WALLME
ACCELARATING CONSTRUCTION

MANUAL
FOR AAC BLOCKS

WALLME CONTECH INDIA PRIVATE LIMITED

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1.Introduction

"Based on the initial adoption of AAC blocks, it was analyzed that the lack of adequate awareness of AAC masonry practices among masons, contractors, and homeowners result in adopting traditional concrete masonry practices that results in cracks and water seepage issues."

The purpose of this manual is to serve as a reference material for structural design and installation of AAC blocks, for architects, contractors, masons, and homeowners; those seeking to use Wallme AAC blocks for wall construction.

These notes and details are to be read in conjunction with the project's architect guidelines.

If any omissions discrepancy or fault exists in this manual, please contact the structural engineer immediately for a decision before proceeding with work.

"AAC blocks masonry is easy, but it should be laid with greater care."

2. IS Standards for AAC

The information given in this document is based on relevant IS codes and good construction practices. Kindly make sure that your site supervisor or contractor follows the instructions to get the full benefits of AAC building material.

IS Standards:

IS: 2185 (Part 3): - Specification for concrete masonry units (Autoclaved Aerated Concrete)

IS: 6041: - Best Practices for Construction of Autoclaved Aerated Concrete Block Masonry

IS: 1661: - Best Practices for Application of Cement and Cement-Lime Plaster.

IS: 1905: - Best Practices for the structural design aspect of unreinforced load-bearing and non-load-bearing walls.

IS: 2250: - Best Practices for preparation and use of masonry mortar.

IS-6441 Part-1 & IS-6441-Part-5: Methods of test for autoclaved cellular concrete products, Density & Compressive Strength.

3. Planning your Building

3.1 Why consider traditional low productive building material?

Building constructions sector has been slower to transform, and In some ways, clutching tightly to the **'status quo' by adopting traditional low productive building material** and practices that are hurdles to accelerate the construction pace.

3.2 Need to Transform

The rapid urban expansions and the deep desire for better quality living, continue to generate demand for a large number of residential buildings.

Engineers and architects are under moral obligation to transform and would devise ways to **build taller, stronger, faster** and **beautiful buildings** using innovative building materials. Building architecture is fueled by an acceleration of technology, material science, and down-to **try-it** attitude.

3.3 Innovative Wall material

Wallme AAC Blocks are a new age **innovative building** material made of Flyash, gypsum, lime, cement and aluminum powder cured under high temperature and pressure, providing value to builders and its inhabitants.

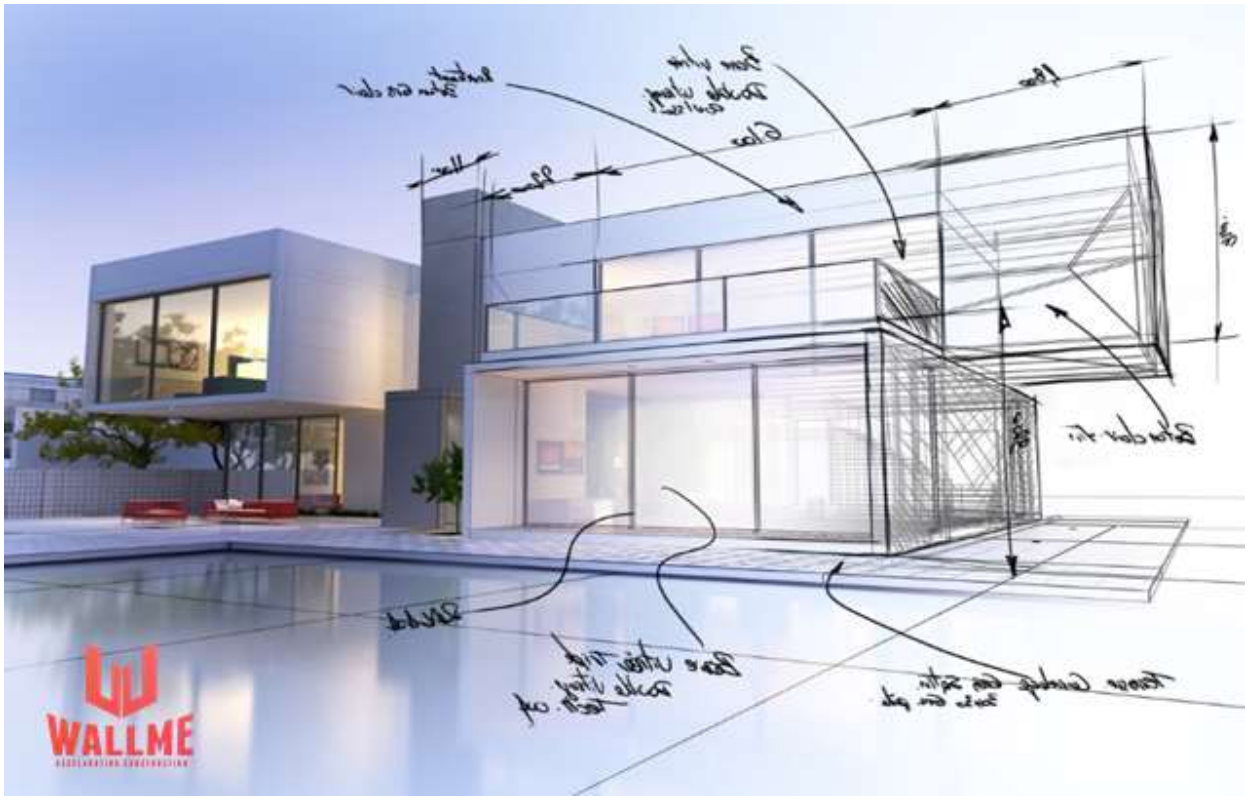
NOW IS THE TIME FOR BUILDERS TO ADOPT **ADVANCED BUILDING** MATERIAL LIKE **AAC BLOCKS**

4.Design Considerations for AAC Block Walls

Key design consideration for AAC Blocks are listed below.

