

Mortar Laying Machine

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Abstract – As the name suggest the approach of this machine and the research paper is to make the process of laying the mortar over the bricks easier, economical, resourceful, systematic, energy saving and time efficient. Brick laying process being the most crucial step in the construction of buildings needs more labor power, materials and time, if this process is somehow done with more efficiency and less time it could approx. save half of the time consumed for building the bricks walls. For an average brick layer can efficiently lay about 1000 bricks in a day at ideal conditions, favorable temperature and without any bends or change in laying patterns. But at moderate conditions with moderate to complex designs the brick layer can lay up to 600 to 700 bricks a day. With this being the conventional pattern and figures for laying of the bricks with the mortar laying machine the bricklayer has to just set the bricks over the previous layer and then use the mortar laying machine to have a flat and smooth layer of the mortar over the current layer which will act a bed for next layer. Also, the pressure plate provided will help in filling the gaps between the bricks. With some more modification this device can also help in plastering and rendering work of the walls, the reason behind to have this machine is to reduce the time for laying the bricks, what the brick layer does is he spread the mortar measures the thickness by rope gauges and then after having a perfect horizontal layer he then places one brick, covers it with mortar and then places the next brick, and so this process is very much time consuming as one has to wait for first brick to be in line and covered with mortar before the second brick is placed. In this we can change the conventional brick placing techniques and lay the brick with specific gaps (maintained with gap spacer) and then use the machine all over the layer to cover it with mortar and fill in the gaps too. Further in this you'll find the design of the machine and also how the working goes.

Key Words: Energy saving, time efficient. brick laying, 1000 bricks, mortar laying machine, filling the gaps.

1.INTRODUCTION:

This research paper will surely help in reshaping the conventional approach we have towards the brick masonry walls. The mortar laying machine can be used to instead of the spreading the mortar with trowel not only this it can save time and can help in spreading the mortar over the entire brick layer surface. Many new types of brick are entering the market in order to make use of sustainable materials which cause less pollution and which last for a longer period of time. So, taking this point into consideration the machine is provided with 45-degree adjustable angle plate which moves up and down according to the desired thickness of the mortar which is required. Also, the pressure plate provided can guide the user to apply the required pressure as and when required depending upon the consistency of the mortar, more the viscosity of the mortar more pressure needs to be applied till the vertical slits between the bricks are completely filled with mortar and vice versa for the mortar with less viscosity. Also, one hasn't to worry about thickness as the 45-degree adjustable plate provided at the front of the machine helps in maintaining the desired thickness of the mortar. With these modifications suitable for the mortar, you can also adjust the size of the machine according to the brick thickness. For 4-inch thickness and also for 6-inch thickness bricks. With the adjustable screws provided you can adjust the thickness of the mortar being laid on the bricks. The screws are provided in the front as well as the back in order to have uniform movement of the machine over the brick layer. With three of the sides made with same material the fourth face (one of the side-face) is made of the transparent fabricated material in order to have check of the mortar in the machine. With this being said the refilling of the machine needs not to be headache you can just refill the machine with mortar while keeping the machine on the brick layer itself.

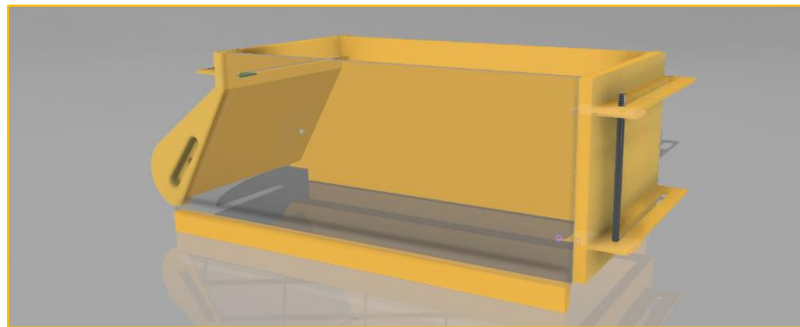


1.1 Size Shape and Dimension:

Size and shape are as shown in the figure with the 45-degree slant slope at the commencing end of the machine, this is provided to control the thickness of the mortar being spread onto the surface, along with this the side running edges are provided so that the machine fits onto the brick surface this help in coating the face bricks with mortar and the adjustable faces make it possible to control the thickness of this mortar too.

Dimensions → **Length:** 30 to 45 cm; **Breadth:** 10 to 15 cm; **Height:** 20 to 30 cm; **Acrylic & GI Sheet thickness:** 5 mm.

The dimensions can be exceeded beyond this, but then the workability will be affected significantly thereby scratching out one of the advantages of the system.



1.2 Material:

The use of the material made for the formation of the machine depends upon the type of the mortar to be used in the system. Also, we need to make sure that concrete does not stick to the machine surface if so then the shelf life of the machine will be affected.

Concrete will naturally bond to other materials. To prevent concrete from sticking to these materials, you need to treat them with a release agent to keep the concrete from sticking by forming a thin lubricant film over the material. When the concrete is dry, it's easy to separate.

A few different kinds of release agent exist, including:

- **Oil-based:** Chemical blends, like linseed oil, mineral oil and paraffin, make the surface stick-resistant.
- **Water-based:** This variety is made from plant-based materials, like vegetable oils, and won't discolour the concrete surface.
- **Reactive:** The fatty acids in this substance have a chemical reaction with the alkalinity in the concrete to prevent sticking and keep the concrete unstained.

What Will Concrete Stick To?

Concrete does adhere to wood, though the connection is often not ideal. Many builders use wood panels as forms that concrete is poured into to create a foundation or floor. After the concrete is cured and dry, the wood is removed.

If you don't want concrete to stick to wood, you would need to use a release agent to make removal easier. Lumber mills often pretreat their wood with oil-based blends to make it stick-resistant. If your wood has not already been treated, you may have to purchase a commercial agent and apply it yourself.

Concrete also sticks very well to plastic. Treating plastic with a release agent prior to coming in contact with concrete is the best way to ensure your plastic buckets and tools remain free of dry concrete.

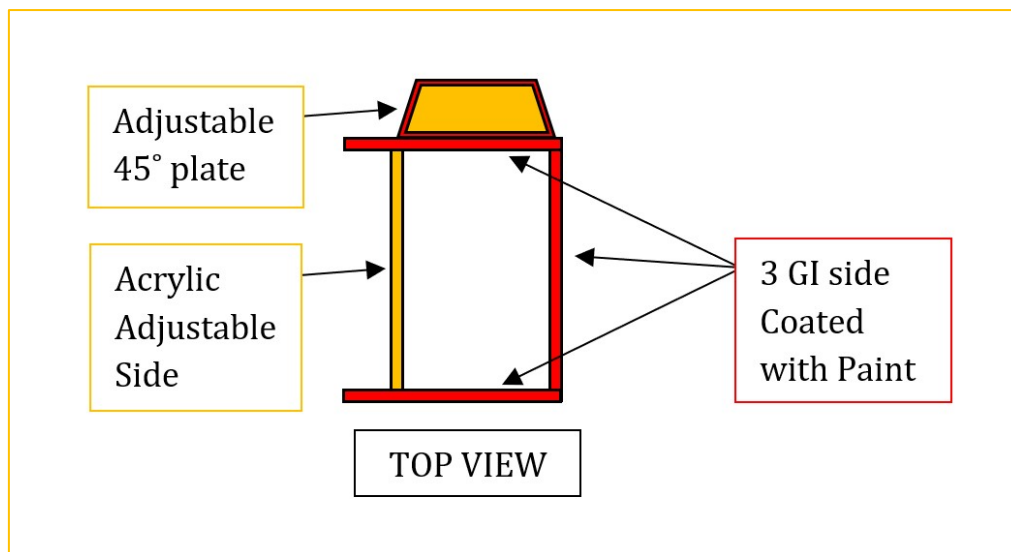
What Will Concrete Not Stick To?

Concrete does not adhere to:

- Concrete – Dried concrete doesn't have any natural bonding agents, so in order to get wet concrete to bond to existing concrete, a bonding agent will need to be used.
- Molds – Most concrete molds are made from urethane rubbers, which are designed to be resistant to concrete bonding.
- Paint – Paint is another material that has no natural bonding agents, so concrete generally won't stick to it very well.
- Oil – Oil or oiled surfaces are often used to make the surface resistant to concrete bonding.
- Glue
- Mortar

To promote adhesion, you'll have to add the bonding agent yourself to get the concrete to work properly. If you're repairing existing concrete, you'll need to get the concrete to bind to these materials so that the repair lasts as long as possible.

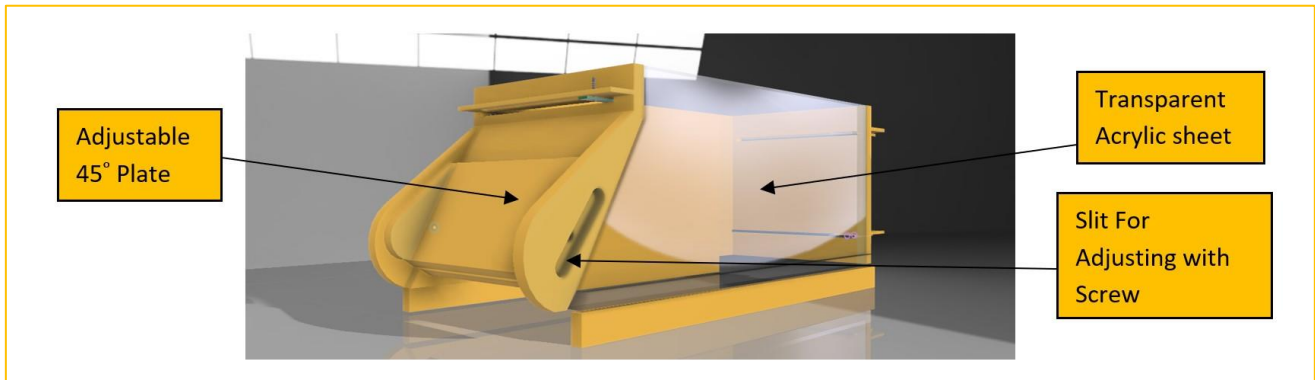
So, in order to deal with this problem, the three sides as shown in the figure Made of GI (Galvanized Iron) can be coated with water proof paint, and to the acrylic fourth side transparent glass primer can be coated in order to avoid the sticking of the mortar to the machine surface from inside



1.3 COMPONENTS:

1. 3-Sided GI sheet (Fixed).
2. One side acrylic sheet (Movable).
3. Adjustable 45-degree commencer.
4. Screw heads for customized working.
5. Pressure plate A) Used for applying back pressure to mortar.

B) Act as base plate to keep the mortar in the machine when machine is not in use.



2. ADVANTAGES:

1. On an average it boosts the building speed by 45 to 50 %.
2. It reduces the wastage of mortar by 20 to 30 % as the spillage of the mortar won't take place due to the proper placing provided for the mortar.
3. No use of rope gauge is necessary as the brick is placed with uniform thickness.
4. No need to align the brick, as the machine moves forward the back portion and the plates align the brick automatically.
5. Less number of labors are needed.
6. Economy is achieved while building.
7. Time spend for the brick wall erection is reduced by 50 %.
8. Plastering and rendering of the edges of the brick is done then and there itself.
9. As the laying of the mortar is fast there is no bonding issue between mortar making it more durable.
10. Pressure plates allows one to fill the spaces between the bricks.

DISADVANTAGES:

1. Last 20 to 30 cm of the brick layer mortaring needs to be done manually.
2. Care needs to be taken while removing the system from the bricks.
3. Wet concrete can lead into removal of water from edges.
4. Beyond 25 cm from top the mortaring can't be done as the machine won't fit into the space.

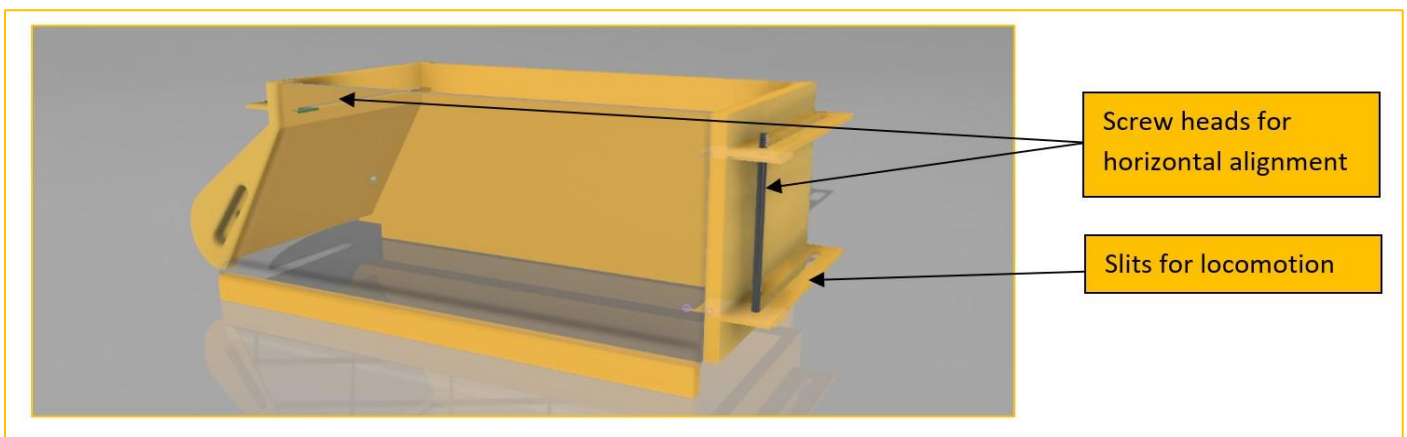
PRECAUTIONS:

1. Placing of the system onto the surface of brick requires smooth process or it may damage the brick alignment and the project for the whole.
2. Avoid using too wet mortar for mortaring the bricks, might result into the leaking of water through edges.
3. Make sure to use the pressure plate carefully to much application of force may result into removal of mortar from the gaps.
4. Using high viscous mortar is advisable.

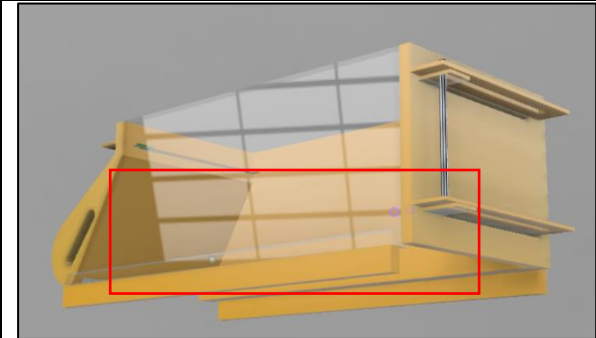
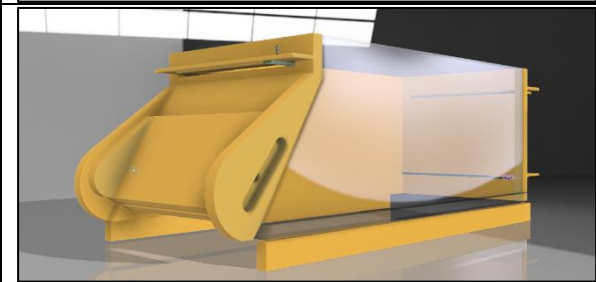
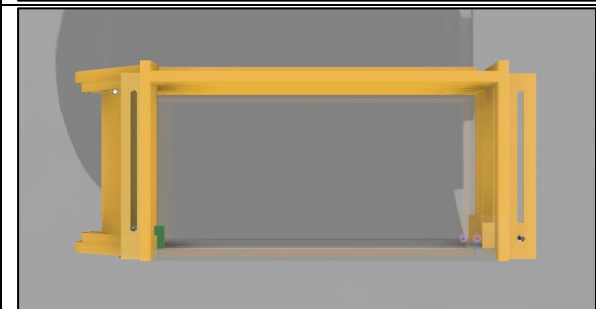
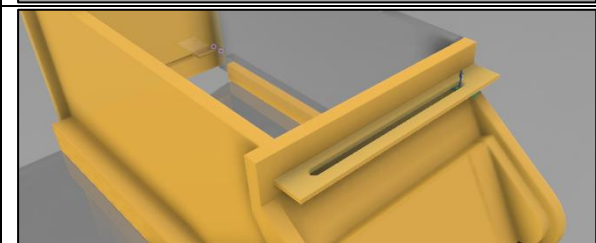
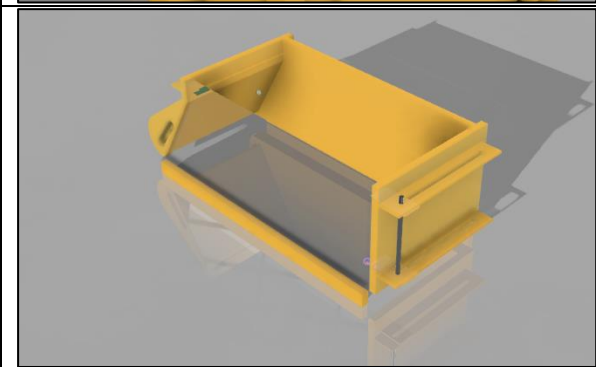
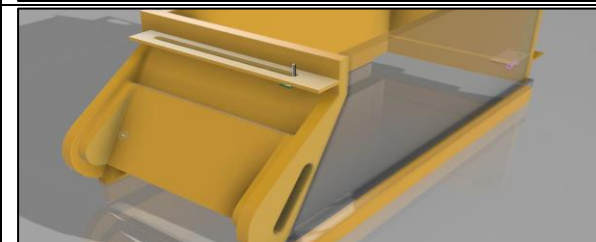
5. Removing the mortar after the work is done, it increases the life of the system in whole.
6. Scrape the edges to avoid mortar settling which might affect the performance of the system.
7. Don't fill the mortar to the mouth of the system, increased self-weight may cause the system to be heavy and can cause undesired layering.
8. Make sure to fasten the bolts before operating the system.

