APEX Integrated Housing Construction Process and Method Manual (Version 1.0)

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1. Building Positioning and Layout

(1) Scope

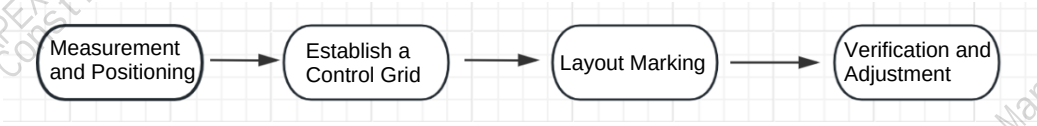
This standard applies to the positioning of steel piles and house layout for APEX buildings. Refer to the construction drawings for specific positioning values.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   The main equipment includes a theodolite, level, steel tape measure, lime powder, string line, and plumb bob.
2) **Work Conditions**:
   Develop a Layout Plan: Before starting the layout, create a detailed plan, including the starting and ending points, measurement directions, and spacing.
   Site Preparation: Ensure the site is cleared and organized to facilitate smooth layout operations.

(3) Operating Techniques

1) **Process Flow**



2) **Measurement and Positioning**: Using measuring instruments and tools, measure and position the building based on the construction drawings and actual site conditions, determining the building's location, orientation, and dimensions.
3) **Establish a Control Grid**: Set up a control grid in the construction area, including axis control stakes and elevation control points, to assist with further layout measurements.
4) **Layout Marking**: Mark the building's outline and detailed dimensions on the ground or walls according to the measurement and construction drawings.
5) **Verification and Adjustment**: Check the marked outline and dimensions. If errors are found, make timely adjustments and re-verify to ensure accurate positioning.

(4) Quality Standards

1) **Horizontal Error**: The horizontal layout error should generally not exceed 5mm, ensuring the building's levelness.
2) **Vertical Error**: The vertical layout error should generally not exceed 5mm per meter, ensuring the building's vertical alignment.
3) **Dimensional Accuracy**: The size error for each part of the building should generally not exceed 10mm. Right angles should be 90 degrees as per the drawings to ensure component accuracy.

(5) Finished Product Protection

1) Ensure that location markers are clear and protected from rain, trampling, or other damage.
2) Use durable, waterproof string lines and plumb bobs.
3) Protect layout markings, such as chalk lines or lime markings, from being altered or damaged.

2. Prefabricated Helical Steel Pile Foundation

(1) Scope

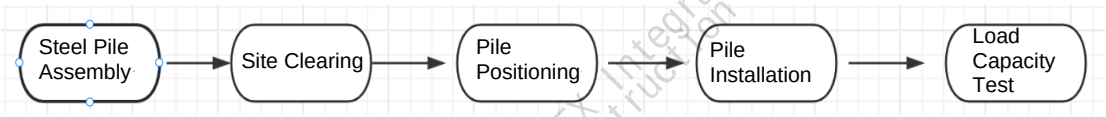
This standard applies to the prefabricated helical steel pile foundation for APEX houses. Refer to the construction drawings for specific positioning values.

(2) Construction Preparation

1) **Materials and Main Equipment:**
   (1) Prefabricated helical steel piles: Specifications and quality must meet design requirements.
   (2) Main equipment: Pile driver, level, steel plate hole cutter, temporary electrical box (220 volts), and cables.
2) **Work Conditions:**
   (1) The pile foundation axis and elevation must be measured and inspected, with pre-check procedures completed. Control stakes for axis and elevation should be placed in locations unaffected by piling and must be well-protected.
   (2) Clear obstacles both above and below ground.
   (3) Use axis lines to mark pile locations, securing them with wooden stakes or steel nails, and mark them with lime.
   (4) The site should be compacted, level, and well-drained to ensure stable and vertical movement of the piling machine.
   (5) Conduct trial piling: Before construction, trial piles must be driven, with no fewer than two trial piles. Determine penetration resistance and assess the suitability of the piling equipment, construction techniques, and technical measures.
   (6) Develop a construction plan and conduct a technical briefing.

(3) Operating Techniques

1) **Construction Process**



2) **Prefabricated Helical Steel Pile Assembly Plan:**
   Use specialized tools such as torque machines, jackhammers, water drills, and rock drills, selecting appropriate equipment based on soil conditions.
3) **Site Clearing:**
   Clear the area designated for helical steel pile installation, removing obstacles that could hinder the work, and confirm there are no underground utilities such as sewers, fiber optics, or cables that could be impacted.

4) **Pile Positioning:**
Position the helical steel piles as per the measurements in the construction drawings, maintaining a positioning error within ±5mm.

5) **Pile Installation:**
Once positioned, use specialized installation tools to screw in the helical steel piles. During installation in dry areas, monitor the alignment and level of the piles, keeping positioning errors within ±30mm, level errors within ±5mm, and ensuring all piles in a single building are at the same height with a height error margin of ±3mm. For areas with firm soil conditions, screw in the piles to the designed top elevation in one go. If hard soil, rock layers, or obstructions prevent reaching the design elevation, and load-bearing capacity is verified to meet design requirements, the excess pile length may be cut, with the pile top elevation maintained within ±3mm. In softer soils, if the pile fails to meet design load requirements, additional rods may be added to extend the depth until the load capacity is achieved.

6) **Load Capacity Testing:**
Perform load-bearing tests on the installed piles to ensure compliance.

(4) Quality Standards

1) Positioning errors for the piles should be within ±30mm, and level errors within ±5mm.
2) Ensure all piles in a single building maintain the same height, with a height error margin of ±3mm.

(5) Finished Product Protection

1) The galvanized coating on the helical steel piles must remain intact and undamaged.
2) Pile storage requirements:

   (1) The site must be level and firm, preventing uneven settling.
   (2) Piles of the same type should be stored together, with the pile tips aligned in the same direction.
   (3) If geological conditions differ from the provided data during piling, halt construction and consult with the relevant authorities.

(6) Quality Records

1. Maintain records of trial piles or tests.
2. If supplementary piles are needed, include a layout diagram.

3. Installation of Prefabricated Rectangular Steel Pipe Structure

(1) Scope

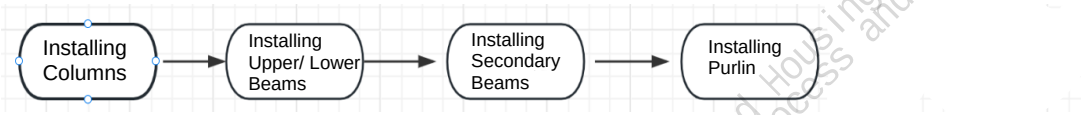
This standard applies to the installation of prefabricated rectangular steel pipe structures in APEX houses.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) Prefabricated rectangular steel pipes: Specifications and quality must meet design requirements.
   (2) Main equipment: electric screwdriver, forklift or crane, electric drill, mobile scaffolding, socket tightening device, temporary power box (220 volts), and cables.
2) **Work Conditions**:
   (1) Recheck the reference axes, elevation, level lines, levelness, the position and protruding length of embedded helical steel pipe piles. If deviations exceed permissible limits, make technical corrections. Ensure the level of the steel pipe pile tops is within a 5mm error range.
   (2) The construction site should be compacted and leveled to allow for the normal passage of steel structure transportation and installation vehicles.
   (3) Sort and organize steel pipes of different lengths according to their designated positions.

(3) Operating Techniques

1) **Construction Process**



2) **Installing Columns**:
   Before installing columns, verify the elevation to prevent alignment issues with steel beams. Connect the column flanges to the steel pipe pile foundation flanges using bolts. To account for hole alignment accuracy, it is recommended to drill the flange holes on-site, leaving a 2cm buffer space for possible deviations.
3) **Installing Upper and Lower Beams**:
   (1) During the connection of columns and beams, ensure the alignment of bolt holes using special alignment tools if necessary.
   (2) Reinforce the connection points between columns and beams with steel plates on all four sides, securing them along with the internal sleeve.
4) **Installing Secondary Beams**:
   The positions for secondary beams are pre-marked on the columns and beams.

Workers should transport the beams to their designated positions and secure them with bolts according to the drawings.

5) **Fixing the Staircase in Front of the Door**:
The staircase is prefabricated. Once the main structure is built, assemble the steel staircase frame in the designated position.

(4) Quality Standards and Precautions

1) Helical steel piles are crucial for structural stability. Control their position, verticality, length, and elevation to ensure accurate installation.
2) High-strength bolts are vital for secure connections. Follow proper torque procedures to ensure firm fastening.
3) If the galvanized layer on the steel structure is damaged, remove rust and repair it immediately to ensure structural durability.
4) Follow safety measures when using machinery and scaffolding to prevent accidents.
5) Adhere to the 3D model installation manual for precise positioning of columns, beams, and purlins.
6) Recommended assembly sequence: columns → lower beams → upper beams → secondary beams.

(5) Finished Product Protection

1) Use wooden blocks under components to avoid direct contact with the ground and prevent sliding or rolling. If stacking components, use pads or rubber mats to prevent damage.
2) Protect the construction site from corrosive elements like soil contaminants and wastewater.
3) Place warning signs on-site to protect finished products from damage.
4) Install barriers and secure equipment to prevent impact damage.

4. Installation of ALC Panels or Other Insulated Panels

(1) Scope

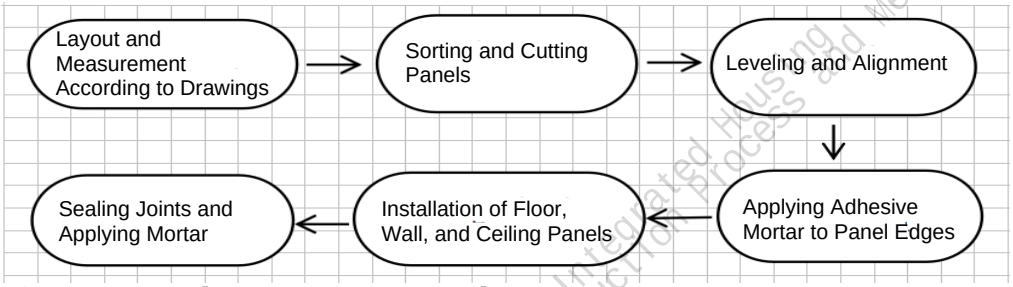
This standard applies to the installation of ALC (autoclaved lightweight concrete) panels or other insulated panels in APEX houses. For illustration, ALC panels are used as examples.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) ALC panels must meet design specifications.
   (2) Auxiliary materials: U-shaped clips, self-tapping screws (5-6cm flat head), adhesive mortar, crack-resistant mortar, mesh tape (20cm wide), wooden wedges, corner strips, construction line, trowel.
   (3) Tools: forklift, crane, cutting saw (platform saw if available), electric drill, crowbar, customized cart (optional for panel transport), straps, mobile scaffolding.
2) **Work Conditions**:
   (1) Cut the panels to the required size according to the steel frame's net height and depth, leaving space for adhesive mortar.
   (2) Repair damaged edges by cleaning the dust and using adhesive mortar for large damage or crack-resistant mortar for minor repairs.
   (3) Recommended installation sequence: floor panels → wall panels → ceiling panels. Sort and transport the panels to the work area.

