



# KAMAAC

PROJECTS & ENGINEERING PVT LTD

*FROM CONCEPT TO STABILIZATION*

A JOURNEY FROM BRICKS TO BLOCKS

# ABOUT US

KMAAC was established in the year ---- & based in Vadodara by two friends turned partners, Manav Gupta & Manash Paul with their vast experience & expertise in the field of engineering, building material technologies & related products.

We as a firm with over – years of establishment deal with new generation innovative products in the filed of building material technologies such as AAC block Plant, AAC block Jointing Mortar Plant, Wall Putty Plant, Floor & Roof Tiles Plant & Solid Eco - Green Block Plant. The firm deals with turnkey projects from designing to execution of the plant products that we offer, from conceptualizing to design of the plant & from supplying to installation of the plant machines & equipments with complete precision & supervision at every level.

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# THE FOUNDATION

picture

Mr. Manav Gupta having cleared the engineering from ... in the year ... & started working with ... as an trainee engineer & later down the years having worked with Biltech, Seimens & Escorts brings his vast and skill full experience of more than 23 years in AAC plant projects & operation & has an expertise in optimum automation for the process smoothness & man power reduction.

Manav Gupta  
(PARTNER & DIRECTOR)

picture

Mr. Manash Paul having cleared the engineering from ... in the year ... & started working with ... as a trainee engineer & later down the years having worked with L&T Projects, Gulf & Biltech brings his vast and skill full experience of more than 20 years in AAC plant projects & operation & has an expertise in Layout & equipment design & process.

Manash Paul  
(PARTNER & DIRECTOR)



# OUR PRODUCTS

1	AAC BLOCK PLANT
2	AAC BLCK JOINTING MORTAR PLANT
3	WALL PUTTY PLANT
4	FLOOR & ROOF TILES PLANT
5	SOLID ECO GREEN BLOCK PLANT



# CLIENT PORTFOLIO

## ALLAWA AAC PVT LTD

Allawa, Sri Lanka  
( 110 M3 / Day )

## AEROCON BUILDWELL PVT LTD

Ujjain, Madhya Pradesh  
( 500 M3 / Day )

## SINHA ENGICON PVT LTD

Patna, Bihar  
( 240 M3 / Day )

## BILTECH BUILDING ELEMENTS LTD

Bhigwan  
( 330 M3 / Day )

## BRICK SHELL AAC BLOCKS PVT LTD

Udalpur, Gujarat  
( 500 M3 / Day )

## MARDA INDUSTRIES PVT LTD

Meghalaya  
( 480 M3 / Day )

## SYNNOVE BUILDCON

Tundav, Gujarat  
( 110 M3 / Day )

## AUSTIN AAC INFRATECH

Guwahati  
( 400 M3 / Day )

## ANANDALOKE

Siligudi, West Bengal  
( 50 M3 / Day )

## BILTECH BUILDING ELEMENTS LTD

Tumkur,  
Expansion ( 250 M3 / Day )

## OM ECOLITES AAC BLOCK

Ranchi, Jharkhand  
( 100 M3 / Day )

## GREENLIGHT AAC BLOCKS

Godhra, Gujarat  
( 75 M3 / Day )

## GH BUILDING

Chittoor, Andhra Pradesh  
( 50 M3 / Day )

## SUPER ENTERPRISE

Dabhoi , Gujarat  
( 50 M3 / Day )

## AEROKON INFRAVENTURES

Jabalpur, Madhya Pradesh  
( 500 M3 / Day )

## RAHAT BUILDING INDUSTRIES

Godhra, Gujarat  
( 160 M3 / