Spacing	Standard spacing (150mm x 150mm) but customizable

4. Performance Characteristics

- **Tensile Strength**: High tensile strength to resist cracks and deformation in concrete.
- **Flexural Strength**: Enhances the concrete's flexural strength, especially in pavements and slabs.

5. Handling and Storage

- **Storage**: Store in a dry, sheltered location to avoid damage or rusting. Avoid exposure to harsh chemicals.
- **Handling**: Use appropriate lifting equipment when handling large rolls of wire mesh to prevent injury and damage.

6. Safety Considerations

- Ensure protective gear (gloves, goggles) is used during handling to avoid injury from sharp edges.
- Ensure proper handling techniques to prevent strain or injury during installation.

7. Installation Guidelines

- **Placement**: The mesh should be placed within the middle of the concrete slab or structure to maximize reinforcement.
- **Overlap**: Overlap adjacent sections of the mesh by at least 150mm to ensure continuous reinforcement.
- **Concrete Coverage**: Ensure adequate concrete coverage over the mesh to protect the wire from corrosion and exposure.

8. Warranty and Certification

- **Warranty**: Typically, the manufacturer will provide a warranty against defects in material and manufacturing.
- **Certification**: Certificates of conformity to international standards may be provided upon request.

ITEM NO 6 CONCRETE CLASS C (1:2:4)

Class C concrete is commonly used for general-purpose construction. It's a standard mix that provides moderate strength and durability. The specific composition can vary depending on local standards, but here's a typical specification for Class C concrete:

General Specifications for Class C Concrete:

1. Compressive Strength:

• Typically, Class B concrete is designed to achieve a compressive strength of **20 MPa** or about **3000 psi** at 28 days (Cube Strength).

2. Mix Proportions:

- A typical mix ratio for Class B concrete may vary, but common proportions are:
 - Cement: 1 part
 - **Sand**: 2 parts (fine aggregate)
 - Gravel/Coarse Aggregate: 4 parts
- \circ Water-Cement Ratio (W/C): Typically around **0.45 to 0.60** (this varies depending on mix design and local standards).

3. Cement Type:

• The type of cement used is often **Ordinary Portland Cement (OPC)**, though specific projects may require other types like **Pozzolanic Cement** or **Sulphate-Resistant Cement**, depending on environmental factors.

4. Aggregate:

- Fine Aggregate (Sand): Clean, well-graded sand free from harmful impurities.
- **Coarse Aggregate (Gravel)**: Crushed stone or gravel, typically with a maximum size of **20 mm**.

5. Water:

• Clean, potable water should be used to mix the concrete. The water should be free from harmful chemicals or impurities that might affect the concrete's strength.

6. Workability:

- Slump value typically ranges from **50 to 100 mm** for ease of handling and placement.
- 7. Durability:
 - Class B concrete should be suitable for use in **mild exposure environments** (e.g., normal atmospheric conditions, not exposed to severe weather or aggressive chemicals).

8. Curing:

• Proper curing is essential to ensure that the concrete develops its full strength. The concrete should be kept moist for at least **7 days**, or until the concrete has reached a sufficient strength (as per local guidelines).

ITEM NO 7 NON- SHRINKAGE CONCRETE GROUT

Non-shrinkage concrete grout is a specialized type of grout designed to fill voids, gaps, and cavities while preventing shrinkage during and after setting. It is commonly used in construction applications like anchoring, repairing, and leveling. The specifications for non-shrinkage concrete grout typically include the following:

1. Material Composition

- **Cement**: The base of the grout is usually made from high-quality hydraulic cement.
- **Fine Aggregates**: The grout may include fine aggregates like silica sand to provide workability and help with the flow of the grout.
- Additives: Non-shrinkage additives are incorporated to control shrinkage and improve the grout's performance. These additives may include expansive agents, plasticizers, or other shrinkage-reducing agents.
- Water: The grout mixture includes a specific amount of water to achieve the desired consistency and workability.

2. Performance Characteristics

- **Non-Shrinkage**: The grout must exhibit no significant shrinkage once it has set and cured, ensuring it remains in place without pulling away from the surface or filling.
- **Flowability**: It should have excellent flowability to ensure it fills all voids and gaps without segregation. This property is usually determined by the flow test.
- Workability: The grout should be easy to mix, place, and finish, even in confined spaces.
- **High Strength**: It should achieve a high compressive strength once set, usually specified in MPa (Mega Pascals) at a certain age (e.g., 7 days, 28 days).
- **Durability**: The grout should be resistant to environmental factors such as moisture, freeze-thaw cycles, and chemical attacks (like chlorides or sulfates), depending on the application environment.
- Set Time: The grout should have a reasonable setting time, which can vary depending on the environmental conditions and specific requirements of the project.

3. Mix Design

The mix design for non-shrinkage grout is generally based on the manufacturer's guidelines. A typical mix might be:

- Cement: 1 part
- Fine aggregate (sand): 2 to 3 parts
- Water-cement ratio: Typically around 0.25 to 0.30, but this depends on the specific product.
- Additives: As per the manufacturer's recommendations, to reduce shrinkage.

4. Application Methods

- **Grouting Pressure**: Some non-shrinkage grouts are designed for pressure grouting to ensure proper filling of all voids.
- **Pouring**: For non-shrinkage grout used in anchoring or filling larger gaps, it is typically poured into the void or space until completely filled.
- **Injection**: For applications that require filling narrow or confined spaces, injection methods may be used.

5. Curing

- **Curing Time**: Proper curing is essential for achieving full strength and performance. Curing times can vary but are generally recommended for at least 24 to 48 hours.
- **Curing Method**: Wet curing or the use of curing compounds is recommended to prevent rapid moisture loss and ensure proper hydration of the grout.

6. Compressive Strength

- **28-Day Strength**: The grout should achieve a minimum compressive strength of approximately 30 MPa (depending on the application) after 28 days of curing.
- **Early Strength**: Some formulations are designed to gain early strength within hours, particularly when grouting is required quickly.

7. Expansive Characteristics

• **Expansion After Setting**: Non-shrink grouts typically exhibit a controlled expansion after setting to compensate for any shrinkage that might occur during hydration, ensuring that they fully occupy the voids without pulling away from the sides.

8. Application Standards and Compliance

- The grout should meet or exceed standards such as:
 - ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)
 - **BS EN 1504-6** Products for repair of concrete structures.
 - \circ ACI 503R Guide for the selection and use of non-shrink grouts.

9. Packaging and Storage

- **Packaging**: Non-shrink grout is typically packaged in bags (e.g., 25 kg bags).
- **Storage**: It should be stored in dry, cool conditions, protected from moisture and contamination.

10. Special Considerations

- **Temperature**: Temperature of the grout and surrounding environment can affect the grout's performance. For instance, in high temperatures, the grout might set too quickly, while in low temperatures, the curing process can be slowed.
- **Application Method**: The grout's consistency and properties may need adjustment based on whether it will be applied manually, pumped, or injected.

ITEM NO -09 PIR SAND WICH PANELS

PIR (Polyisocyanurate) sandwich panels ,a general specification outline for PIR sandwich panels are as :

1. Panel Composition:

- **Core Material**: Polyisocyanurate (PIR) foam core, offering superior thermal insulation properties.
- Facings: Usually metal facings made from materials such as:
 - Galvanized steel
 - Aluminum
 - Pre-coated steel (e.g., polyester, PVDF, or plastisol coatings)
 - Organic coatings for specific aesthetic or durability needs

2. Core Density:

• Typically between 32 kg/m³ and 40 kg/m³, depending on the panel thickness and performance requirements.

3. Thermal Insulation Properties:

- Thermal Conductivity (λ): Typically in the range of 0.022 to 0.024 W/m·K.
- Thermal Resistance (R-value): R-value is usually between 5.0 and 6.0 m²·K/W for typical thicknesses (50-60 mm).
- **Fire Resistance**: PIR panels generally offer a **Class 1 or Class 2** fire rating, depending on the specific formulation of the PIR core.

4. Panel Thickness:

• The thickness typically ranges from 40 mm to 200 mm, depending on the thermal and structural requirements.

5. Fire Performance:

- Fire Classifications: PIR sandwich panels can meet BS EN 13501-1 or FM 4880/4881 standards.
- Fire Rating: Generally, B-s2, d0 or C-s3, d0 according to European fire standards.

6. Compression Strength:

• **Compressive Strength**: Typically, PIR foam cores have compressive strength ranging from **100 kPa to 150 kPa**, depending on the thickness and core density.

7. Acoustic Performance:

• Sound insulation properties depend on thickness and density, but typical **sound** reduction values (Rw) can range from 20 dB to 30 dB.

8. Panel Dimensions:

- Standard panel width: 1000 mm, 1200 mm, or customized.
- Standard panel length: up to 12,000 mm.
- Custom sizes can be produced based on project requirements.

9. Weather Resistance:

- Panels are designed to withstand harsh environmental conditions (rain, wind, UV exposure, etc.).
- The facings are typically coated to enhance durability against corrosion and weathering.

10. Joint System:

- **Tongue-and-groove** or **male-female** interlocking systems to ensure seamless installation and thermal bridging prevention.
- Sealed joints to prevent air leakage.

11. Applications:

- Used for walls, roofs, and facades in buildings like industrial warehouses, cold storage facilities, and commercial buildings.
- Can be used in both exterior and interior applications.

12. Environmental Considerations:

- PIR sandwich panels are typically CFC- and HCFC-free and have a low Global Warming Potential (GWP).
- The panels can also be recyclable, depending on the materials used for facings.

13. Certifications and Standards:

- **CE Certification**: Complies with European construction standards.
- **FM Approval** (Factory Mutual) or **UL Certification** (Underwriters Laboratories) for specific fire performance.
- **ISO 9001**: Quality management system certification.

These are general guidelines. For specific project requirements, it's always best to consult with the manufacturer for detailed technical data sheets and compliance with local building codes.

ITEM NO 8- CONCRETE MASONARY UNIT (CMU)

The specification for concrete machine-made blocks (also known as concrete blocks, CMUs, or concrete masonry units) generally includes various properties and characteristics to ensure that they meet the required standards for construction. Here's a general specification for concrete machine-made blocks:

1. Material Composition

- **Cement**: Ordinary Portland Cement (OPC)
- Aggregate: Fine and coarse aggregates
- Water: Clean, potable water for mixing.

2. Dimensions

- Standard sizes:
 - **Length**: 390 mm (16 inches)
 - **Width**: 190 mm (8 inches)
 - **Height**: 140 mm (6 inches) Other custom sizes can be made according to project requirements.

3. Compressive Strength

- Minimum Compressive Strength: 7.0 MPa (1000 psi)
- 0
- 4. Water Absorption
 - Water Absorption Rate: Typically not exceeding 10% for standard blocks and can vary based on mix design.

5. Sound Insulation

• Blocks can provide a sound transmission class (STC) rating of approximately 40-50, depending on the density and thickness.

6. Thermal Insulation

- Lightweight concrete blocks provide better thermal insulation properties.
- Thermal conductivity (k-value): Typically ranges from 0.7 to 1.5 W/m·K depending on the material composition.

7. Fire Resistance

• Concrete blocks are typically **fire-resistant** and have a fire rating of **up to 4 hours** depending on the block thickness and type.

8. Durability

- Concrete blocks are designed to be durable, resistant to water penetration, frost, and weathering.
- Meets the durability requirements set by national building standards (e.g., ASTM, BS).

9. Shape & Appearance

- The surface should be smooth and uniform, with no visible defects like cracks or chips.
- Available in different finishes: smooth, rough, or textured, depending on aesthetic requirements.

10. Manufacturing Process

- **Machine-making**: Concrete blocks are produced using a block-making machine, which ensures uniformity in shape, size, and compaction.
- The blocks are either cured using **air curing** or **steam curing** to enhance their strength and durability.

11. Quality Control

- Each block should undergo **visual inspection** and **strength testing** for compliance with the specifications.
- **Sampling** should be conducted to verify the quality, strength, and absorption rates.

12. Compliance with Standards

- The blocks must conform to national and international standards such as:
 - ASTM C90 (for concrete masonry units)
 - **BS EN 771-3** (European standard for masonry units)

15. Reinforced Blocks (Optional)

• In specific applications, concrete blocks can be reinforced with steel bars (rebars) to increase their load-bearing capacity.

SPECIFICATION FOR WORKMANSHIP

When laying block masonry, a proper specification ensures durability, stability, and strength. Below is a general specification for laying block masonry

1. Materials

- Blocks:
 - Type: Concrete blocks, as specified masonry units.
 - Size: Standard block size (390mm x 190mm x 140mm) or as per design &drg.
 - Strength: Blocks should meet the required compressive strength per specifications (e.g., 7 MPa.).
- Mortar:
 - Type: Cement sand mortar mix with water repellent additive.
 - Mix ratio: Standard mix ratio for masonry mortar (1:4 cement-to-sand)
 - Additives: Add water repellents as per manufacturer's recommendation.
- Water:
 - Clean, potable water should be used for mixing mortar.

2. Preparation

• Surface Preparation:

- Ensure the foundation or substrate is clean, level, and free from debris before starting the masonry work.
- Damp the base (concrete slab or foundation) with water to prevent rapid drying of the mortar.

• Block Preparation:

• If required, dampen the blocks before laying to avoid excessive water absorption from the mortar.

3. Laying Blocks

- Bond Pattern:
 - The bond for block masonry is the English bond with 10mm (+/- 2mm) uniform joint may be used or as specified. Ensure that joints are staggered between courses.

• Mortar Application:

- Spread mortar evenly on the foundation, then on the top of the first block before laying the next block.
- Apply enough mortar to form a joint of approximately 10mm, ensuring a continuous joint.
- \circ The mortar should be laid on both the bed and the sides of each block (butt joint).

• Alignment and Leveling:

- Use a spirit level or laser level to ensure blocks are laid in a straight line and level.
- Use a mason's string line for horizontal alignment to keep the blocks straight and even.
- Check the vertical alignment using a plumb bob or spirit level.

4. Jointing

- Joint Thickness: Maintain a consistent mortar joint thickness (typically around 10mm).
- **Pointing**: Tool the mortar joints after they have set but before they harden completely. Ensure the joints are properly compacted and smooth.

5. Reinforcement (if required)

- **Reinforcement Bars**: As specified by the design, place horizontal reinforcement bars 3/8" dia 300 mm long welded to MS column at every three block courses.
- Grout: If required, grout voids around the reinforcement.

6. Curing

- After laying the masonry, keep the blocks damp for at least 48 hours to ensure proper curing of the mortar.
- Use a water spray or curing compound to prevent the mortar from drying out too quickly, especially in hot or dry conditions.

7. Protection

- Protect freshly laid masonry from extreme weather conditions, such as heavy rain or freezing temperatures.
- Use tarps or protective coverings to shield the masonry.

8. Cleanup

- Remove any excess mortar from the surface of the blocks before it hardens.
- Clean tools regularly to maintain their effectiveness.

9. Quality Control

- Inspect for proper bond, alignment, and level throughout the project.
- Ensure block placement is uniform, with no visible gaps or misaligned blocks.
- Verify that the mortar joints are consistent and compact.

10. Health and Safety

- Ensure all workers wear proper protective gear, including gloves, eye protection, and safety footwear.
- Follow local health and safety regulations for working with masonry and mortar materials.

ITEM NO 09 CEMENT SAND PLASTER RENDERING

Cement-sand plaster is commonly used for finishing walls and ceilings in construction. The standard specifications for cement-sand plaster generally depend on the type of plastering required (internal or external) and the required thickness. Here are the typical specifications for cement-sand plaster:

1. Proportions

- Internal plaster
 - **Cement: Sand** ratio = 1:4 CSM (one part cement, four parts sand)
- **External plaster** (for external walls):
 - **Cement: Sand** ratio = 1:3 CSM (one part cement, three parts sand)

2. Materials

- **Cement**: Ordinary Portland Cement (OPC)
- Sand: Clean, well-graded natural sand. The sand should be free from impurities such as clay, silt, or organic matter. The particle size should be between 0.075 mm and 4.75 mm. Fineness modulus of sand should typically be in the range of 2.5-3.5.

3. Water

- Clean potable water free from impurities should be used for mixing.
- The water-cement ratio should be maintained properly, generally between 0.45 to 0.55.

4. Thickness

- **Internal plaster** thickness: 12–15 mm.
- **External plaster** thickness: 15–20 mm.

Note: If more thickness is needed, it can be done in two layers. The first layer should be about 10 mm, and the finishing layer can be around 5-10 mm.

5. Mixing Procedure

- The cement and sand are thoroughly mixed dry to ensure uniform distribution of the materials before water is added.
- Water is added gradually and mixed until a uniform, workable paste is formed.

6. Application

- The plaster is applied in two coats: the **base coat** and the **finishing coat**.
 - **Base coat**: Applied in a rough manner, with a thickness of 10-12 mm.
 - Finishing coat: A smoother, finer coat with a thickness of 3-5 mm.

• The plaster should be applied with trowels or other appropriate tools, ensuring an even surface.

7. Curing

- Proper curing is essential for the strength and durability of plaster. The plaster should be kept moist for at least 7 days (for internal) and 14 days (for external).
- Curing can be done by spraying water or covering the surface with wet burlap or jute bags.

8. Surface Preparation

- The surface to be plastered should be clean and free from loose particles.
- For better bonding, the surface may be roughened or pre-wetted before applying the plaster.

9. Admixtures (optional)

• In some cases, admixtures like water-repellent agents or plasticizers can be added to improve the plaster's properties like workability, adhesion, and water resistance.

10. Strength

• The compressive strength of the plaster should meet the standard requirements, typically around 2.5 to 5 MPa after 28 days of curing, depending on the mix proportions.

ITEM NO 10 FLOOR PROCELEAN HEAVY DUTY TILE

When specifying floor porcelain tiles the following factors, such as size, finish, material composition, and performance characteristics should be consider. Below is specification for porcelain floor tiles:

1. Material Composition

- Material: High-quality porcelain (fired at a high temperature, typically over 1200°C).
- **Body Composition**: 100% porcelain,(Full body) with minimal impurities, ensuring durability and resistance to wear.
- Water Absorption: Less than 0.5%

2. Physical Dimensions

- Tile Size:
 - Sizes: minimum 12"x12" (300x300 mm),
 - Thickness:
 - Thickness: 10mm ~, 12mm (depending on the tile size and application).
 - Heavy-duty tiles (for commercial spaces) may have thicker options (up to 20mm).

3. Surface Finish

- Matte/Unpolished: Non-reflective finish, ideal for slip resistance.
- **Textured**: For added slip resistance (especially in wet areas like bathrooms or kitchens).

4. Performance Characteristics

- Abrasion Resistance:
 - Class PEI (Porcelain Enamel Institute) rating to indicate durability:
 PEI II (Medium traffic)
- **Hardness**: Porcelain tiles are highly durable, usually rated at 7 on the Mohs scale of hardness.
- **Chemical Resistance**: Good resistance to chemicals, which makes porcelain ideal for commercial spaces where cleaning agents are used frequently.

5. Durability and Resistance

• Stain Resistance: Porcelain tiles generally resist staining and are easy to clean.

6. Environmental and Sustainability Factors

• **Sustainability Certifications**: Look for certifications like LEED (Leadership in Energy and Environmental Design) or other eco-friendly credentials.

7. Installation Considerations

- **Subfloor Requirements**: The subfloor should be dry, level, and smooth. For large-format tiles, additional preparation may be needed to ensure a secure bond.
- **Grout Joint**: Typically between 1/16" and 1/8" (1.5-3mm) for standard tiles; larger grout joints may be used for larger tiles.
- Adhesive: Use high-quality thin-set adhesive, typically modified for added bonding strength.

8. Aesthetic and Design Options

- Color: Available in various colors, including white, beige, gray, black, and more.
- Patterns: Solid colors, marbled effects, geometric patterns, and wood-look designs.
- Finish Design: Available in both traditional and modern designs.

9. Certifications and Standards

- ANSI A137.1: The standard for ceramic tiles.
- ISO 13006: International standard for ceramic tiles.
- **BS EN 14411**: European standard for ceramic tiles.

ITEM NO 11 VINYL FLOORING

In specifying vinyl flooring, the following key factors are to consider. :

1. Type of Vinyl Flooring

• **Rigid Core Vinyl (SPC or WPC)**: Features a strong core, making it more durable and ideal for high-traffic areas.

2. Dimensions

• **Tile Size (LVT, VCT)**: 12" x 12", 18" x 18", or custom sizes

3. Wear Layer Thickness

• **Commercial Use**: 20 mil to 40 mil (0.5mm to 1.0mm)

4. Core Type

• **Rigid Core** (SPC/WPC): Offers additional stability and is highly resistant to dents and scratches.

5. Surface Treatment

- UV Coating: Helps resist scratches, stains, and wear.
- Antimicrobial: Reduces bacterial growth on the floor.
- Slip Resistance: Especially important for wet areas (bathrooms, kitchens).

6. Finish

- Matte, Glossy, or Semi-Gloss: Determines the shine and reflects light.
- **Textured or Smooth**: Affects appearance and slip resistance.

9. Moisture Resistance

- Waterproof: Ideal for high-moisture areas like bathrooms, kitchens, and basements.
- Water-Resistant: May not be suitable for areas with direct water exposure.

10. Installation Method

• Glue-Down: Requires adhesive and is common for sheet vinyl and VCT.

ITEM NO 12 & 13 GLAZED ALUMINUM DOORS & WINDOWS

This specifications cover materials, dimensions, finishes, and performance standards typically required in construction projects.

1. General Requirements:

- **Scope**: The specification covers the supply and installation of aluminum doors and windows, complete with glazing.
- **Manufacturer**: The doors and windows must be manufactured by a reputable company with proven experience in aluminum systems.
- **Compliance**: All doors and windows must conform to relevant national building codes and standards (e.g., ASTM, BS, or ISO).

2. Materials:

- Frames:
 - High-quality aluminum alloy (e.g., 6063-T5 or 6061-T6) with corrosion-resistant properties deluxe model bronze colour.
 - The frame should be extruded aluminum profiles, with thermal breaks to minimize heat transfer.
- Glazing:
 - Single Glazing: 5mm tinted glass or as specified.
 - **Safety**: Glass must meet safety standards (e.g., tempered or laminated as per local building codes).
- Seals:
 - High-quality silicone or EPDM rubber gaskets to ensure airtight and water-tight performance.
 - Weatherstripping must be used to minimize drafts, noise, and water infiltration.

3. Design:

- **Door Types**: Hinged, sliding, or bi-fold as per the design requirements.
- Window Types: Casement, sliding, fixed, or tilt-and-turn, as required.
- Configuration:
 - Windows and doors must be available in custom sizes and configurations, with a range of opening types and panel options.
 - Profiles should be designed for easy installation, with adequate drainage and weatherproofing features.
- Finish:
 - **Anodized Finish**: Clear, bronze, or black anodized aluminum for corrosion resistance and durability.