(3) Operating Techniques

1) **Construction Process**



2) **Layout and Measurement According to Drawings**
   Lay out and measure the steel structure's internal dimensions according to the requirements specified in the design drawings to ensure precision.
3) **Sorting and Cutting Panels**
   (1) Sort the panels according to their specified dimensions for floor and wall panels as listed in the materials inventory.
   (2) Once sorted, use a tape measure to mark the dimensions and draw cut lines on the panels using a marker or chalk line. Carefully cut the panels with a saw, making sure to avoid cutting too large. During cutting, cool the saw blade with water to prevent overheating.
   (3) Pay special attention when cutting panels that need to fit around the connections

of columns and beams, as the connecting bolts protrude about 2cm from the plane. Ensure these panels are accurately cut in advance.

(4) Mark the installation lines on-site, including the panel divisions and the positions for doors and windows.

4) **Leveling and Alignment**

When installing wall panels, mark vertical and horizontal lines using construction strings to guide the placement. For floor and ceiling panels, use a level to adjust and ensure evenness throughout the installation.

5) **Applying Adhesive Mortar to Panel Edges**

(1) Clean the joining surfaces of the panels thoroughly, removing all dust, and slightly moisten them with a damp brush. Apply adhesive evenly along the panel edges using a trowel, with a thickness of 3-5mm.

(2) Clean the top and bottom of the installation area, ensuring that any damaged corners are properly repaired and that the surface is free of dust. Apply adhesive to both the upper and lower contact surfaces.

6) **Installation of Floor, Wall, and Ceiling Panels**

(1) For floor panels, verify the dimensions according to the layout plan. Apply adhesive to the panel edges and transport them to the installation position using a forklift or cart. Carefully place the panels between the secondary beams, using a crowbar to assist in positioning if necessary. Ensure the adhesive is compact and the panels interlock tightly, with a maximum error tolerance of 5mm.

(2) For wall panels, clean the edges and slightly moisten them. Apply adhesive using a trowel, and transport the panels into place using a forklift or cart. Secure the panels with U-shaped clips, fastening them with flat-head self-tapping screws (5-6cm) using an electric drill. Stand the panels upright, align them with the wall lines, and use a plumb board to ensure vertical alignment. Press the panels firmly into place to ensure even distribution of adhesive. Use a crowbar to tighten the bottom of the panel, ensuring it aligns tightly with the upper beam, and secure it with wooden wedges. Once the adhesive has set, remove the wedges and fill the gaps with additional adhesive mortar or foam.

(3) For ceiling panels, check the dimensions against the layout plan and, for safety and ease, use a crane. Once lifted to the roof, apply mortar and fit the panels in sequence. Use a mobile scaffold on the floor panels to assist with the ceiling installation.

(4) Note: The ceiling panels should extend 300mm beyond the perimeter steel beams and be aligned neatly along the outer edge.

7) **Sealing Joints and Applying Mortar**

After installing all the panels, use crack-resistant mortar and 20cm wide mesh tape to seal the joints, both inside and outside. On the roof, secure the panels every 80cm using flat-head or hex-head self-tapping screws (12-14cm) with L-shaped steel brackets attached to the beams, secondary beams, and purlins. Apply crack-resistant mortar and mesh tape to ensure a smooth, clean surface. Floor panels should also be finished with crack-resistant mortar or ground mortar, keeping the surface level and

clean. Coordinate this with interior finishing to avoid obstructing other trades. Treat the extended eaves with crack-resistant mortar as well.

(4) Quality Standards and Precautions

1) Use materials that meet design specifications.
2) Ensure panels are intact and properly installed with accurate mortar application.
3) Follow design guidelines for joints and anchoring methods.
4) Refer to the table below for permissible deviations:

Item	Permissible Deviation (mm)	Inspection Method
Surface Evenness Between Panels	3	2m straightedge and wedge feeler gauge
Elevation	5	2m plumb line

(5) Finished Product Protection

1) Use specialized lifting equipment or padded slings to handle panels carefully.
2) Store panels in a stable stack, no more than 10 panels high, and protect from rain and sun.

(6) Common Quality Issues

1) Ensure adhesive is applied evenly, and wedges are tight.
2) Check for damage before installation and make repairs if needed.
3) Align the first panel properly to avoid misalignment.
4) Remove excess adhesive promptly.

5. Window Installation

(1) Scope

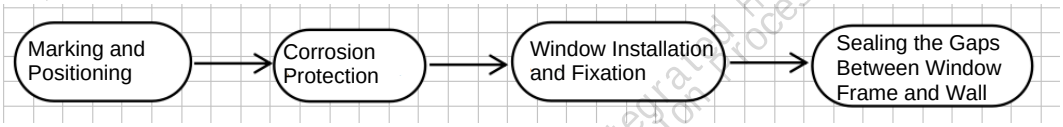
This standard applies to the installation of aluminum alloy or other types of windows in APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) Aluminum alloy windows must meet the specified design requirements in terms of specifications, performance, and quality.
   (2) Auxiliary materials: foam adhesive, self-tapping screws (6cm flat head), wooden wedges, caulking gun, weatherproof silicone sealant, level, and construction line.
   (3) Tools: construction line, electric drill, level.
2) **Work Conditions**:
   (1) Check if the dimensions and elevation of the window openings meet design requirements. Verify the alignment of the three key lines (horizontal line, vertical line, and window frame alignment line). If discrepancies are found, address them promptly.
   (2) Inspect the aluminum alloy windows upon arrival. The window frames and sashes should be free from visible color differences, surface irregularities, scratches, scuffs, dents, or any other defects. The glass must also be free from noticeable color variations, scratches, or scuffs. Reject any non-compliant products.
   (3) Mark the center-lines of the windows and the interior +50cm reference line as specified in the drawings.

(3) Operating Techniques

1) **Construction Process**



2) **Marking and Positioning**:
   (1) Based on the installation position, dimensions, and elevation in the design drawings, mark the window edge lines on both sides, using the window center-line as a reference.
   (2) Use the interior +50cm horizontal line as a reference to measure upwards and mark the lower edge of the window, ensuring uniform elevation across all windows.
   (3) Determine the window's in-and-out alignment within the wall thickness based on the exterior wall drawings and windowsill width.
3) **Corrosion Protection**:
   Apply a protective anti-corrosion coating to the external surfaces around the window frame to prevent direct contact between cement mortar and the aluminum alloy surface.

4) **Window Installation and Fixation**:
(1) Verify the window dimensions and elevations with the drawings, and check the window frame and sash dimensions.
(2) Place the main window frame into the structural opening. Align it with the vertical and horizontal lines and secure it with wooden wedges around the perimeter to hold it in place.
(3) Use self-tapping screws to fix the main window frame to the structural steel frame.
(4) Sort and install the glass panels based on window size, and secure them firmly with window glazing beads.

5) **Sealing the Gaps Between Window Frame and Wall**:
(1) Fill the gaps between the main window frame and the structural steel frame with foam adhesive, ensuring thorough and compact filling.
(2) Once the interior and exterior wall panels are installed, seal the edges with weatherproof silicone sealant.

(4) Quality Standards and Precautions

1) Ensure that all materials used meet design specifications.
2) Maintain a consistent level across all windows on the same floor to achieve a uniform exterior appearance.
3) Be careful with the amount of foam adhesive applied to avoid making it difficult to clean the window frame if excess spills out.
4) Check that the wooden wedges are properly secured when fixing the frame to the wall, and then use a level and plumb line to recheck the frame. Make necessary adjustments if any misalignment is detected.
5) When sealing the gap between the wall and the main window frame with silicone sealant, ensure the seam is even, smooth, and continuous, with no gaps or excess spilling out.

(5) Finished Product Protection

1) Do not remove the protective film from the windows until the foam adhesive and silicone sealant are applied.
2) Use an exterior protective film to cover the windows during exterior construction or any work that might generate debris or contaminants to protect the finished product.

6. Installation of Exterior Wall Integrated Decorative Panels

(1) Scope

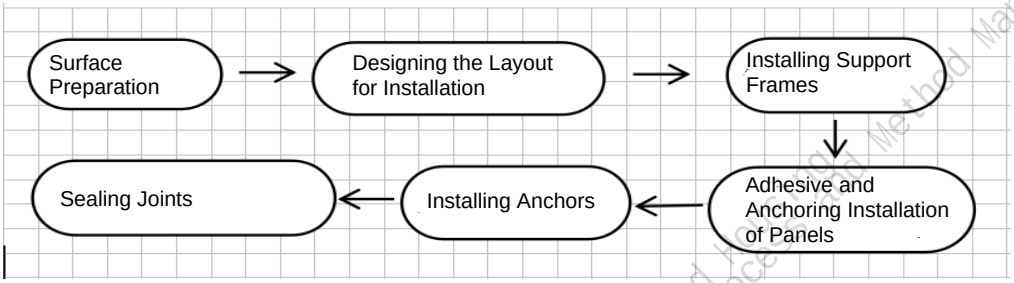
This standard applies to the installation of exterior wall integrated decorative panels for APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) The specifications, performance, and quality of exterior wall decorative panels must meet the design requirements.
   (2) Auxiliary materials: adhesive (mortar adhesive), stainless steel L-shaped J corner steel, anchors, 8mm expansion screws, drill bits, angle steel, trowel, bucket, construction line, and electric box.
   (3) Tools: welding machine, cutting saw (or platform saw), electric drill, angle grinder, scaffolding.
2) **Work Conditions**:
   (1) Ensure the wall surface is smooth and free of dust.
   (2) Joints in ALC panels must be sealed and reinforced.