4.1 Design Flexibility

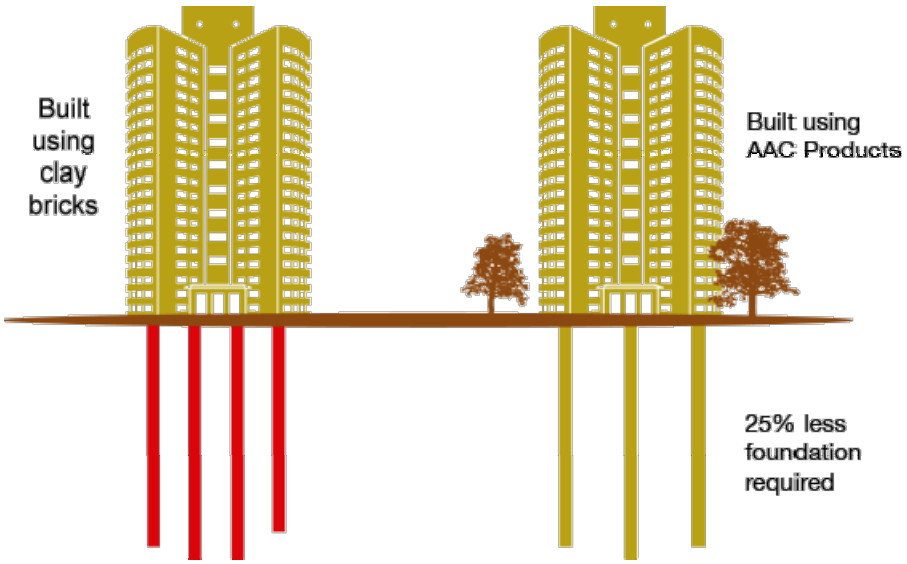
AAC Blocks provides flexibility in design by providing walls independent of beams by virtue of its light weight.



4.2 Foundations, Columns & Beams

The Density of AAC blocks are 50-60% lower than clay bricks or concrete blocks. This low density thus reduces the self-weight of the masonry built using these blocks.

The self-weight of masonry units comprises of 50% of the total Dead Load of a Building. And by choosing these light weight AAC Blocks the self-weight of the building reduces considerably thus reducing the structural cost of foundations, columns & beams.



AAC Blocks have significant cost advantages for following foundation types:

- Buildings founded on weak soils where SBC(safe bearing capacity) of the soil is very low.
- Buildings founded on soil strata where pile foundations are adopted.

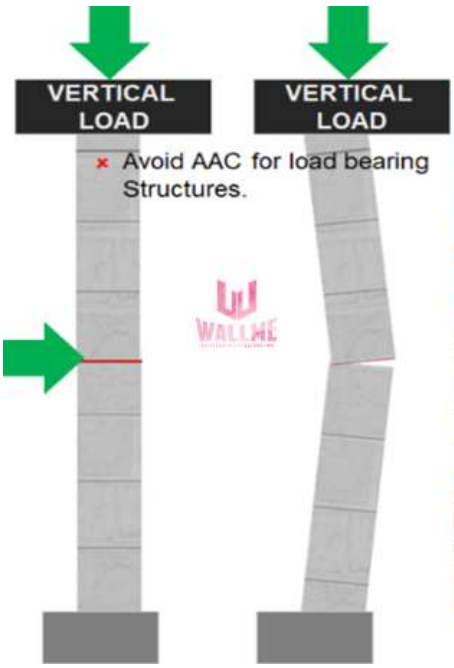
4.3 Flat Slabs

For structures where Flat Slabs & Post Tensioned slabs are used, AAC Block masonry is preferred due to its light weight characteristics.

Note: AAC blocks dry density is 550 to 650 kg/cum, as compared with the weight of CMU/brick masonry of 1200-1800 kg/cum.

4.4 Avoid AAC for load-bearing structures.

AAC for load-bearing structures, i.e., structures where beam & columns are not used.

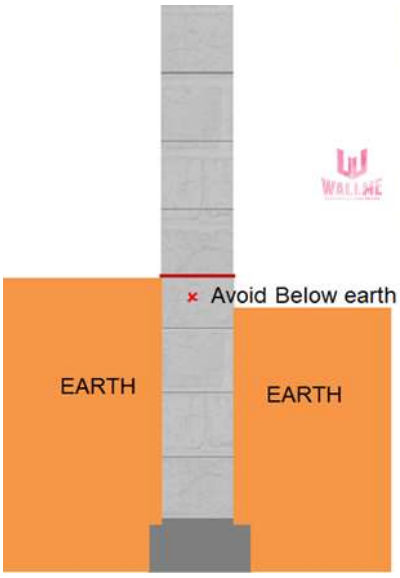


4.5 Below Plinth

Avoid the use of AAC Blocks below plinth level or ground level considering the following parameters.