DIRECTIONS OF USE:

1. Firstly, adjust the size of the machine according to the size of the brick on which the mortar is being laid.
2. Then make sure the pressure plate is at the base of the system then pour the mortar into the system this pressure plate at the base will act as base till the machine is placed in the right place.
3. After that place the machine on the top of the brick which is to be mortared, then remove the pressure plate from the bottom by simply sliding the plate from the back, slits for the same are provided in the system.
4. The mortar will then reach the surface of the brick now use the same pressure plate from the top, the size of the pressure plate is same as that of the box in which the mortar is filled.
5. Press the mortar with the pressure plate and then make sure to pull the machine further, the end of the machine will align the bricks and the process of mortaring will be continued.
6. After the mortaring is done, make sure to fit the pressure plate back to the base to avoid further loss of the mortar due to removal of the system from the bricks.
7. After the machine is used for the day make sure to keep the surfaces of all four sides clean to avoid the accumulation of the mortar into the system, which may further decrease the loading capacity of the system, affecting the efficiency of the system.
8. Timely oiling of the screw heads is also necessary to avoid the jamming of the plates to each other.



Perks	Traditional method	Mortar laying machine
1. Time (required)	More	Less (half approx.)
2. Labor (required)	More	Less (30% reduced)
3. Economy (used)	More	Less (25 to 30% is achieved)
4. Energy (consumed)	More	Less (30 to 40% is saved)
5. Wastage of material	More	Less (20 to 35% is procured)
6. Quality	Less	More

	<p>1. This is the acrylic third side of the machine; the lowest part of the machine faces the highest amount of force when mortar is filled in the machine. The red block shows the area which is most affected due to the weight of the mortar filled into the machine.</p>
	<p>2. This side you can see the commencing side of the machine, the 45-degree adjustable span is seen in the figure, this is used for adjusting the thickness of the mortar. Screw and slits are provided to adjust the thickness as and when required.</p>
	<p>3. This view shows the top view of the system, two slits are seen in the figure, this allows the lateral adjustment of the system, the system can be used for 4-inch, 6-inch & 9-inch thickness of bricks. Both sides are provided with marks and measurements to align the 4th side of the machine in proper level.</p>
	<p>5. This shows the groove provided along with the fitting provided to fasten the system.</p>
	<p>6. The spaces available right near the grooves provided should be used by the user to hold the machine, providing separate handles will only complicate the working, and using the grooves for handles are best suited as any other location won't be that optimum, and will only result into more energy application for moving the system.</p>
	<p>7. One can change this 45-degree plate, as many brick requires different types of mortar, and some of them require their mortar in zig zag mounts so the different shape and sizes of teeth can be used in this 45-degree angle plates. As the requirement is very much varied these days, many buildings make use of AAC block for exterior walls and normal brick for interior walls.</p>

3. CONCLUSIONS:

It can be concluded from this that, use of this machine will not only save money, but also the top-quality mortaring can be done with the help of this machine. Making use of a smaller number of labors, and increasing the number of bricks being laid in a day and requiring almost half the time to lay the bricks than the conventional system, this machine can bring revolution with some more modifications in the building industry where still traditional method is more prevalent. Making use of less mortar and causing less wastage of mortar while laying the mortar over brick this machine allows the user to have an approach towards the sustainable growth. With some of the directions given for the use of the machine, one can make the most out of this machine. Although there are some shortcomings in the system, but with time many of them can be solved with modern outlook and open approach to this topic. Never the less this can change the whole perspective of building the walls, with many more mortar spraying machines available in the market, when both combined together can boost the performance tremendously.

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