(3) Operating Techniques

1) **Construction Process**



2) **Surface Preparation**:
   Repair any bulges, loose or cracked areas, or uneven surfaces on the walls. Remove any oil, dust, or other residues.
3) **Designing the Layout for Installation**:
   (1) Based on the design drawings and the actual dimensions of the wall, mark vertical and horizontal control lines. Measure the dimensions around doors and windows. Create a rough sketch of the building's exterior and optimize the layout plan, considering safety, aesthetics, and material efficiency.
   (2) Hang vertical guide wires and horizontal lines for each floor. Mark the first level's insulation and decorative panels according to the layout plan. If there are expansion joints, mark their locations and widths.
4) **Installing Support Frames**:
   Verify the dimensions and elevation of the first level against the drawings. Install the initial support frames at the starting position, ensuring each panel has two

frames for support. The long edge of the frame must be at a 90° angle to the steel structure.

5) **Adhesive and Anchoring Installation of Panels**:
(1) Use specialized adhesive for insulation and decorative panels. Before attaching, spread the adhesive evenly on the back insulation layer of the panel. Apply using the frame-point method, ensuring at least 60% effective contact area with the wall. At the base, fully apply adhesive up to 300mm from the bottom edge. At corners, around windows and doors, and within 200mm of expansion joints, fully apply adhesive.
(2) For beams, columns, windows, and cornices, use single panels with specialized adhesive and tile anchors. Cornices should be sloped outward for drainage, with drip edges extending 5mm downward. Use tile levelers and 8mm cross spacers between panels to maintain uniform gaps.

6) **Installing Anchors**:
(1) Attach anchors along the panel edges, using at least two parallel anchor strips. Ensure a minimum of 8 anchor points per square meter, with at least 4 per panel. On the top and bottom levels, place anchors on both sides of the panel.
(2) Use stainless steel L-shaped anchors with a minimum thickness of 2mm and aluminum alloy brackets 50mm in length.

7) **Sealing Joints**:
(1) After installation, clean the joints and panel surfaces. Fill the gaps with EVA foam strips that are 1.2 times the joint width. Apply masking tape neatly, then seal with weatherproof silicone using a spatula to ensure a smooth and compact finish. The sealant depth should be at least 5mm.
(2) Remove the masking tape immediately after applying the sealant.

(4) Quality Standards and Precautions

1) Pay attention to the panel layout. Double-check dimensions on-site and refine the plan according to the drawings. Ensure consistent horizontal and vertical joint spacing.
2) Reserve adequate space for trim around windows and doors, and ensure the window trim is not sloped inward.
3) When cutting panels, avoid chipping the tile surface. Selecting the correct saw blade is critical to minimize damage.

(5) Finished Product Protection

1) Keep heavy machinery and equipment at a safe distance from the panels to avoid damage.
2) Use protective film on the decorative panels during exterior construction or other activities that may cause contamination.

7. Installation of Interior Partition Framework

(1) Scope

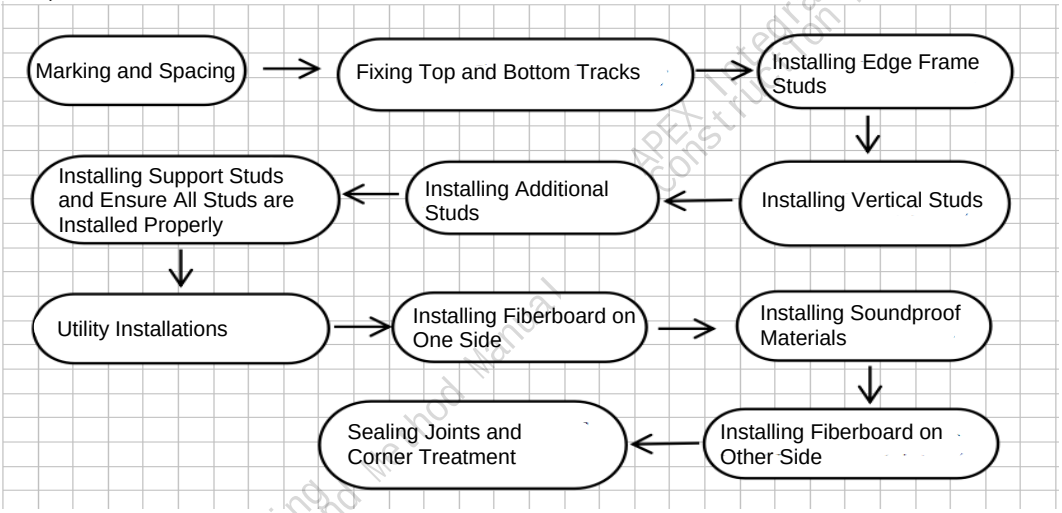
This standard applies to the installation of light steel framework and cement fiberboards in APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) The specifications, performance, and quality of the exterior wall integrated decorative panels must meet design requirements.
   (2) **Light Steel Framework**: The light steel framework used for partition walls includes support card series and continuous series frames. Main components include top and bottom tracks, reinforcement studs, vertical (or horizontal) studs, and cross-bracing studs. Accessories include support cards, brackets, corner brackets, connectors, fasteners, corner strips, and pressure strips. The framework configuration must comply with design requirements, with a smooth, straight appearance and no sharp edges, cracks, or burrs. The surface should be free from significant contamination, corrosion, or mechanical damage.
   (3) **Auxiliary Materials**: Shot nails, expansion bolts, galvanized self-tapping screws, extruded polystyrene board, cement fiberboards, wooden framework, medium-alkali fiberglass tape, and fiberglass mesh should all meet design standards.
   (4) **Tools**: Cutting saw, electric drill, angle grinder, scaffolding, electric box, electric shears, cordless saw, nail gun, trowel, plumb bob, and measuring ruler.
2) **Work Conditions**:
   (1) The primary structure must be complete, and the roof waterproofing layer should be installed.
   (2) Mark the +50cm elevation line indoors.
   (3) The ambient temperature for the work should not be below 5°C.
   (4) Review the construction drawings thoroughly and provide detailed technical instructions to the work crew.
   (5) Check all partition materials against the design and ensure they are complete and properly prepared.

(3) Operating Techniques

1) **Construction Process**



2) **Marking and Spacing**:
At the junction of the partition wall with the ceiling, floor, and adjacent walls, mark the installation lines corresponding to the width of the studs. Ensure lines are clear and accurately placed. Determine the positions of vertical studs, cross-braces, and additional studs according to the panel dimensions specified in the design.

3) **Fixing Top and Bottom Tracks**:
Secure the top and bottom tracks along the marked lines using shot nails or expansion bolts. The spacing between fasteners should not exceed 600mm, and the joints should remain straight.

4) **Installing Edge Frame Studs**:
Fix the edge frame studs along the marked lines, ensuring they align perfectly. The ends of the studs should be securely fastened, with a spacing of no more than 1 meter between fasteners.

5) **Using Support Card Series Studs**:
Attach the support cards to the openings on the vertical studs, spacing them 400-600mm apart, with a 20-25mm gap from the ends of the studs.

6) **Installing Vertical Studs**:
Ensure the vertical studs are straight, with spacing determined by the design. If no spacing is specified, use the panel width as a guide, spacing them 453mm apart for 900mm panels or 603mm apart for 1200mm panels.

7) **Using Continuous Series Studs**:
For partitions under 3 meters in height, install two continuous studs.

8) **Cross-Bracing at Panel Joints**:
If the horizontal panel joints do not align with the top or bottom tracks, install cross-braces for additional support.

9) **Special Structures**:
For special structures, such as curved or sloped partitions, ensure the framework meets design specifications.

10) **Utility Installations**:
Install water, electricity, and gas lines as per the drawings. Coordinate utility installations with the framework assembly, or complete them before covering with cement fiberboards. Reinforce areas around utilities to ensure stability and avoid cutting the vertical or horizontal studs. Do not run utility lines along the bottom wall track.

11) **Inspecting and Reinforcing the Framework**:
Before installing the panels, inspect the framework for stability and ensure the doors, windows, fixtures, and utility lines are correctly installed and secured. Reinforce any loose sections. Ensure vertical deviation is ≤3mm and surface unevenness is ≤2mm.

12) **Installing Cement Fiberboards**:
(1) Install the panels vertically, with the long edges (factory-sealed) resting on the vertical studs. For fire-rated walls, install the panels vertically. Use horizontal placement for curved walls.
(2) Fix the panels with self-tapping screws, spacing them no more than 200mm along the edges and 300mm in the middle. Position the screws 10-16mm from the edge of the panel.
(3) Begin fastening from the center of the panel, working outward. Drive screws slightly below the surface without damaging the board. Fill the screw holes with mortar.
(4) Use full panels whenever possible. If joints are necessary, butt them together without forcing.
(5) If using wooden baseboards, leave a 20-30mm gap at the bottom edge of the panel. For marble or terrazzo baseboards, align the panel's bottom edge flush with the top of the baseboard.

13) **Sealing Joints and Corner Treatment**:
(1) There are three methods for sealing panel joints: flush seams, recessed seams, and trim seams. Flush seams are standard and should be treated as follows:

① Ensure the joints between panels are tight.
② Use a small trowel to fill the seams with mortar, ensuring they are fully packed and smooth. Allow the mortar to dry and check for cracks, filling any as needed.
③ Apply a 1mm layer of mortar over the joint, press fiberglass tape into place, and smooth out the surface.
④ Treat inside corners the same way as flush seams.

(2) Treat outside corners as follows:

① Apply two layers of fiberglass tape, wrapping 100mm around each side. Follow the same procedure as for flush seams, using mortar to smooth the surface.
② For metal corner strips, apply putty, secure with galvanized nails, and smooth with mortar.

③ Check for cracks after the mortar has dried and repair as necessary before proceeding with surface finishes.

(4) Quality Standards and Precautions

1) **Quality Standards**:

(1) The light steel framework and cement fiberboards must meet design specifications.

Inspection Method: Check product certifications and compare with the drawings.

(2) Fastening materials must comply with design and functional requirements. Ensure the framework is rigid and free from bending or deformation. The connection to the base structure should be secure and stable.

Inspection Method: Visual inspection and manual testing.

(3) Wall structure and panel arrangement must follow design requirements, and the panels should be firmly installed. Boards should not be damp, warped, or have broken edges.

Inspection Method: Visual and manual testing.

2) **Basic Requirements**:

(1) The top and bottom tracks must be correctly positioned and aligned vertically. Vertical studs should be accurately spaced and securely fixed, allowing for expansion (typically 30mm shorter than the clear height).

Inspection Method: Visual inspection.

(2) Panel surfaces should be smooth, clean, and free from hammer marks. Fastening points should meet design requirements.

Inspection Method: Visual inspection.

(3) Joints and trim must match design specifications, with uniform widths and smooth surfaces, free from cracks.

Inspection Method: Visual inspection.

3) **Permissible Deviations**:

Serial Number	Item		Permissible Deviation (mm)	Inspection Method
1	Light Steel Frame	Light Steel Frame Vertical Alignment	3	2m Plumb Line Inspection
2		Light Steel Frame Spacing	3	Ruler Measurement
3		Light Steel Frame Flatness	2	2m Ruler Measurement
4	Surface Panel	Surface Panel Flatness	3	2m Ruler Measurement
5		Surface Panel Vertical Alignment	4	2m Plumb Line Inspection
6		Surface Panel Connection Flatness	3	5m Line Inspection
7		Connection Height Difference	1	Measurement Using Caliper
8	Pressing Strip	Pressing Strip Flatness	3	5m Line Inspection
9		Pressing Strip Spacing	2	Ruler Measurement

(5) Finished Product Protection

1) During construction, ensure that previously installed components, such as wiring and equipment, are not damaged or displaced.
2) Properly store light steel framework and cement fiberboards to prevent deformation, moisture damage, or contamination.
3) Protect installed elements like doors, windows, floors, and windowsills from damage.
4) Avoid impacting the completed walls, keeping them clean and intact.

(6) Common Quality Issues

1) **Panel Joint Cracking**: This is a common issue with partition walls. Addressing it requires considering multiple factors, including the rigidity of the framework, secure fastening of panels, quality mortar application, and careful joint treatment. Proper overall execution is necessary to avoid cracking.
2) **Dry Heat Damage**: In unoccupied rooms during the heating season, control the temperature and ventilate to prevent wall deformation and cracks.
3) **Loose Connections**: Ensure all joints meet design specifications, and address any weak points in the framework during installation.
4) **Uneven Panel Surfaces**: This can result from misaligned studs or inconsistent panel thickness.
5) **Uneven Recessed Seams**: Ensure precise panel measurements and consistent seam spacing during installation

8. Interior Water and Electrical Installations

(1) Scope

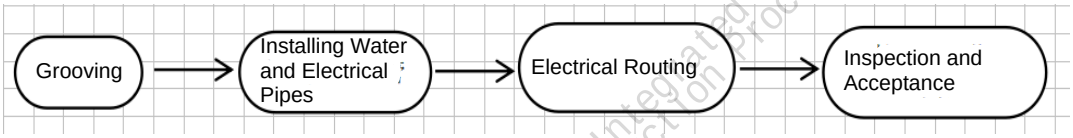
This standard applies to the water and electrical installation work for APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) All water and electrical materials must meet the design specifications in terms of performance and quality.
   (2) Auxiliary materials: crack-resistant mortar, electrical wires, conduits, water pipes (both indoor and outdoor drainage pipes), circuit breakers, electrical switches, outlets, elbows, and floor drains.
   (3) Tools: small cutting saw (or platform saw), electric drill, angle grinder, scaffolding, wire cutters, pipe wrench, electric tester, and others.
2) **Preparatory Work**:
   (1) Plan the routing of the pipelines according to the drawings, determining which sections should run through walls and which should go through the ceiling. Comprehensive planning is necessary, and the construction should proceed in accordance with the plans.
   (2) Before starting, establish the positions for the water and electrical lines, including the installation locations of the main and auxiliary electrical panels. Consider factors like the placement of furniture and user habits to ensure a practical layout.

(3) Operating Techniques

1) **Construction Process**



2) **Grooving**:
   Groove along the predetermined paths for water and electrical lines. Floor grooves should typically be 2-3cm deep, and wall grooves must be horizontally and vertically aligned. Be cautious not to damage any existing pipes or wiring. Given that ALC wall panels are 10cm thick, groove depth should not exceed 5cm.
3) **Installing Water and Electrical Pipes**:
   (1) Install cold water pipes, hot water pipes, and electrical conduits separately, ensuring at least 15cm of spacing between hot and cold water pipes.
   (2) Keep power and low-voltage lines separate and use foil to prevent interference where they intersect.

(3) Avoid placing pipes behind mirrors, shelves, or furniture to prevent damage from drills or nails.

4) **Electrical Routing**:

(1) Arrange electrical lines according to the plans, maintaining horizontal and vertical alignment and separating power and low-voltage lines. Diagonal routing is not permitted.

(2) Arrange the circuits for the kitchen, bathroom, and other areas based on the placement of electrical appliances.

(3) Supply circuits for outlets in different rooms, as well as those for the kitchen, bathroom, and shower, should be independently protected with circuit breakers. These circuits must not share a neutral wire with other circuits.

5) **Inspection and Acceptance**:

(1) Upon completion, inspect the water and electrical systems. Check that the pipes are securely installed, and ensure the wiring complies with safety standards, with no exposed wires.

(2) All in-wall electrical wires should be encased in 20mm flame-retardant PVC conduits and connected using elbows, joints, and junction boxes. Wires must not be exposed above ceilings or buried directly in cement to ensure they can be pulled out or replaced.

(3) Ensure there are sufficient power and low-voltage outlet interfaces. Install outlets on both sides of the bed, as well as a telephone outlet. Near the desk and on the living room TV wall, install three power outlets, along with TV, telephone, multimedia, and broadband sockets.

(4) Switch boxes should be installed 1.2m above the floor, with at least one multi-purpose outlet per room.

(5) All outlets and switches should be at least 300mm above the floor. Ensure consistent height within each room, with a height variance of less than 5mm and less than 1mm for side-by-side installations. Outlets and switches should not be obstructed by sliding doors or furniture.

6) **Sealing and Protection**:

Once the inspection is passed, protect the water and electrical lines. Fill the grooves in the walls and floors with mortar and smooth the surface.

7) **Water and Electrical Installation Notes**:

(1) Positioning: Plan all switches, outlets, and water connections before starting work.

(2) Follow the principle of "water lines in the ceiling, electrical lines in the floor." Run water lines through the ceiling and electrical lines on the ground when possible.

(3) Design electrical circuits for switches, outlets, and lighting to accommodate changes in room layout.

(4) Apply waterproofing using membrane coatings, especially in kitchens and bathrooms.

(5) Complete waterproofing only after inspecting the concealed installations.

(6) Perform two water retention tests after waterproofing to ensure effectiveness.

(7) The bathroom waterproof layer should be at least 1.8 meters high, and additional

waterproofing should be applied around drains, corners, and pipe outlets.
(8) Use odor-proof floor drains.
(9) Hot water pipes should always be on the left and cold on the right.
(10) Avoid running water pipes across the floor.
(11) Follow electrical codes and avoid using substandard materials.
(12) Do not mix power and communication lines within the same conduit.
(13) Ensure junction boxes are insulated.
(14) Make sure electrical connections are secure to prevent poor contact.
(15) Wires should run horizontally or vertically, maintaining a neat and orderly appearance.
(16) Ensure stable low-voltage signals by minimizing interference.
(17) Check water pipes regularly to ensure proper flow and functionality. Install valves for easy future maintenance.

9. Interior Decorative Wall Panel Installation

(1) Scope

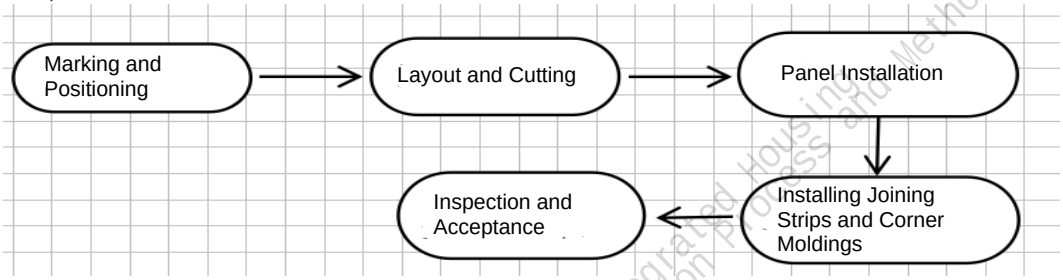
This standard applies to the installation of interior decorative wall panels for APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) All decorative wall panel materials must meet the specified design requirements in terms of quality and performance.
   (2) Auxiliary materials: foam adhesive, structural adhesive, construction lines, laser level, joining strips, corner moldings (inner and outer), ink line, and measuring rod.
   (3) Tools: cutting saw, electric drill, angle grinder, scaffolding, pipe wrench, electric tester, and more.
2) **Preparation Conditions**:
   (1) **Surface Preparation**: Ensure the walls are free from bulges, cracks, dust, and are smooth and even.
   (2) **Ceiling Height**: The ceiling height must be marked according to the specified height in the drawings before panel layout and installation. Electrical outlet boxes should be pre-cut on the panels.

(3) Operating Techniques

1) **Construction Process**



2) **Marking and Positioning**:
   Mark and position the construction lines based on the design drawings. Use a laser level to determine the ceiling height, align the horizontal and vertical dimensions, and mark the lines, ensuring evenness.
3) **Layout and Cutting**:
   (1) Combine the panel layout from the drawings with the actual on-site measurements, and proceed with cutting, making sure to account for door and window openings to avoid blocking the frames.
   (2) Cutouts for switches, outlets, and network ports should be pre-measured and cut according to the marked heights.
4) **Panel Installation**:
   (1) Apply foam or structural adhesive to the back of the wall panels in a dotted

pattern to ensure even coverage before adhering them to the wall surface.
(2) During the adhesion process, use a measuring rod to press the panels evenly, ensuring flatness.