4. Performance Requirements:

- Air Tightness: Should conform to the air permeability requirements as per relevant standards (e.g., ASTM E283).
- Water Tightness: The doors and windows must withstand water penetration at specific wind pressures and rainfall rates as defined by local standards (e.g., ASTM E331).
- Wind Load Resistance: The windows and doors must be capable of withstanding specified wind loads, depending on the building location and local regulations (e.g., ASTM E330).
- Thermal Performance:
 - Low U-value to meet energy-efficiency standards (for double glazing: U-value typically 1.4 W/m²·K or better).
 - The thermal transmittance for frames and glazing should be calculated to meet energy-efficiency goals.
- **Sound Insulation**: Minimum sound reduction of 30 dB, or as per the project's acoustical requirements.

5. Installation:

- **Method**: Doors and windows should be installed per the manufacturer's instructions, ensuring proper sealing and adjustment.
- Anchorage: Secure anchoring systems to allow for thermal expansion and contraction.
- **Plumb & Level**: The frames must be plumb and level, with all components operating smoothly without binding.

6. Accessories:

- **Handles and Locks**: High-quality, corrosion-resistant hardware such as stainless steel or brass handles, locks, and latches.
- Hinges & Tracks: Stainless steel or aluminum hinges for doors, and robust sliding tracks for windows.
- **Flashing**: Appropriate flashing systems for waterproofing, to prevent water ingress at joints.

7. Quality Control & Testing:

- All materials and installation processes must be subjected to inspection and testing as per project specifications.
- Testing:
 - **Air Infiltration**: ASTM E283.
 - Water Penetration: ASTM E331.
 - **Structural Performance**: ASTM E330.
 - **Thermal Insulation**: ASTM C1363 or equivalent.

ITEM NO 14 UPVC GLAZED DOORS & WINDOWS

When specifying uPVC (unplasticized polyvinyl chloride) doors and windows, several factors should be taken into account to ensure they meet the desired performance standards for durability, energy efficiency, security, and aesthetics. Following are the key specifications for uPVC doors and windows:

1. Material

- **uPVC Profile**: Made from high-quality, lead-free uPVC, offering excellent weather resistance, durability, and low maintenance.
- **Thickness**: Profiles should have a thickness of at least 2.5 mm to 3 mm for enhanced strength and insulation.
- **Color**: Available in a range of colors (white, wood grain finishes, etc.), using UV-resistant coatings to prevent color fading.

2. Design & Construction

- **Multi-chamber Design**: For improved thermal and acoustic insulation.
- **Reinforcement**: Steel or aluminum reinforcement inside the frame for added strength, especially in larger frames or for heavier door sections.
- **Profiles**: Available in various styles such as casement, sliding, tilt-and-turn, or French doors, based on design preferences and requirements.

3. Glazing

- **Double or Triple Glazing**: For thermal and acoustic insulation.
- Low-E Glass: Low-emissivity glass that reflects heat, enhancing energy efficiency.
- Argon Gas: Filled between glass layers to improve thermal performance.
- Toughened/Tempered Glass: For safety, especially for large windows or doors.
- Acoustic Glass: If noise reduction is required, acoustic glazing options can be used.

4. Weather Performance

- **Sealing**: High-quality rubber seals around the frame to ensure airtightness and water resistance.
- **Weatherstripping**: To prevent drafts and water ingress, ensuring the door or window is energy-efficient and weatherproof.
- Water Drainage System: Properly designed channels to allow water to drain out, preventing pooling or leakage.

5. Security Features

- **Multipoint Locking System**: For enhanced security, especially on doors, ensuring that multiple locking points engage.
- Hinges: Heavy-duty stainless steel or brass hinges for doors, which are corrosion-resistant.
- **Reinforced Frames**: Ensure that the frame has metal reinforcements for strength and to prevent warping over time.
- Security Glass: Laminated or toughened glass for break-in resistance.

6. Thermal Insulation

- U-Value: A U-value of 1.4 W/m²K or lower is common for energy-efficient uPVC windows.
- **Thermal Break**: Profiles with a thermal break (a plastic or insulating material) to improve insulation properties.
- Solar Gain: Windows should be designed to maximize natural light while minimizing solar heat gain in warmer climates.

7. Acoustic Insulation

- **Soundproofing**: uPVC windows and doors can be designed with thicker glass or specialized soundproof glazing to reduce noise transmission.
- Acoustic Ratings: Look for windows that meet specific soundproofing standards (e.g., Rw value).

8. Durability & Maintenance

- **UV Stability**: The uPVC profiles should be UV stabilized to prevent yellowing or degradation over time.
- Low Maintenance: uPVC requires minimal maintenance. Frames are resistant to rot, corrosion, and weathering and only require cleaning with soap and water.
- **Surface Finish**: Smooth or wood-grain finishes are available, with the latter offering a natural appearance while being easy to maintain.

9. Opening Types

- **Casement Windows**: Hinged on the side, opening outward for ventilation.
- Sliding Windows: For limited space, allowing easy operation and enhanced air circulation.
- **Tilt and Turn Windows**: Dual-function windows that tilt inwards for ventilation or open fully for easy cleaning.
- **French Doors**: Double-opening doors often used for outdoor areas, which can be hinged or sliding.

10. Sizes & Customization

- **Frame Dimensions**: Customizable frame sizes based on requirements, both for residential and commercial projects.
- **Opening Sizes**: Available in standard and custom sizes for easy installation in existing structures or new builds.

11. Compliance & Certifications

- **ISO Certification**: Ensure that the product meets international standards for quality and performance (e.g., ISO 9001 for quality management).
- **CE Marking**: In compliance with European safety, health, and environmental requirements.
- **Energy Ratings**: Windows and doors should meet the minimum energy efficiency standards as per local regulations (e.g., A++ for energy-efficient models in the UK or EU).

12. Finishing and Hardware

- **Handles and Hinges**: Must be corrosion-resistant (stainless steel or brass) and designed to match the aesthetic of the uPVC frame.
- Finish Options: Matt, gloss, or satin finishes for handles, locks, and other hardware.
- **Weatherproofing**: Hardware should be weather-resistant to ensure long-term functionality, especially for coastal or high-humidity areas.