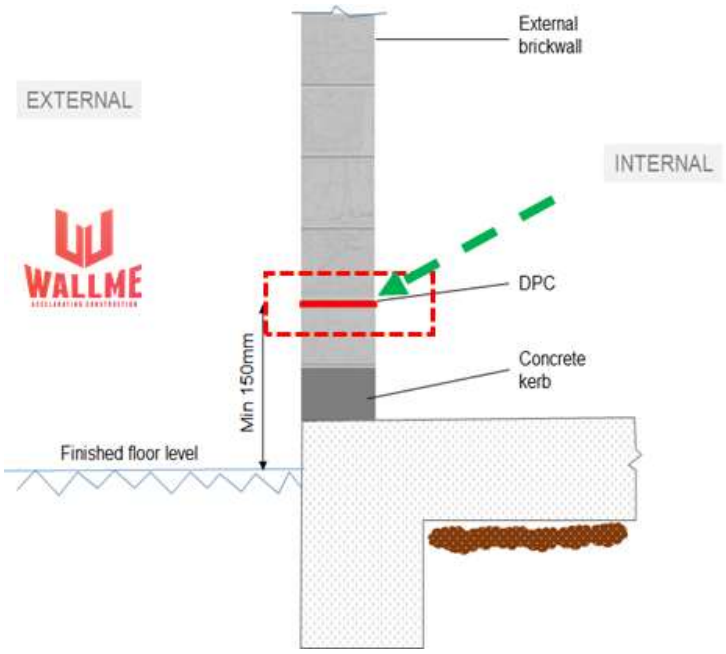
a. The horizontal load from fillings along the side of the block.

b. Potential water seepage from the soil around the wall.



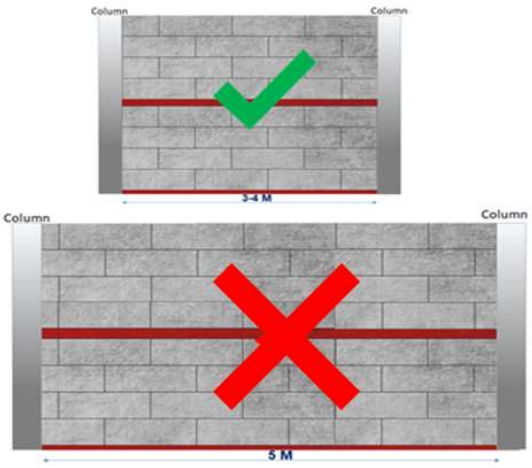
4.6 Damp Proof Course/Coat

As with any masonry walls to guard against ground moisture, to protect against rainwater bouncing off the ground and splashing onto the wall, the DPC should be installed at a minimum 150 mm height above the surrounding finished floor level.



4.7 AAC Wall Span

Similar to other masonry units like CMU or bricks, it's not recommended to have long span AAC block wall without RC or stiffeners.

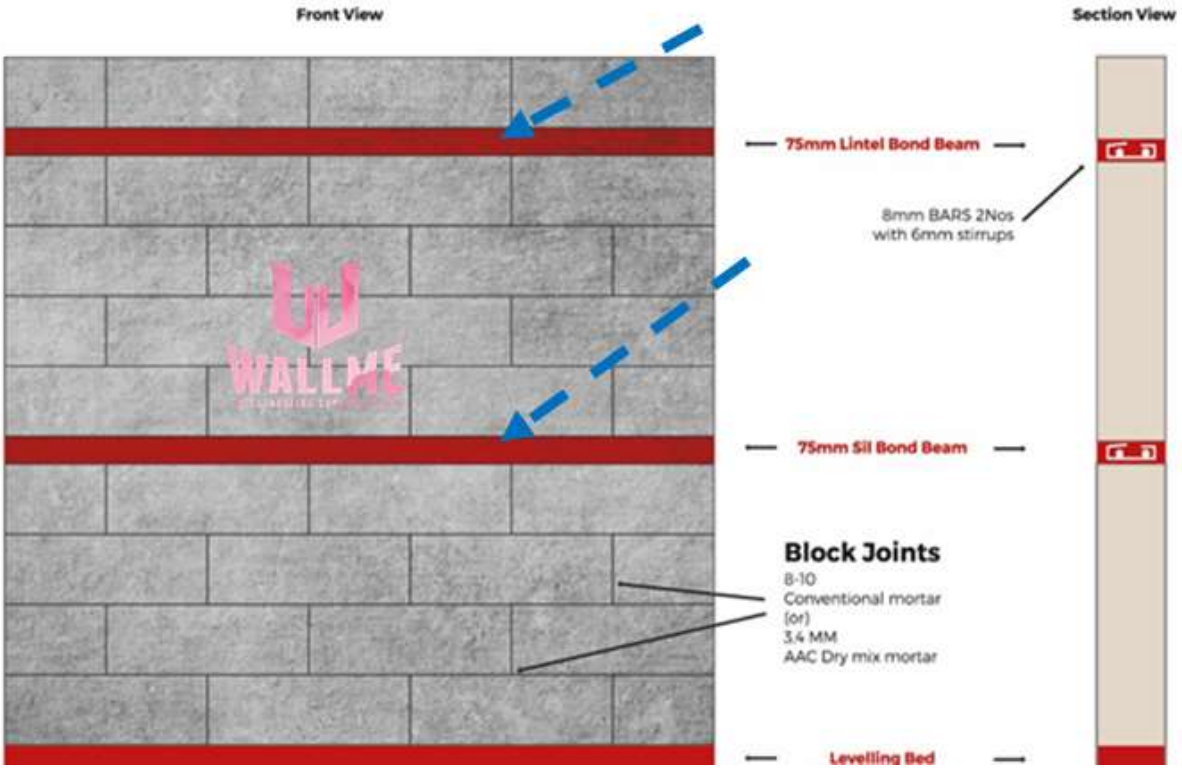


4.8 Bond (Coping) Beam for plain walls

For AAC blocks, it is recommended to provision bond beams after every four courses with reinforcement, so the wall load is uniformly distributed load to avoid any type of shear crack and horizontal cracks

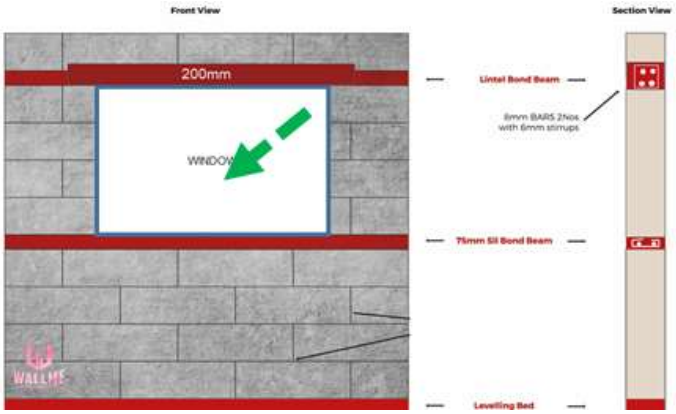
RCC Bond beam of thickness 75 mm with two no's of 8 mm dia. rods and 6 mm stirrups at 200 mm c/c, these are recommendations of IS 6041 and IS 1905-1987.

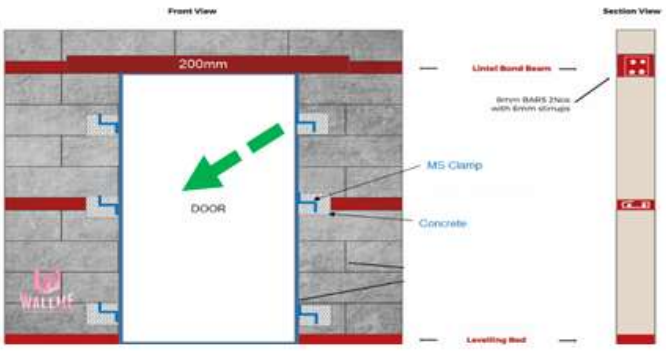
Ensure the levelling bed of 10-25 mm is used to ensure perfect level across all the blocks in the first course and thereon.



4.9 Lintel Bond (Coping) Beam for walls having windows & Doors

RCC Lintel Bond beam of thickness 200 mm with four no's of 8 mm dia. rods and 6 mm stirrups at 200 mm c/c; these are recommendations of IS 6041 and IS 1905-1987.





Lintels shall always rest on full block with minimum bearing as under.

Door/Window Opening size >>>	Up to 3.0 Feet	3.0-6.5 Feet	3.0-6.5 Feet	Above 6.5feet
Minimum bearing (each side)	150 mm	200 mm	300 mm	To design

Below the openings provide sil beam with reinforcement to avoid diagonal tension cracks. The bond beam to be extended up to 300 mm from window corners both the sides.

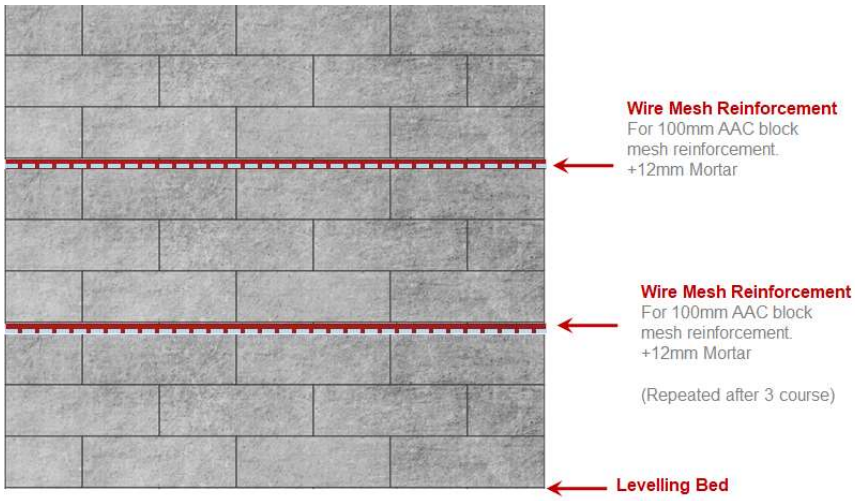
4.10 Wire Mesh Reinforcement

For 4inch (100 mm) walls expanded, galvanized or stainless steel mesh is used primarily as an anti-cracking reinforcement in the construction of brick and block masonry.

Expanded metal reinforcement is easy to handle, and when laid embedded in the mortar joining between brickwork or brickwork courses, forms an integral structure of great tensile strength, which assists in the resistance, vibrations, and thermal changes.

The range of reinforcement coils can also be used for most wall thickness laid on the mortar bed with 5 mm clearance to the outside face of the wall and lapped at least 75 mm, if joining lengths. The reinforcement is then embedded completely, and for most applications, every third course is sufficient.

Below drawing represents the wire mesh reinforcement.



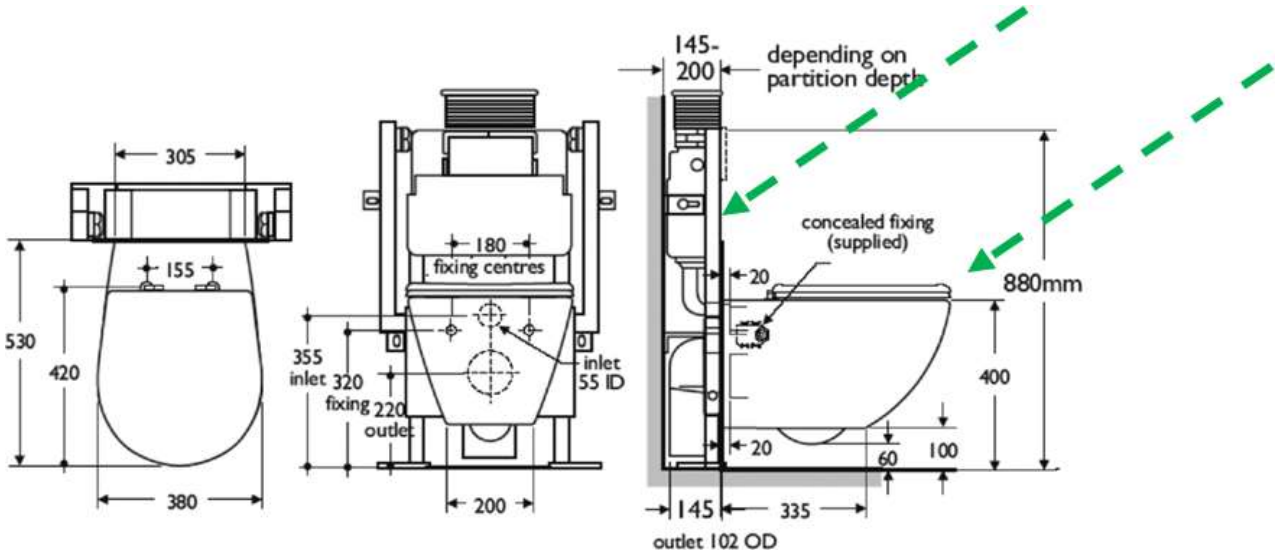
4.11 Reinforcing Mesh for Plastering

Fully meshing using chicken mesh is recommended to assist in maintaining render integrity and minimizing consequential cracking.

The minimum requirement is to mesh AAC wall-Column, other wall material or corners of wall openings (doors and windows) to minimize corner cracking, etc.

4.12 Avoid Heavy loads against 4” AAC Wall.

Avoid heavy fittings like wall hung commode to 4 inch AAC wall. A ledge wall could be planned.



4.13 Elevator/Lift Guide rails

As per regulation **elevator guide rails** are to be mounted on Concrete or MS and hence **avoid** direct mounting on AAC blocks.

5. Mortar for AAC Blocks

There are two types of mortar used for AAC blocks masonry:

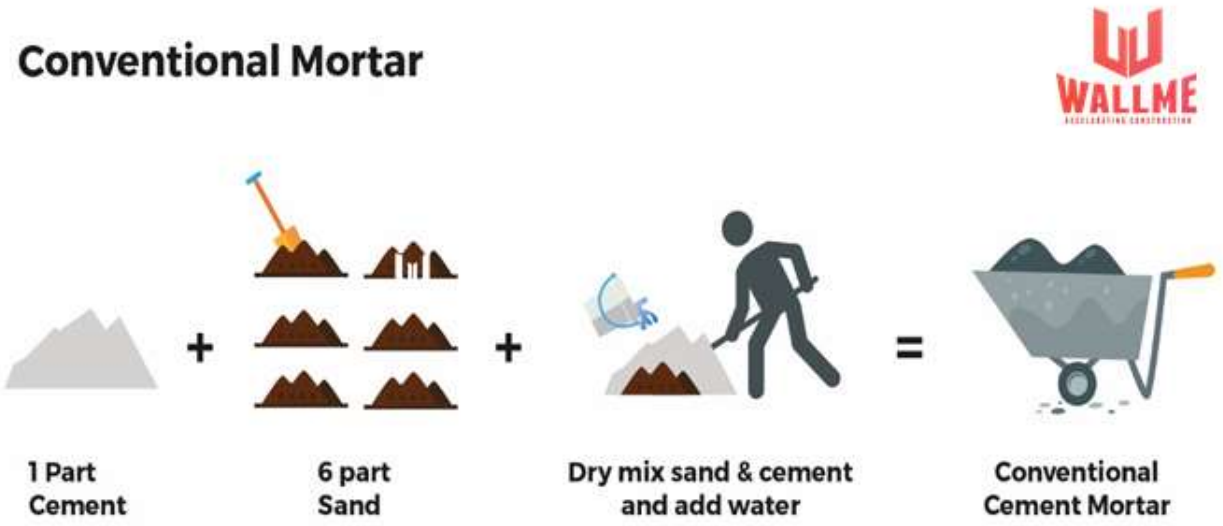
1. Conventional cement mortar (Sand & Cement)
2. Thin Bed Mortar (AAC Block Adhesive)

5.1 Conventional Cement Mortar (Sand & Cement)

Mortars based on mineral binders like lime, cement, or gypsum have been used for many years. These mortars have mainly been used for laying stones, brick, concrete block and AAC Blocks.

Ingredients: In this type of mortar**,** cement is mixed with sand before water is added**,** to create wet mortar for application.

Mortar Mix ratio: The optimum "Cement: Sand" ratio for **mortar mix should be 1:6**, do 'not use' rich mortar mix (1:4**),** as this will shrink and cause cracks in the wall. Preferably use PPC cement for best results**.**



Mortar Thickness: should be 10 mm with required water to avoid the moisture movement for AAC blocks masonry.

Pros:

- Raw material is highly available.
- Labor training is minimal

Cons:

- Curing of joints is necessary
- The 10 mm thickness could clause minor loss of thermal & acoustic insulation.
- Sand required.

5.2 Thin Bed Mortar (AAC Block Adhesive)

Thin Bed mortar is a new technology that offers an extremely thin-joint (~3 mm) alternative to the conventional mortar. Thin Bed mortar is factory-mixed mortar manufactured in as per predesigned chemical design, it is constituted by cement, graded sand and blended with polymers.

Even at ~3 mm thickness, it imparts high strength and water retention properties.

Ingredients: Thin Bed Mortar is prepared by various manufacturers in India (Wallme, myk, etc.), one just needs to add water to the mix before using it.

Mortar Mix ratio: The Thin Bed Mortar: Water ratio for **mortar mix should be 10kg: 6 liter** or as prescribed by the manufacturer. Mix should be done in clean buckets/vessels.

This Bed Mortar Mix Consistency: Thin Bed Mortar should have consistency, such that it flows freely through the teeth of the notched trowel and leaves the shape of the teeth on the mortar bed.

Mortar Thickness: In Thin Bed mortar, the laying of Wallme AAC Blocks requires only 3 mm to 5 mm thickness.

Pros:

- The consistency of the mix is constant and easy to mix, and can be easily applied with the right tools.
- Water curing is not required
- ~ 3 mm thickness mortar is applied.

Cons:

- Initial Labor training is required for mixing & laying of Thin bed mix.
- Thin Bed Mortar bags are available only with select dealers.

6. Laying/Joining AAC Blocks

If the **mason is new** to building AAC blocks, he/she **needs to be trained** on the best practices.

AAC blocks have to be laid carefully, and if not, there are increased chances of damage or cracks in the wall.

Masonry Laying Standard for Wallme AAC blocks: shall be in accordance with the recommendations of IS 6041 of 1985 and IS 1905 of 1987.

Step1: Cleaning Foundation: the foundation/beam needs to be chipped off with uneven cement deposits and dust cleaned with water.

Step 2: Damp Proof Course: needed for external walls where rainwater could bounce off ground/floor.

Step 3: Apply Thick Layer of Levelling Bed: for walls above ground floor, a layer of mortar (cement: sand-1:6) should be used before starting the first course of blocks; this is to level the foundation before the first course.

Step 4: Wet the block with a sponge: Each **block** needs to be made wet with a sponge on all sides of mortar contact surface**,** and place them one by one**, pressing** it firmly to have proper bond without any level difference and fill joints between the blocks by same mortar. (Do 'not' soak the blocks).

Step 5: AAC First course: Blocks should be laid true to level and plumb on a firm bed of mortar. Making sure that it is properly aligned, levelled and plumbed**,** as this may assist the mason in laying succeeding courses to obtain a straight and truly vertical wall.

Horizontal & Vertical Joints to be filled properly without gaps/cavities to avoid air entrap, the best way to do this is sliding of **the** block after placing on mortar surface

Mortar Thickness:

Conventional Mortar: Before laying AAC Blocks, apply 8 mm to 10 mm thick lean cement mortar uniformly over the block, and it requires the curing for the joints after laying.

Thin Bed mortar: apply only ~3 mm thick layer uniformly over the block.

Step 6: **Second and Subsequent Courses**: All loose particles and dust must be brushed from the top of the first course before applying mortar.

Blocks must be cut with saw or block cutter.

Step 7: Bond Beams:

Bond Beam (75 mm): To be laid after 5 courses of blocks (or) below windows.

Lintel Bond Beam (200 mm): To be laid above windows or doors.

Step 8: Beam Joint: Joint between final course & beam should be filled with cement mortar.

Dos:

- AAC wall laying pattern is only suitable for Stretcher course and not for Header course.

Don’ts

- The vertical joints shall not be in straight line, overlapping of blocks in structure course shall be minimum 250 mm over the bottom course.
- The mortar shall not be spread so much ahead of the actual laying of the blocks, as it tends to stiffen and lose its plasticity, thereby resulting in poor adhesion and bond.

7. Window & Door Installations

7.1 Installation steps

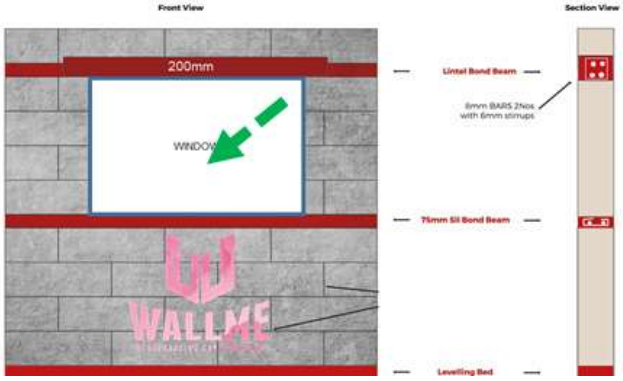
Step1 Fixing MS Clamp: Fix adequate (2/3) number of clamps on each side of Window or Door frame. Clamp must be fixed to **the** wooden frame by screw, as nails could be loosened after some time and your door frame will be coming out from **the** wall. So, try to fix clamps with **a** screw.

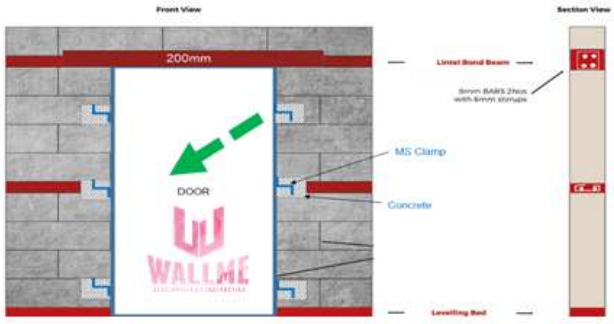
Step 2 Fixing door or Window in the opening of the wall: Cut the AAC wall on both sides of the door or window at the location where the clamps are planned.

Step 3 Aligning door frame with wall: The purpose of aligning door frame is when you plaster on wall**;** plaster surface and door frame will be **at the** same level. Before permanently fixing the door with cement-concrete, finally**,** check the alignment and top-level of **the** door frame.

Step 4 Fill Concrete: fill the MS clamp gaps & gaps all around **the** door frame with cement concrete to bond with **the** masonry wall.

Step 5 Curing: Cure the concreting portion for **a** minimum of 7 days





7.2 Other considerations

- Cracks in partition walls may occur at the corners of door frames and window frames at lintel level or sill level. It may, therefore, be desirable to provide **a chicken mesh** reinforced before plastering.

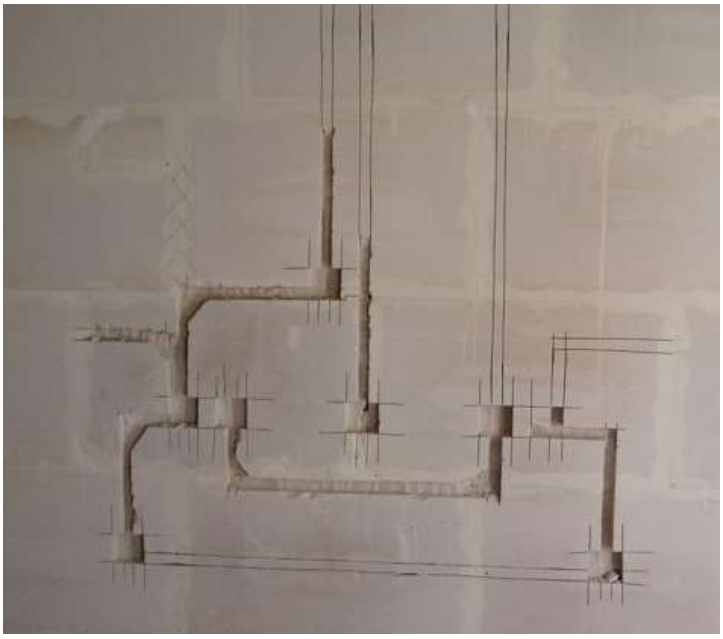
8. Electrical & Plumbing Installation in AAC

Electrical and Plumbing conduits within an AAC wall should be placed in the routed groove.

Step1: Mark the groove Route with a pencil or marker.

Step 2: Use an angle grinder with concrete blade to cut along the line markings

Step 3: Chip off the groove with hammer & chisel



AAC Wall grooved for electrical conduits & boxes.

Step 4: Insert the conduit & electrical boxes

Electrical conduits & boxes placed in AAC wall.

Step 5: Fill the groove with compact mortar and apply wire mesh

Plumbing conduits & boxes placed in AAC wall.

When laying grooves, adequate care must be taken to ensure the structural integrity of the AAC blocks is maintained. If conventional cement mortar is used for joint, please start electrical after a minimum of 10days curing.

9.Plastering

AAC walls should be plastered on both sides of the wall, i.e., internal and external side of the wall.

9.1 Preparing wall surface for plastering

Step 1: Clean the surface of dust, fungus, oil, etc.

Step 2: A smooth surface may be roughened by wire brushing, if it is not hard; or by hacking or bush hammering.

Step 3: Evenness: the background should be even, in order to avoid variation in thickness of plaster.

Step 4: Do not soak the wall before plastering. The wall shall be moistened evenly before applying the plaster. A fog spray is recommended for this purpose

9.2 Cement Mortar for plastering

It is recommended to use cement mortar 1:6 for internal & external plastering works, and preferably use PPC cement for masonry and plastering works to minimize shrinkage cracks.

9.3 Internal Plastering

Plastering thickness should be **10 mm for internal walls**. Avoid plastering more than 10-12 mm thick, as it can result in cracks.

9.4 External

External plastering has to be carried out in two coats; applying SBR coating with sand on block surface will enhance the bonding and minimize thickness of plastering

Plastering thickness can be **12-15 mm for external** walls, based on external forces acting on the wall.

10. Load Installation Methods

Load installation methods are based on their weights of the application.

10.1 Light Loads (up to 15 Kgs)

Application: For light loads like electrical fittings, small mirrors, etc.

Solution: 75 mm (3”) wooden pegs should be used.

a. Drill a hole, insert the plugs deep inside before inserting the screw.

10.2 Medium Loads (up to 50 Kgs)

Application: For Medium loads like large mirrors, wash basins, water heater, etc.

Solution: Sleeve anchors – 100 mm (4”) length of (8 mm, 10 mm,12 mm) Diameter based on load should be used,

10.3 Heavy Loads (up to 100 Kgs)

Application: For Heavy loads like Water closet, etc.

Solution: Rack Bolt (light or heavy) should be used, Drill a hole, insert the rack bold & pack it with concrete. After 7 days, the fitting could be installed.

If the block thickness is 100 mm, it is recommended to build a ledge wall to support heavy loads.

11. Common Challenges with AAC Masonry

Even the most structurally sound homes may experience cracks in the walls over time. So what causes cracks in your walls, and how do you know when they need to be repaired?

AAC blocks are wire cut from a large billet that is completely cured at the plant, so there is **no** curing shrinkage, but moisture shrinkage will depend on the exposure; hence, it's important the Mason is made aware of the construction practice. Below are the various types of cracks that occur in any wall materials(common for clay bricks, concrete blocks etc) constructions.

11.1 Horizontal Cracks in Walls

Horizontal cracking of any kind is an indication of structural failure caused possibly due to uneven load distribution.

Solution: following care must be taken

a. The levelling bed made before the first course of AAC blocks should be zero level.

b. Provision for nominal beams to ensure load is evenly distributed, and cracks are minimized.

11.2 Vertical Cracks in Walls

Vertical cracks are normally caused by **simple material shrinkage**.

Most vertical cracks occur a short time after construction due to moisture. The only vertical cracks to be concerned about are those that are wider at the bottom than at the top. Also, vertical cracks in combination with horizontal cracking indicate a structural issue to be reviewed by the engineer.

11.3 Step Cracks

Step cracks normally form in corners. They are caused by simple concrete shrinkage and typically form in pairs. All step cracks are of little concern, except when found in combination with horizontal cracks. If the step crack is moving, or wider at the bottom than at the top, it can be an indication of settlement.

11.4 Shear Cracks

Horizontal cracking at the bottom course of block is an indication of a wall failure.

Excessive lateral earth pressure is the main cause of sheer cracks, but water and age also add to its severity.

Solution: AAC Blocks should not be used below earth/plinth level.

11.5 Fittings falling off

Based on the Fitting load type (light/medium/heavy), appropriate installation technique has not been used, and hence, the loads could be falling off.

Solution: Please refer to section 10 given above for appropriate load installation method.

11.6 Thermal & Acoustic Insulation properties impacted

Cause: Thicker Mortar joints result in reduced thermal & acoustic insulation.

Solution: Use of thin bed mortar (AAC adhesive or mortar) would reduce the joint thickness and help in improved thermal & acoustic insulation.

11.7 Uneven course levels

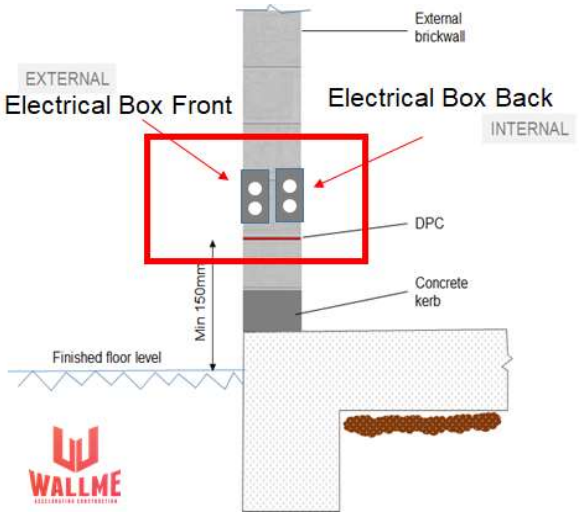
Cause: AAC Walls built on a wet surface (or) more than 6 layers or 1.2 meters built in a single day.

Solution:

- Ensure the surface does not have excess water before starting the levelling course.
- Maximum height built in a single day should not be more than 6 layers or 1.2 meters.

11.8 Other Precautions

- Don’t make the holes on block masonry for scaffolding supports
- Don’t hammer the block masonry for electrical or hydro sanitary pipes or ducts, angle grinders must be used please refer to tools section.
- Don’t chase the blocks back to back for lesser thickness blocks.



12. Basic Construction Tools for AAC

You've heard it many times, having the right tools makes any job easier. Before you start, there are some basic tools and equipment you'll need. These tools may vary depending on the availability, but generally, the following tools are required when building a AAC masonry wall:

12.1 Mortar Mixing Tools

HANDHELD ELECTRIC CEMENT MIXER: 	for mixing Thin Bed Mortar with water.
SPADE or SHOVEL: 	For mixing conventional cement mortar.

12.2 Tools for applying mortar (Conventional & Thin Bed Mortar)

FLAT V-NOTCH TROWEL: 	for levelling Thin Bed Mortar or ensuring that a sufficient amount of glue is applied at once while bricking AAC walls.

PUTTY BLADE: 	for filling gaps between blocks
MASON TROWEL 	for applying conventional Mortar
MASON CEMENT PLAINER 	: For leveling of mortar.
SPONGE 	For wetting the AAC blocks before installation

12.3 Block Alignment Tools

6 FEET ALUMINUM LEVEL:	for check top level alignment

	
RUBBER MALLET: 	For adjusting the alignment of AAC blocks as well as their integration with the glue. It has a special shape and weight.
PLUMB: 	for vertical alignment
THREAD: 	Used for horizontal alignment by tying at the corners

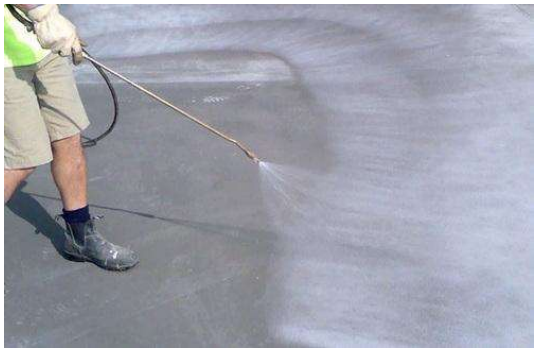
12.4 AAC Block Cutting Tools

BLOCK CUTTER: 	for cutting blocks to size
TIPPED HAND SAW: 	for cutting blocks to size
BLOCK CUTTER: 	For cutting new blocks or broken blocks to size. Reduces waste.

12.5 Electrical & Plumbing Groove cutting Tools

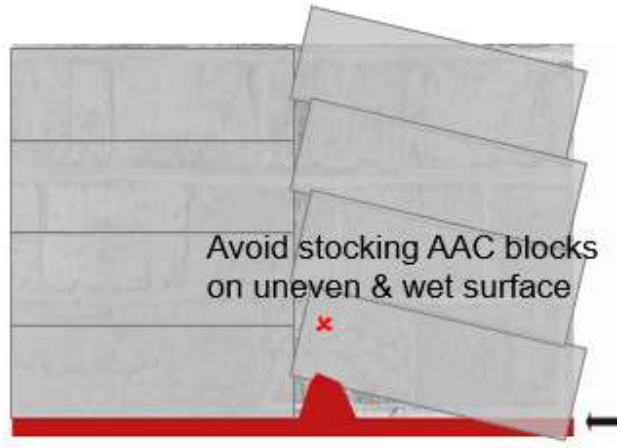
ANGLE GRINDER: 	for cutting grooves in AAC blocks

12.6 Curing Tools(for conventional joints)



Water curing for joints is preferred to be done with manual or mechanical sprayers to avoid excessive dampness.

12.7 Stacking Care: Stock AAC Blocks on a flat & dry surface



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