5) **Installing Joining Strips and Corner Moldings**:
(1) For full wall installations, use H-shaped joining strips to connect panels. Insert one side of the strip into the slot of the first panel, adjust as needed, and then fix it using self-tapping screws. Insert the next panel into the opposite slot of the joining strip and continue.
(2) Use specialized corner moldings for inside and outside corners to ensure smooth transitions, taking care with the panel dimensions during cuts.
(3) When finishing around doors and windows, trim corner moldings to 45-degree angles for a neat and attractive appearance.

6) **Inspection and Acceptance**:
(1) Measure and verify dimensions throughout the layout process to ensure a uniform and visually pleasing result. Avoid discrepancies where panel edges are uneven or where cuts are misaligned. Use a measuring tape and pencil to ensure straight, even cuts, especially for baseboards.
(2) Ensure window trim pieces fit tightly at 45-degree joints, and that the panels align neatly at the top and bottom, without slopes.
(3) Cutouts for outlets, panels, and switches must remain within marked boundaries, avoiding oversized gaps.
(4) Fix panels using both adhesive and anchor methods. Press horizontally and vertically with a measuring rod to ensure they are firmly attached and even.
(5) Install baseboards tightly against the walls, following the control height line. Leave a 30-50cm gap at door openings to complete after door installation.

(4) Finished Product Protection

1) **Regular Cleaning**: Wipe the surface with a clean, damp cloth. Avoid using cleaning agents that contain harsh chemicals.
2) **Avoid Impact**: Prevent hard objects from striking the surface to maintain its smooth finish and durability.
3) **Water and Moisture Protection**: Keep the area dry to avoid long-term moisture exposure, which could cause panel warping or damage.

10. Ceiling Installation

(1) Scope

This standard applies to ceiling installation in APEX houses. Refer to the construction drawings for specific measurements.

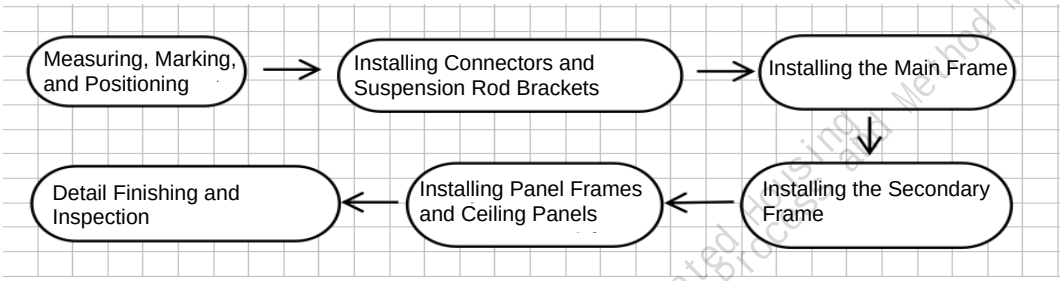
(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) All ceiling materials must meet design specifications and quality requirements.
   (2) Auxiliary materials: expansion bolts, suspension rods, main and secondary frames, laser level, corner trims, inside and outside corner trims, chalk line.
   (3) Tools: cutting saw, electric drill, angle grinder, scaffolding, pipe wrench, voltage tester, etc.

2) **Work Conditions**:
   (1) Use a laser level in advance to set the elevation and mark suspension rod points according to the design drawings.
   (2) Measure the space again according to the design drawings to avoid material waste from incorrect cuts.

(3) Operating Techniques

1) **Construction Process**



2) **Measuring, Marking, and Positioning**:
   Identify the specific locations for the main frame, secondary frame, suspension rods, and lighting fixtures. Set up the work platform accordingly.

3) **Installing Connectors and Suspension Rod Brackets**:
   (1) Attach the connectors and suspension rod brackets as per the design plan and drawings, using expansion bolts to secure the suspension rods to the roof slab.
   (2) Adjust the suspension rods as needed to maintain consistent height.

4) **Installing the Main Frame**:
   Use lightweight steel framing, spaced at 1000mm intervals. Ensure proper connections between suspension rods and keep the frames level during installation.

5) **Installing the Secondary Frame**:
Based on the specifications of the honeycomb panels, install matching secondary frames. Attach the secondary frames to the main frame using hangers, ensuring connections are secure.

6) **Installing Honeycomb Panel Frames and Aluminum Panels**:
(1) Run a baseline across the middle of the ceiling, perpendicular to the secondary frame, to align the installation.
(2) Cut the honeycomb panels as marked on the drawings, matching them to the dimensions of the lighting fixtures.

7) **Detail Finishing**:
Install additional features like exhaust vents, air outlets, and lighting fixtures, making any necessary cuts and adjustments to maintain the ceiling's visual appeal.

8) **Cleanup and Inspection**:
After installation, clean the work area thoroughly and inspect the ceiling for any imperfections that might affect the overall appearance. Make adjustments as needed.

(4) Finished Product Protection

1) The honeycomb panels come with a protective film, which should be kept on until the overall interior decoration is complete.
2) Avoid collisions: Prevent direct contact with hard objects to protect the surface from damage.

11. Flooring Installation

(1) Scope

This standard applies to flooring installation in APEX houses. Refer to the construction drawings for specific measurements.

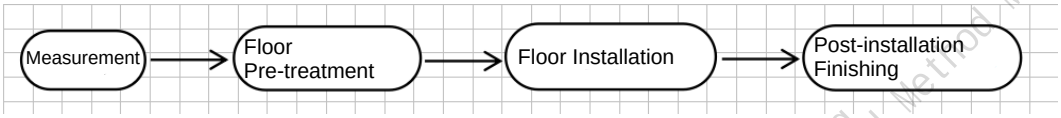
(2) Construction Preparation

1) **Materials and Main Equipment**:
(1) All flooring materials must meet the specified design requirements in terms of specifications, performance, and quality.
(2) Auxiliary materials: edging strips, foam adhesive or structural adhesive, floor mortar, floor tape, moisture barrier.
(3) Tools: cutting saw, measuring bar, rubber mallet, laser level, ruler, pencil, utility knife, spacers.

2) **Work Conditions**:
(1) The ground should be flat and free of bulges or depressions.
(2) Clean the ground thoroughly. The surface should be treated with a stabilizer or interface agent, providing a certain degree of moisture resistance.

(3) Operating Techniques

1) **Construction Process**



2) **Measurement and Planning**:
(1) Use a ruler to measure the length and width of the room to ensure the floor dimensions match the room.
(2) Allow for expansion and contraction of the flooring by leaving appropriate gaps around the room perimeter.
(3) Use a pencil to mark the position and cutting lines for each piece of flooring.

3) **Floor Pre-treatment**:
(1) Inspect each piece of flooring for quality, ensuring there are no damages or defects.
(2) Clean the ground with a cloth to make sure it is free of dust, oil, and moisture.

4) **Floor Installation**:
(1) Evenly apply foam adhesive or structural adhesive to the ground. Use an appropriate amount of adhesive to avoid overuse or underuse.
(2) Place the flooring in the designated position and use spacers to maintain gaps between the pieces.

(3) Use a rubber mallet to gently tap the flooring, ensuring it fits snugly against the ground.
(4) Cut the flooring as needed using cutting tools, following the previously marked lines to ensure each piece fits correctly.

5) **Post-installation Finishing**:
(1) During installation, keep the ground and flooring dry to prevent moisture from affecting the installation quality.
(2) Ensure gaps between the flooring pieces are even to prevent issues from expansion or contraction due to temperature changes.
(3) For corners or irregular areas, cut and adjust the flooring as needed based on the actual conditions.
(4) After installation, clean the floor regularly to avoid stains and scratches.

6) **Maintenance and Care**:
(1) Avoid using sharp objects that could scratch the flooring during daily use.
(2) Do not let water sit on the floor for long periods; clean up any spills promptly.
(3) Use specialized floor cleaning agents regularly to maintain the floor's shine and durability.

12. Installation of Prefabricated Eaves Gutters

(1) Scope

This standard applies to the installation of prefabricated eaves gutters in APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:

(1) All gutter materials must meet the specified design requirements in terms of specifications, performance, and quality.

(2) Auxiliary materials: self-tapping screws, L-shaped flat iron, expansion bolts, connectors, weather-resistant adhesive.

(3) Tools: cutting saw, construction line, electric drill, chalk line, drill bits, mobile scaffolding.

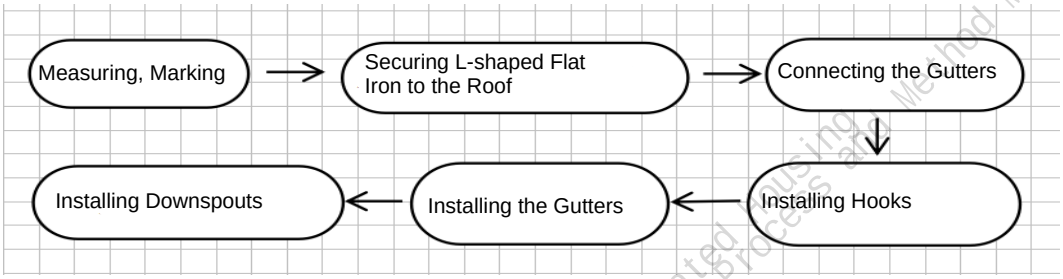
2) **Work Conditions**:

(1) The outer surface of the ALC roof panels must be even, and the decorative coating must be complete.

(2) The roof slope must be sufficient to prevent water pooling.

(3) Operating Techniques

1) **Construction Process**



2) **Measuring, Marking, and Cutting**:

(1) Determine the position of the downspouts and measure the length of the eaves. Based on the design drawings and considering the building facade, roof shape, and doors/windows, install the gutter from the eaves closure point, sloping towards the center or one side as specified. Refer to the design drawings for downspout locations.

(2) Measure the actual length of the eaves and record it.

(3) Use a level pipe to mark the standard gutter line, sloping 1%-3% towards the downspout.

(4) The gutter installation line should be 4cm from the roof tiles.

(5) Cut the gutters uniformly according to the measurements, ensuring overlap joints of 3-5cm for hooks.

3) **Securing L-shaped Flat Iron to the Roof**:
(1) Secure an L-shaped flat iron every 80cm along the outer roof edge.
(2) Fix the long part of the flat iron using self-tapping screws to the steel pipes underneath the ALC panels.
(3) Drill holes in advance for securing the gutters, aligning with the marked lines.