13. Installation

- **Fit and Finish**: Proper installation is key for performance. Frames should be installed with precise measurements and alignment.
- **Structural Fixings**: Use appropriate screws, anchors, or brackets to secure the window or door frame to the building structure.

By specifying these details, uPVC doors and windows can provide an optimal balance of performance, aesthetics, security, and energy efficiency. Be sure to work with a trusted supplier who adheres to recognized standards for materials, design, and performance.

Item No 14 Gypsum Board False Ceiling Specification

1. Materials

- Gypsum Board:
 - o Thickness: 12.0mm
 - Type: Standard Moisture-Resistant .
 - Finish: Smooth, white.
 - Edge Type: Tapered edges for joint treatment.
- Suspension System:
 - Main Runners: Galvanized steel, 0.6mm thickness.
 - **Cross Tees**: Galvanized steel, 0.4mm thickness, designed to create grid patterns for board installation.
 - **Hanger Wires**: Galvanized steel wire, with minimum 2mm diameter, spaced as per load requirements.
 - **Ceiling Suspension Clips**: For fixing boards to the grid.
- Jointing Materials:
 - Joint Compound: Suitable for filling and finishing joints between boards.
 - Joint Tape: Paper or fiberglass tape for reinforcing joints.
 - **Corner Beads**: For finishing edges at the junctions of the ceiling.
- Fasteners:
 - **Screws or Nails**: For fixing gypsum boards to the grid or ceiling joists. Galvanized screws are commonly used.
 - **Pop Rivets**: For securing in certain areas, if required.

2. Ceiling Design

- Ceiling Grid Layout:
 - Grid spacing typically 600mm x 600mm or 1200mm x 600mm.
 - The design may vary depending on structural support, aesthetics, and lighting fixtures.
- Height:
 - Standard false ceiling height: 2400mm (or according to design requirements).
 - The space between the false ceiling and the slab should be designed to accommodate services like HVAC ducts, lighting, or other utilities.

3. Installation

- Preparation:
 - \circ Ensure the area is clean and dry before installation.
 - Proper inspection of the slab to ensure a level and plumb surface.
- Suspension System Installation:
 - Install the main runners and cross tees, ensuring that the grid is level and securely fixed.
 - Fix suspension wires at the recommended spacing (typically every 1.2m).
 - Use ceiling anchors or fasteners as needed.

- Gypsum Board Installation:
 - Fix the gypsum boards to the grid system using appropriate screws or nails.
 - Ensure the boards are flush with the grid and aligned with adjacent boards.
 - Cut and adjust boards around light fittings, air vents, etc., as required.

• Jointing and Finishing:

- Apply joint compound to the board edges and smooth over with a spatula.
- Embed joint tape into the wet compound and smooth out.
- Apply successive layers of joint compound, sanding between coats for a smooth finish.
- Apply corner beads for sharp edge protection.
- Final Finish:
 - The surface should be free of blemishes and joints must be well-blended to appear seamless.
 - Paint or finish according to specifications (typically water-based paint or an appropriate finish for moisture-resistance if required).

4. Performance Criteria

- Load-Bearing Capacity: Ensure the ceiling system can support the weight of fixtures, lighting, or any additional load.
- **Thermal Insulation**: Gypsum board offers some thermal insulation but may need additional layers or materials for enhanced performance.

5. Standards and Codes

- **ISO 9001**: Quality management standards for the manufacturing process.
- ASTM C1396: Standard specification for gypsum board.
- Local Building Codes: Follow the relevant local building regulations and codes for fire safety, load-bearing, and other requirements.

ITEM NO 16 WOODEN RIBS /RAFTER 2"X4"

For 2"x4" wooden purlins, the following factors should be considered:

1. Dimensions:

- Size: 2" x 4" nominal (1.5" x 3.5" actual size).
- Length: Based on project needs
- 2. Material:
 - Wood Type: Softwoods such as pine, fir, or cedar are commonly used for purlins.
 - **Grade:** Standard lumber grades (e.g., No. 1, No. 2, or Construction grade) depending on the required strength and load-bearing capacity.
- **Treatment : P**ressure-treated wood is required to resist rot and insects.

3. Strength and Load Capacity:

- **Design Load:** Determine based on the intended use (roof support, deck, or structure). The load capacity of the purlin will depend on its spacing and the type of roofing or structure being supported.
- **Span:** The distance between the supports should be considered, as longer spans require stronger or more spaced purlins.
- **Deflection Limit:** Typically, the deflection for roof purlins should be limited to 1/240th of the span under maximum load to avoid excessive bending.

4. Spacing:

• Typical Spacing: Purlins are spaced as per shown on drawing.

5. Finish:

• **Surface Treatment:** Depending on the desired finish and location, purlins may need to be sanded, stained, or painted to enhance appearance and protect the wood.

6. Installation:

• **Fasteners:** Use appropriate nails, screws, or metal connectors based on the application. For roofs, consider using galvanized or stainless steel fasteners to prevent corrosion.

7. Compliance with Standards:

• Ensure the wood purlins meet local building codes and standards (e.g., the National Design Specification (NDS) for Wood Construction in the U.S.).

ITEM NO 17 - KISOK

When designing a wooden kiosk, it's important to consider both functional and aesthetic specifications to ensure durability, usability, and a pleasing appearance. Here's a typical specification breakdown for a wooden kiosk:

1. Structure and Framework

- Materials:
 - High-quality, pressure-treated wood (e.g., Fur, pine, or oak) to prevent decay and damage from weather.
 - Plywood or MDF panels for side walls, if required, with a water-resistant finish.
 - Stainless steel fasteners (screws, nails) to avoid rusting over time.
- Dimensions:
 - **Height**: 8-10 feet (2.5-3 meters) depending on the usage.
 - Width/Length: Custom, based on the space and purpose of the kiosk (e.g., 6x6 feet for small, 10x10 feet for larger ones).
- Foundation:
 - Concrete footings or wooden posts anchored to the ground for stability, especially in windy or open areas.
 - Leveling mechanism to adjust for uneven ground.

2. Roofing

- **Type**: Gable roof or flat roof (depending on aesthetic preference).
 - **Material**: Wood shingles, corrugated metal roofing, or asphalt shingles (for water resistance).
 - Angle: A gentle slope for rainwater drainage (approx. $10-20^{\circ}$).
 - Finish: Waterproof sealant for long-lasting protection.

3. Walls and Sides

- Panels:
 - Wooden slats or panels, either horizontally or vertically arranged.
 - Option for transparent materials (e.g., Plexiglass, tempered glass) for windows to display items or for light.
- Door:
 - Hinged door or sliding door made of solid wood or wood frame with glass. Optional lock system for security.
- Windows:
 - Fixed, sliding, or folding windows. You can have one or more depending on the kiosk size and usage.
 - Window size should allow easy interaction with customers.

4. Counter

- Surface:
 - Solid wood or wood composite with a smooth, durable finish.
 - The height of the counter should be around 36-42 inches (90-107 cm) for easy standing access.
 - Optional: Overhang for extra workspace or to provide shade.

5. Electrical and Lighting

- Electrical Wiring:
 - Concealed wiring within wooden structures, with appropriate safety measures and compliance with local codes.
- Lighting:
 - LED lights or spotlights installed on the ceiling for visibility.
 - Power outlets for devices, cash registers, or other equipment.

6. Flooring

- Material:
 - Procelean, vinyl flooring, or pressure-treated wood.
 - Should be weather-resistant and easy to clean.
- Finish:
 - Slip-resistant surface for safety, particularly if the kiosk will be outdoors.

7. Accessibility and Safety

- Accessibility:
 - Ensure the counter is at a convenient height for all customers.
 - Ramp access if the kiosk is designed for use by people with disabilities.
- Safety:
 - Smooth, rounded edges to prevent injuries.
 - Adequate support beams and reinforcements to ensure the structure is safe.

8. Optional Additions

- Storage: Shelving, drawers, or hidden storage for inventory, supplies, or personal items.
- Security:
 - Security system or a heavy-duty lock for doors.
 - Option for a roll-up shutter or door for closing the kiosk after hours.

3.7 Technical Specification of Resin Anchorage

Scope of Work

- This specification covers the installation of resin anchorage systems in reinforced or nonreinforced concrete substrates, including the preparation, application, and curing of resinbased anchor products.
- The system should be capable of carrying static and dynamic loads, depending on the design requirements.

2. Materials

- **Resin**: The anchorage system should be based on a **two-component chemical resin** (epoxy, polyester, vinyl ester, or hybrid) designed for concrete bonding.
 - **Base Material**: Epoxy or polyester resin.
 - Hardener: Suitable hardener to provide proper curing at varying temperatures.
 - Adhesive System: Should have a high tensile and shear strength suitable for concrete applications.
- Anchoring Elements:
 - **Threaded Rods, Rebars, or Bolts**: Stainless steel (AISI 304, AISI 316, or as specified in the design) or galvanized steel as per project specifications.
 - **Insertion Caps**: Use of special plastic caps to ensure proper resin flow.
- **Cleaning Agents**: Cleaners such as wire brushes, compressed air, and cleaning solvents for surface preparation of the substrate.

3. Design Considerations

- **Load Capacity**: The system should be designed to meet the specified loads (tensile, shear, and bending as per structural calculations).
- Safety Factors: Minimum safety factor of 2.5 based on ultimate load capacity.
- Concrete Strength: Ensure the compressive strength of the concrete is above a specified minimum value (e.g., C25/30 or higher).
- **Temperature Range**: The resin product should be suitable for use within the temperature range expected on-site (e.g., -40°C to +40°C).
- Curing Time: Specify the curing time of the resin, typically ranging from 1 hour to 24 hours depending on the resin product.

4. Installation Requirements

- Surface Preparation:
 - The concrete should be clean, dry, and free from contaminants such as dust, oils, and loose debris.
 - The holes for anchorage should be drilled using **hammer drills** or **diamond core drilling** techniques with a rotary hammer.

- Use **blowing tools or compressed air** to remove dust and debris from the drilled holes.
- The diameter and depth of the holes should match the manufacturer's recommendations to ensure proper bonding.

• Mixing and Application:

- Mix the resin in accordance with the manufacturer's instructions, ensuring a proper ratio of base material and hardener.
- Use a **dual-component dispensing gun** to ensure accurate mixing and application of the resin.
- Inject the resin into the hole to ensure complete fill, taking care to avoid air pockets.
- Insert the anchor rod or bolt into the resin-filled hole, ensuring it is aligned and fully embedded.
- Allow the resin to cure to the required strength before applying any load (typically **24 hours** at room temperature).

5. Quality Control

- Perform **pull-out tests** on anchor installations to verify that the anchor meets the required load-bearing capacity.
- Inspect for proper mixing of the resin and ensure there is no premature curing of resin during installation.
- Ensure that installation temperatures are within the acceptable range for the resin used.

6. Health and Safety

- Ensure all workers are equipped with appropriate **personal protective equipment (PPE)**, including gloves, eye protection, and respirators.
- Use ventilated areas during resin mixing to avoid inhalation of fumes.
- Ensure that all resin products used comply with **health and environmental regulations** (e.g., REACH, OSHA standards).

7. Testing and Certification

- The resin anchorage system must be certified by the manufacturer for the specific concrete grades and loads.
- Independent third-party testing may be required for certain applications, especially for critical structural components.

8. Maintenance

- Regular inspection of the anchor system should be carried out, especially in highly corrosive environments.
- Replace any resin anchors that show signs of deterioration, corrosion, or failure.

3.8 Technical Specification for Composite Metal Deck Slab

A **Composite Metal Deck** (CMD) is a structural floor decking system that combines a metal deck with a concrete slab to form a composite structure that acts as a single unit to support loads.