4) **Connecting the Gutters**:
(1) Cut and connect the gutter sections based on the roof shape and measured eave length.
(2) Use 3.0-meter-long colored aluminum gutters. Overlap the joints by 3cm, pressing firmly and securing in the order of the bottom surface first, followed by the sides. Seal with weather-resistant adhesive.

5) **Installing Hooks**:
(1) Determine the number of hooks based on the gutter length and flat iron.
(2) Space the gutter hooks 800mm apart, marking their positions.
(3) Add extra hooks at gutter corners, joints, and downspout openings.

6) **Installing the Gutters**:
(1) Use a hammer drill to create holes at the hook locations, ensuring the depth in the ALC panels is at least 6cm.
(2) Fill the holes with weather-resistant adhesive and gently insert plastic anchors with a hammer.
(3) Clip the hooks into the gutters, pre-drill holes for screws, and use stainless steel screws to secure them, tapping lightly to ensure the gutters are flush with the wall.
(4) Seal the upper edge of the gutters against the wall with weather-resistant adhesive to prevent rainwater from seeping onto the facade. Ensure the eaves are dry and carry out the work in good weather.

7) **Installing Downspouts**:
(1) Use 90° elbows to connect the downspouts, positioning them parallel to the wall according to the markings.
(2) When fixing the downspouts to the wall, be careful to drill accurately to avoid damaging the exterior walls.

(4) Precautions

1) Protect the exterior decorative panels during installation, avoiding impacts from tools.
2) Perform a water test after installation to ensure proper slope and smooth water flow.
3) During the water test, check for leaks at the joints and adjust as necessary.

(5) Finished Product Protection

4) Since the eaves gutter is exposed to the elements, regularly clean debris from the channel.

5) The gutter material is lightweight; avoid heavy impacts.
6) Avoid disassembling the gutters unnecessarily during use.

13. Roof Waterproofing

(1) Scope

This standard applies to roof waterproofing construction for APEX houses. Refer to the construction drawings for specific measurements.

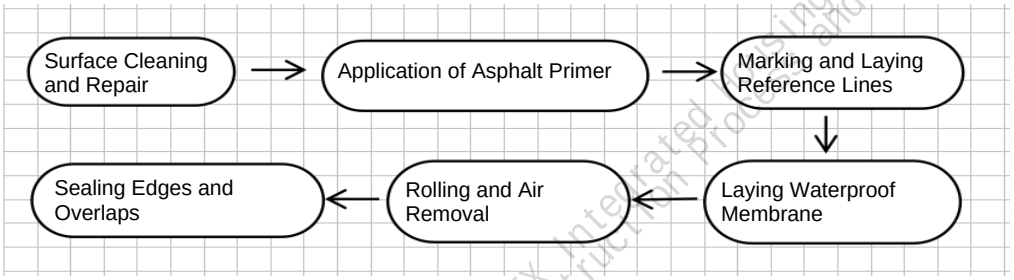
(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) All waterproofing materials must meet the design specifications in terms of performance and quality.
   (2) Auxiliary materials: broom, blower (or vacuum cleaner), hand hammer, steel chisel.
   (3) Tools: scissors, tape measure, chalk line, roller, brush, pressure roller.

2) **Work Conditions**:
   (1) The roof waterproofing surface must be smooth and solid, free from protruding sharp edges, depressions, or loose surfaces. It should be clean and dry, and the exterior eaves gutter must be installed.
   (2) The moisture content of the roof surface must be low enough to show no visible water droplets.
   (3) Before applying the waterproof layer, clean the surface of dust, sand, debris, oil, and any mortar protrusions.

(3) Operating Techniques

1) **Construction Process**



2) **Surface Cleaning and Repair**:
   Clean and repair the surface of the roof plaster layer, removing loose dust, bulges, cracks, and uneven spots to ensure a clean and smooth surface.

3) **Application of Asphalt Primer**:
   Once the base surface is clean, apply a self-heating asphalt primer evenly in one direction. Ensure even thickness without leaving any uncovered spots or excess accumulation. Let it dry until it is non-sticky to the touch.

4) **Marking and Laying Reference Lines**:
   (1) Mark control lines for adhesion and conduct a trial layout, strictly following the

marked lines to ensure the overlap width of the waterproofing membrane is 6-7cm (indicated on the membrane).
(2) Determine the density of the control lines based on site conditions to ensure the membrane is laid straight, without deviation caused by cumulative errors. Perform a trial layout and cut the membrane to the required shape before final adhesion.

5) **Laying Self-Adhesive Rubber Waterproof Membrane**:
(1) Align the membrane with the reference lines during installation to avoid alignment errors. Do not stretch the membrane. After laying, use a pressure roller to press from the center outward to remove air and secure the membrane. Do not prematurely remove the release paper on the overlap areas to avoid contamination or misalignment.
(2) Pull-and-Lay Method: Align the membrane along the reference line and unfold it. Lift one end of the membrane along with the release paper, fold it along the membrane's length, and use a utility knife to gently cut the release paper without damaging the membrane. Carefully peel off a small section of the release paper (about 500mm), and two people should work together to remove the paper and position the membrane. Gradually pull the release paper evenly and lay the membrane smoothly, ensuring the release paper remains intact. If torn, stop and clean the remnants before continuing.
(3) Extend the membrane over the exterior eaves gutter, covering down to the bottom to integrate the gutter with the roof waterproofing layer and prevent water seepage where the gutter is fixed to the wall.

6) **Rolling and Air Removal**:
After laying and pressing large areas of the membrane, use a hand-held roller to press along the overlap areas, rolling outward to remove air and secure adhesion.

7) **Sealing Edges and Overlaps**:
The overlap areas of self-adhesive membranes are factory-prepared for easy adhesion. Overlap width should be 6-7cm. For short overlaps, terminations, pipe wraps, and irregular areas, use a special sealing compound for self-adhesive rubber asphalt membranes. The sealed overlap width should be at least 10cm.

(4) Precautions

1) Handle the membrane gently during installation to prevent damage.
2) Avoid exposing the membrane to organic solvents like gasoline or xylene.
3) Sediment in the primer is normal; stir as needed during use.
4) If bubbles appear during application, puncture them with a needle roller within 30 minutes.
5) Ensure all air bubbles are expelled during installation to maintain waterproof integrity.

(5) Finished Product Protection

1) Avoid walking or dragging heavy objects over the membrane until it is completely dry.
2) Keep sharp objects away from the waterproof layer.
3) If modifications or secondary work are needed, repair any damage with the same material to prevent leaks.

14. Indoor Kitchen and Bathroom Waterproofing

(1) Scope

This standard applies to indoor waterproofing construction for kitchens and bathrooms in APEX houses. Refer to the construction drawings for specific measurements.

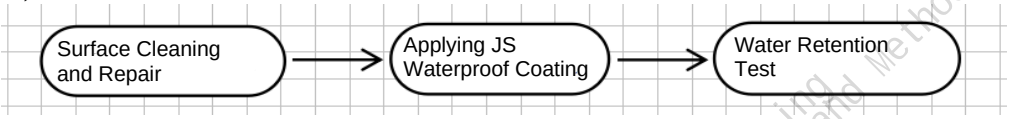
(2) Construction Preparation

1) **Materials and Main Equipment**:
   (1) All indoor waterproofing materials must meet the specified design requirements in terms of specifications, performance, and quality.
   (2) Auxiliary materials: surface stabilizer (interface agent), crack-resistant mortar, floor mortar.
   (3) Tools: trowel, putty knife, straight edge, box tape measure.

2) **Work Conditions**:
   (1) Before starting, clean and sand the floor, walls, and ceiling to ensure surfaces are smooth and clean. Check for any leaks or water seepage risks in the house structure and repair if necessary.
   (2) Treat the base surface before waterproofing, including filling cracks, repairing hollow areas, and addressing sandy or loose walls.

(3) Operating Techniques

1) **Construction Process**



2) **Surface Cleaning and Repair**:
   Treat the base surfaces of the floor and walls, removing cement residue from drainage pipes and leveling out any protruding or rough spots on the walls. Sweep away loose dust and sand with a broom, and use a brush for detailed cleaning. If the wall strength is insufficient, apply reinforcement measures.

3) **Applying JS Waterproof Coating**:
   (1) **First Coat:** Dampen the walls and start applying the waterproof coating. Keep the first layer thin, around 0.3mm thick, using a vertical rolling technique. Dampen the floor with water, ensuring no standing water is present, and then apply the waterproof coating.
   (2) **Second Coat:** Once the first layer has cured, apply the second coat in a direction perpendicular to the first. Ensure even coverage and avoid missed spots. The thickness of the second coat should not be less than that of the first.
   (3) Pay extra attention to areas around drains, pipe bases, and wall corners.
   (4) **Shower Area:** The waterproofing height should be at least 1.8 meters.

(5) **Bathtub Area:** The waterproofing height on walls adjacent to the bathtub should be 30cm higher than the bathtub's edge.
(6) **Sink Area:** The waterproofing height on walls adjacent to the sink should be 30cm higher than the sink.
(7) **Toilet Area:** The waterproofing height on walls adjacent to the toilet should be at least 1.8 meters.

4) **Water Retention Test**:
After completing the waterproofing work, check for any leaks. Fill the room with water and let it sit for 24 hours before conducting a leak inspection.

(4) Precautions

1) During construction, reinforce gaps around the toilet pipe base, drainage pipe base, and floor-wall corners with mortar.
2) Clean the floor and walls before starting to prevent peeling caused by poor adhesion.
3) Apply two coats of waterproofing in crisscross directions and ensure no corners are left untreated.

(5) Finished Product Protection

1) Do not walk on or place items on the waterproof layer until it is fully cured.
2) After completion, use a damp cloth or spray mist for curing, usually for 2-3 days.
3) Protect the waterproof layer from damage: cover wheelbarrow legs with padding, and place boards under the base of any temporary scaffolding to prevent damage.
4) Prevent contamination: Take care to protect the finished product from stains or damage during construction.
5) Avoid walking on the waterproof layer before it has cured to prevent leaks caused by damage.

15. Indoor Wall and Floor Tile Installation

(1) Scope

This standard applies to wall and floor tile installation in APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:

(1) All wall and floor tile materials must meet the specified design requirements in terms of specifications, performance, and quality.

(2) Auxiliary materials: crack-resistant mortar, tile adhesive, laser level, tile spacers, grout (joint filler), floor mortar.

(3) Tools: stone cutter, grout finishing tool, plumb bob, tape measure, construction line, chalk line, bucket, notched trowel, straight edge, level, trowel, brush, broom, rubber mallet, mortar scraper.

2) **Work Conditions**:

(1) Clean the wall base, and ensure that windowsills and window casings are properly sealed.

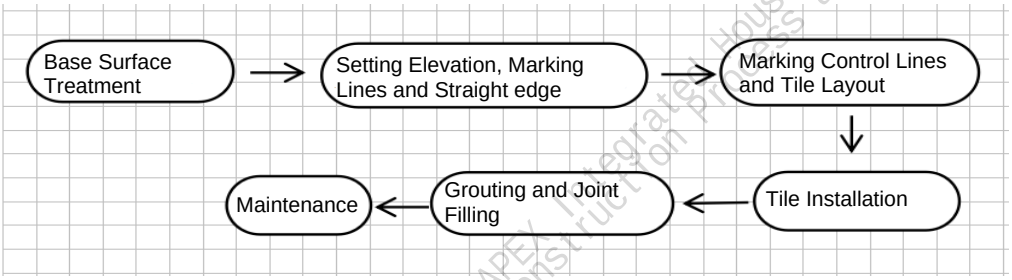
(2) Sort and select tiles by size and color, then categorize and set them aside for use.

(3) Wall plastering and roof waterproofing must be completed.

(4) The floor base layer and all embedded pipes must be installed. Vertical pipes passing through the floor should be securely sealed.

(3) Operating Techniques

1) **Construction Process**



2) **Base Surface Treatment**:

(1) Setting Elevation and Marking Lines: Use the +50cm elevation line marked on the wall to measure and mark the floor surface elevation.

(2) For cement fiberboard panels in partition walls, roughen or plaster the smooth surface with mortar. Use a 2-meter straight edge to level ALC panels with mortar. Level the floor surface with mortar based on the elevation line, and slope it towards the floor drain in rooms with drains.

(3) Once the wall base plaster has dried to 60% or more, mark section and grid lines

according to the drawings and prepare for tiling. After leveling the floor mortar, water it for curing after 24 hours.

3) **Marking Control Lines and Tile Layout**:
(1) Layout the tiles horizontally and vertically according to the detailed drawings and room dimensions to ensure uniform grout lines, as specified in the design. Large walls should have whole tiles, with non-whole tiles limited to less visible areas, such as between windows or in corners, and should maintain symmetry and consistency. Cut whole tiles to fit around protruding fixtures when necessary. When the leveling mortar reaches a compressive strength of 1.2 MPa, mark the control lines for tiling. Determine grout line width based on design specifications and tile dimensions.

4) **Tile Installation**:
(1) Soak the tiles in water to wet them, then let them dry until no standing water is visible before installation.
(2) Wet the leveling layer with water and apply a thin coat of pure cement slurry (water-cement ratio of 0.4-0.5). Only cover as much area as you can tile at one time.
(3) When using adhesive, apply it at a thickness of 2-3mm.
(4) Spread adhesive mortar on the back of the tiles and set them onto the cement-slurry-leveled surface. Position the tiles slightly above the elevation line, ensuring they are level. Use a rubber mallet to tap the tiles into place, working from the inside outward. Ensure the mortar is fully bonded and joints are tight. Use a grinder to cut tiles to fit around floor drains.
(5) Wall Tile Installation: Start tiling from the top down, ensuring each row is level, plumb, and even.
(6) Joint Alignment and Adjustment: After installing 2-3 rows, check the straightness of the joints. If any misalignment is found, adjust immediately before the mortar sets.

5) **Grouting and Joint Filling**:
(1) Grout and fill the joints within 24 hours of tiling, using the same type, grade, and color of mortar (putty, grout, or gypsum).
(2) Use mortar for joint filling, with a depth of about one-third the tile thickness. Ensure the mortar is compact, even, and smooth.
(3) Curing: Water the tiles for curing 24 hours after installation, and continue curing for at least 7 days.

(4) Finished Product Protection

1) Protect installed door frames and pipes during tile installation.
2) Do not cut tiles on freshly laid tile surfaces.
3) Cover the tile surfaces to protect them when other trades, such as cabinet, wooden door, and bathroom vanity installations, are being performed.

16. Wooden Door and Security Door Installation

(1) Scope

This standard applies to the installation of wooden and security doors in APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:

(1) All wooden and security door materials must meet the design specifications in terms of performance and quality.

(2) Auxiliary materials: foam adhesive, silicone sealant, drill bits, self-tapping screws, wooden wedges, rubber mallet, nail gun, construction line, plumb bob, hardware.

(3) Tools: cutting saw, electric drill, laser level, router, pneumatic nail gun.

2) **Work Conditions**:

(1) Check if the door opening dimensions meet the design specifications.

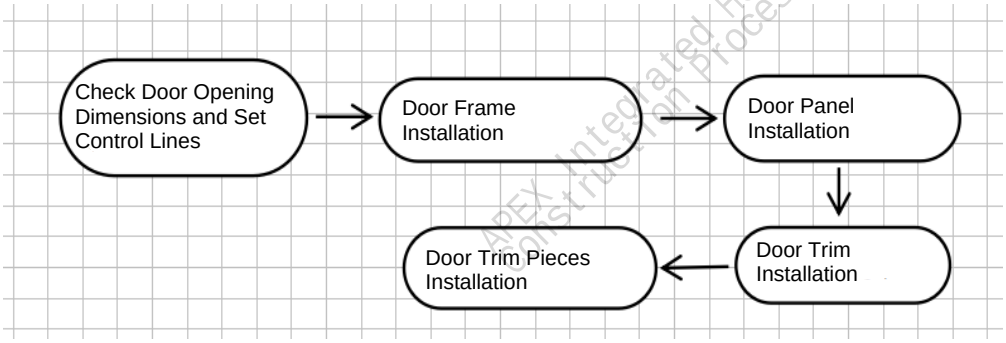
(2) Ensure wall tiles, floor tiles, and interior wall panels are fully installed.

(3) For security doors, ensure that the exterior decorative panels and interior wall panels are installed before verifying the opening dimensions.

(4) Inspect the security doors, wooden doors, door frames, trim, and hardware to ensure they are intact and undamaged.

(3) Operating Techniques

1) **Construction Process**



2) **Check Door Opening Dimensions and Set Control Lines**:

(1) For wooden and security doors, check the dimensions and mark the control lines. Before installation, inspect the reserved door opening dimensions and elevation. Ensure they meet the design requirements and allow for proper installation clearances. Determine the opening direction of the door, and transfer the indoor control line (+1m line) to the door opening as the elevation reference for door frame installation.

(2) Verify that the installation of indoor floor tiles, wall tiles, interior wall panels, and flooring follows the design drawings.

3) **Door Installation**:
(1) Determine the door opening direction and select the appropriate hardware type and installation location.
(2) Check the accuracy of the door opening dimensions and ensure the corners are square. Measure the height of the opening on both sides and the width at the top, middle, and bottom.
(3) Place the door in position, temporarily securing it with wooden wedges. Mark the hinge locations, typically at 1/10 of the door height from the top and bottom edges.
(4) Install the upper and lower hinges. Partially screw in one hinge, close the door to check if the gaps are even and appropriate on all sides, and then fully tighten the screws if everything is correct.
(5) Since security doors are made of steel, the door frame and trim are integrated. Pre-assemble the door on the ground, adjust the level and elevation, and secure it using self-tapping screws through the side of the frame. After securing, fill the gaps between the door frame and wall with foam adhesive. Once dried, finish the interior wall panel installation.

4) **Installing Door Trim**:
The door frame has slots for trim on both sides. After securing the door frame and door, cut the trim to match the door frame height, adding 4-5cm to the trim height. The top trim piece should align with the side trim pieces.

(4) Finished Product Protection

1) Wooden products are typically painted and require careful protection of the painted surface.
2) Be cautious to avoid collisions and scratches during construction to prevent damage to the door surface.
3) Wooden products should not be exposed to water for long periods, and the environment should not be overly humid.

(5) Precautions

1) Maintain level and elevation control during door frame and wooden door installation to prevent misalignment.
2) Adjust the door gaps carefully, as large gaps can cause light leakage and drafts.
3) Do not inject excessive foam adhesive at once to avoid contaminating the painted surface.

17. Installation of Cabinets and Bathroom Vanities

(1) Scope

This standard applies to the installation of cabinets and bathroom vanities in APEX houses. Refer to the construction drawings for specific measurements.

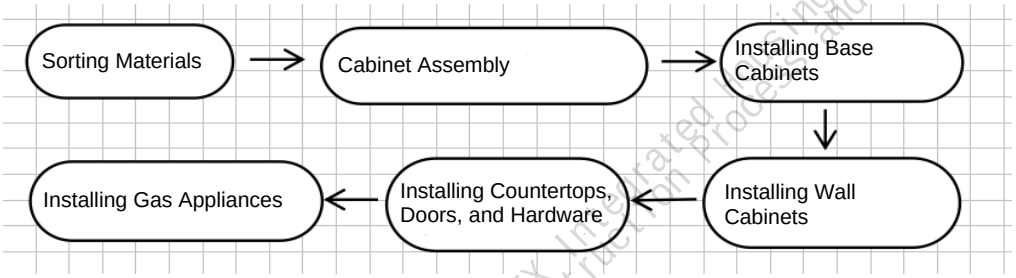
(2) Construction Preparation

1) **Materials and Main Equipment**:
(1) All cabinet and vanity materials must meet the design specifications in terms of performance and quality.
(2) Auxiliary materials: carpet (plastic film), hammer, screwdriver, steel ruler, pencil, chalk line, hardware.
(3) Tools: electric drill, impact drill, level, cutting saw, sander.

2) **Work Conditions**:
(1) Complete all kitchen plumbing and electrical work, including routing water and power lines, before cabinet installation. If not completed, you may need to dig new trenches or lay pipes, impacting the cabinet design and installation.
(2) Install cabinets only after tiling the kitchen to ensure the floor and wall surfaces are finished and won't be altered.
(3) Lay down protective materials like carpet, plastic film, or a protective cover to prevent floor damage or scratches during unpacking and installation.