Key technical specifications of a Composite Metal Deck are :

1. Material Specifications:

- Decking Material:
 - Typically made from **cold-rolled steel** or **galvanized steel** (to prevent corrosion).
 - Steel thickness typically ranges from **20 gauge (0.0359 inches)** to **16 gauge (0.0598 inches)**, depending on load requirements.
 - Steel grades: Usually **ASTM A653/A653M** or **ASTM A1008**, with G60, G90, or higher galvanization ratings for corrosion resistance.
- Concrete:
 - Typically reinforced concrete with compressive strength of **3000 to 5000 psi**.
 - Concrete thickness generally ranges from **3 inches (75 mm) to 6 inches (150 mm)**, depending on load and span requirements.
- Shear Connectors:
 - Typically **shear studs** or **welded embossments** in the deck to bond the concrete slab to the metal deck, ensuring composite action.
 - Embossments or ribs are formed in the deck to enhance bonding between the concrete and the metal surface.

2. Deck Profile:

- Common Types:
 - **1.5'' deep, 2.5'' deep, 3'' deep** or even deeper profiles depending on the project specifications.
 - The deck profile is a series of **ribs or flutes** that provide structural support to the concrete slab and serve as a form during concrete pouring.
 - The ribbed design allows the deck to function as both a formwork and a structural component, offering enhanced load-carrying capacity and resistance to deflection.

• Standard Rib Spacing:

• Rib spacing can vary, with the most common being **6 inches**, **9 inches**, or **12 inches** on center, depending on the specific deck profile and structural requirements.

3. Load Capacity:

- Load-bearing capacity is a function of the **deck profile**, **gauge of metal**, and **concrete thickness**. Standard designs can handle live loads from **50 psf** (pounds per square foot) to **100 psf** or more, but higher capacities are possible with thicker profiles and reinforcement.
- The composite action between the metal deck and the concrete slab allows the system to resist higher loads than would be possible with either material alone.

4. Composite Action:

- The combination of the **metal deck** and **concrete slab** allows for composite behavior, meaning the two materials work together to resist bending and shear forces.
- **Shear connectors** (usually **shear studs**) are placed through the deck and welded to the steel beams below, allowing for the transfer of shear between the concrete and steel deck.

5. Fire Resistance:

- The fire resistance of composite metal decks depends on the thickness of the concrete slab and the type of metal deck used.
- For standard decks, **fire ratings of 1-2 hours** are common, but this can vary based on local building codes, load conditions, and slab thickness.

6. Span and Support:

- The typical span for composite metal decks ranges from **6 feet** to **10 feet** between supports.
- Spans may vary depending on the deck thickness, profile, and loading conditions.
- The deck system is generally supported by steel beams, joists, or concrete girders.

8. Installation and Construction:

- The **metal deck** is typically installed in a horizontal orientation, supported at regular intervals by beams or other structural elements.
- **Concrete is poured** on top of the deck once it is in place. The deck serves as the formwork for the concrete.
- The system is then **tied together** with shear connectors to ensure that the concrete and steel act as a single unit.
- **Post-pour curing** is essential to achieve the desired strength of the composite floor system.

10. Codes and Standards:

- Composite metal deck systems must adhere to various building codes and standards, such as:
 - **ASTM A1008/A1011** for steel material specifications.
 - AISC 360 for structural steel design.
 - ACI 318 for concrete design.
 - **MBMA (Metal Building Manufacturers Association)** specifications for metal deck systems.

Technical Specification for MSS (Mild Steel Structural) Checkered Plate

MSS Chequered Plates, commonly known as steel checker plates, are designed for use in applications requiring a durable, slip-resistant surface. Below is a typical technical specification for a mild steel (MSS) chequered plate:

1. Material:

- Grade: Mild Steel (MS)
- Chemical Composition (Typical):
 - Carbon (C): $\leq 0.23\%$
 - Manganese (Mn): 0.60–0.90%
 - Phosphorus (P): $\leq 0.05\%$
 - Sulfur (S): $\leq 0.05\%$
 - Silicon (Si): 0.15–0.35%

2. Plate Dimensions:

- **Thickness:** Typically ranges from 3 mm to 12 mm, depending on the application.
- Length: Customizable (commonly 2500 mm to 6000 mm).
- Width: Standard widths range from 1250 mm to 2000 mm, but custom sizes are available.
- **Tolerance on Thickness:** $\pm 10\%$ as per the standard.

3. Surface Pattern:

- **Design Pattern:** Diamond, Rhomboid, or other custom patterns.
- Surface Finish: Non-slip, textured pattern designed to increase traction and prevent slips.
- **Surface Treatment:** Plates may undergo galvanization or other corrosion-resistant treatments, depending on the intended use (for outdoor or high-moisture environments).

4. Mechanical Properties:

- Yield Strength (min): 250 MPa (for standard MS grade as per IS 2062)
- Tensile Strength: 410–530 MPa
- **Elongation:** Minimum 23% (for thickness ≤ 40 mm)
- **Hardness:** Typically in the range of 130–160 Brinell Hardness (HB), depending on plate thickness and grade.

5. Surface Flatness:

• The plates should maintain a flat surface with a maximum deviation of ± 3 mm per meter.

6. Weight:

• **Density of Mild Steel:** 7.85 g/cm³ (approx)

• Weight Calculation: Weight can be calculated based on the thickness, length, and width of the plate.

7. Quality Control:

- Plates should be free of any visible defects such as cracks, holes, and inclusions.
- Testing Standards:
 - **Ultrasonic Testing:** To ensure there are no internal flaws.
 - **Chemical Testing:** To confirm composition as per specifications.
 - Mechanical Testing: Includes tensile, hardness, and impact testing.

8. Compliance & Certifications:

- Plates must comply with national and international standards such as IS 2062, ASTM A36 (for mild steel), and others.
- Certification: Material Test Certificate (MTC) may be required by the client for verification of quality.