(3) Operating Techniques

1) **Construction Process**



2) **Sorting Materials**:
Separate different components, such as cabinet body panels, side panels, and cabinet doors. Organize materials for each cabinet unit (base cabinets, wall cabinets) separately.

3) **Cabinet Assembly**:
(1) On-Site Cutting: Lay down protective material on the floor. Perform cuts from the back side of the panels to prevent chipping on the front side.
(2) Assemble the cabinet body after securing connecting parts.

4) **Installing Base Cabinets**:

(1) **Assembly:** Assemble the base cabinets and arrange them according to the order in the drawings, positioning them upside down to install the cabinet feet uniformly.

(2) **Installation Order:** Identify a reference point for installation. For L-shaped kitchens, start from the corner and extend outward. For U-shaped kitchens, align the middle cabinet first, then work outward from the corners. Install corner cabinets first if present; otherwise, start from the cabinet closest to the wall and work outward.

(3) **Level Adjustment:** Adjust the base cabinets using the leveling feet, maintaining a tolerance of ±1mm.

(4) Once the cabinet frame is secured, attach the back panel. Drill holes for plumbing as needed, using a professional hole saw. The hole diameter should be 3-4mm larger than the pipe, and seal the cut edges with sealing strips to prevent water damage and deformation.

5) **Installing Wall Cabinets**:

(1) **Measuring:** Locate electrical wires and plumbing within the wall and adjust the cabinet height based on the user's height. Draw a level line at 650mm above the countertop, but the distance can be adjusted based on user preference.

(2) **Positioning:** Securely attach the wall cabinets to the wall, using at least two hooks for every 900mm.

(3) **Mounting Hooks:** Mark and drill holes, then secure the hooks to the wall. Hang the wall cabinets in order.

6) **Installing Countertops, Doors, and Hardware**:

(1) **Countertop Installation**:

① **Install Support Boards**: Once the cabinets are leveled, place support boards on top, especially around the sink and stove, and secure them with a small amount of silicone. Use a saw to cut support boards cleanly if needed.

② **Countertop Placement**: Cut and drill the countertop, allowing a margin of 3mm. Corner cuts should be rounded to a 25mm radius, and the gap between the countertop and the wall should be 3-5mm.

③ **Countertop Connection**: Use marble adhesive to bond the joints, followed by a wax seal.

④ **Sanding and Polishing**: Let the adhesive cure for 1-2 hours without moving the countertop. Sand any excess adhesive smooth once cured.

(2) **Installing Door Panels and Hardware**:

① **Door Handle Installation**: Align the door panel with the cabinet and ensure it is level. Once adjusted, cover all hinges, and maintain a 1.5mm gap between double doors.

② **Hardware Installation**: For sinks, faucets, and pull-out baskets, drill holes that are 3-4mm larger than the pipes, and seal exposed cross-sections with sealing strips. Seal the drain connections with silicone.

7) **Installing Gas Appliances**:
(1) **Drilling**: Drill holes for power supply connections on-site.

(2) **Range Hood Installation**: Maintain a distance of 750-800mm between the range hood and the stove, ensuring it aligns with the stove.

(3) **Stove Installation**: Connect the gas supply and check for leaks. Have the gas company inspect the installation upon completion.
(4) **Power Outlets**: Drill holes for embedded appliances, ensuring they are large enough for easy future access and maintenance.
(5) Finally, install the baseboard, ensuring a tight, seamless fit.

(4) Finished Product Protection

1) After installing the cabinets, cover them with the protective cardboard provided to prevent damage from ongoing construction.
2) Workers should not stand or place tools on the countertops during high work, nor should they store tools or work clothes on the cabinets.
3) Avoid striking or bumping the cabinets during transportation or subsequent construction.
4) Maintain Cleanliness: Keep the kitchen floor clean to prevent damage to the cabinets from construction debris.

(5) Precautions

1) Ensure that artificial stone countertops have no visible seams, and apply sealant to all cut edges.
2) Check that all screws are properly installed, door panels are level, and the cabinets are free of debris.
3) Ensure even gaps between doors and frames, between doors, between drawers and cabinets, and between adjacent drawers.
4) All sharp corners on the cabinets should be rounded off, and metal parts that are reachable should be smooth and free of burrs. Ensure the height of base and wall cabinets is comfortable for use.
5) Clean up and remove all construction debris once installation is complete.

18. Installation of Outdoor Wood-Plastic Flooring

(1) Scope

This standard applies to the installation of outdoor wood-plastic flooring for APEX houses. Refer to the construction drawings for specific measurements.

(2) Construction Preparation

1) **Materials and Main Equipment**:

(1) All outdoor wood-plastic flooring materials must meet the design specifications in terms of performance and quality.

(2) Auxiliary materials: corner protectors, plastic connectors, self-tapping screws, marker pen, sandpaper.

(3) Tools: electric drill, laser level, cutting saw, rubber mallet, tape measure.

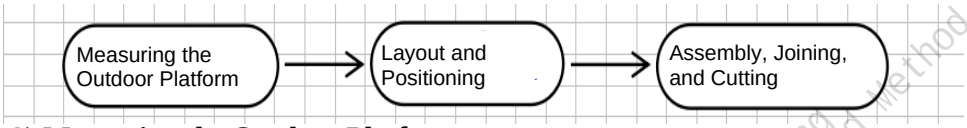
2) **Work Conditions**:

(1) The steel sub-beams of the outdoor platform must be constructed according to the design drawings.

(2) Check that the outdoor platform is level to ensure the wood-plastic flooring is installed evenly.

(3) Operating Techniques

1) **Construction Process**



2) **Measuring the Outdoor Platform**:

Use a laser level and tape measure to measure the platform according to the design drawings. Stretch a construction line across both ends of the platform to set the elevation and ensure evenness.

3) **Layout and Positioning**:

(1) **Positioning**: Use a level and marker pen to mark the location of the first plank on the platform (positioning can be from either end, starting from the designated point). Ensure the plank is level and aligned correctly.

(2) **Laying the First Plank**: Place the first plank at the marked position, ensuring it is level and stable. Use a mallet to secure the plank to the ground.

4) **Assembly, Joining, and Cutting**:

(1) **Joining Planks**: Lay the second plank next to the first, ensuring the gaps between them are aligned. Use plastic connectors and self-tapping screws to secure the planks together.

(2) **Continue Laying Planks**: Repeat the above steps for the remaining planks. For

corners or special shapes, cut or join planks as needed for an aesthetically pleasing and even surface.

(3) **Cutting**: Measure and mark cutting lines with a marker pen. Cut from the back side with a saw to avoid chipping, and sand the cut edges smooth.

(4) **Corner Protection**: Install corner protectors and secure them with self-tapping screws.

(4) Finished Product Protection

1) Cover the flooring with protective film after installation to prevent damage from subsequent construction.
2) Avoid sharp objects that can scratch or dent the surface.
3) Clean any stains or spills immediately.
4) Inspect and maintain the flooring periodically, securing any loose or damaged parts.
5) Use a soft cloth or mop for cleaning and avoid using harsh chemicals or corrosive cleaners.

(5) Precautions

1) Ensure each plank is level and stable to prevent unevenness or looseness.
2) Align the gaps between planks to avoid misalignment or large gaps. Carefully handle corners or custom shapes for a uniform and polished look.
3) Avoid excessive force when hammering or cutting. Protect nearby walls and furniture from damage.

19. Installation of Outdoor Wood-Plastic Railings

(1) Scope

This standard applies to the installation of outdoor wood-plastic railings for APEX houses. Refer to the construction drawings for specific measurements.

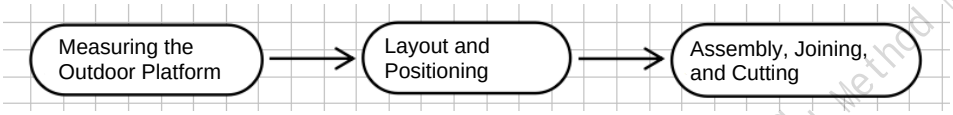
(2) Construction Preparation

1) **Materials and Main Equipment**:
(1) All outdoor wood-plastic railing materials must meet the design specifications in terms of performance and quality.
(2) Auxiliary materials: corner protectors, iron connectors, self-tapping screws, marker pen, sandpaper.
(3) Tools: electric drill, laser level, cutting saw, rubber mallet, tape measure.

2) **Work Conditions**:
(1) The outdoor wood-plastic flooring must be installed according to the design drawings.
(2) Ensure the wood-plastic flooring is level so the railings can be installed at a consistent height.

(3) Operating Techniques

1) **Construction Process**



2) **Measuring the Outdoor Platform**:
Use a laser level and tape measure to measure the platform. Stretch a construction line across both ends to set the height and ensure the railings are level.

3) **Layout and Positioning**:
(1) Accurately measure and mark the positions for the railings. Compare the railing size with the marked positions to ensure proper fit.
(2) Calculate the spacing between each railing and mark the positions accordingly.

4) **Installation, Joining, and Cutting**:
(1) Secure iron connectors to the marked positions using self-tapping screws. Ensure the connectors are level before attaching the railing bases.
(2) For cutting, measure and mark the height dimensions with a marker pen. Cut the railings with a saw and sand the edges smooth.
(3) Insert the main railing posts into the bases and secure smaller railings to the handrail using brackets.

(4) Drill holes where necessary and attach the handrail securely to the railings. Ensure all screws are tight and the structure is secure.

(4) Finished Product Protection

1) Confirm that all materials are available and tools are functional before starting.
2) Keep the work area clean and organized, and ensure that tools and materials do not obstruct the workflow.
3) Ensure the flooring is level before installation.
4) Use appropriate tools and accessories for installation.
5) Perform a final inspection, keep the area clean, and dispose of any damaged or unusable parts promptly.

(5) Precautions

1) Ensure that each railing is level and stable, avoiding uneven or loose installations.
2) Align the gaps between railings and ensure they fit correctly, especially in corners or custom shapes, for a consistent and neat appearance.
3) Exercise caution during installation to avoid excessive force, and protect nearby walls and furniture from damage.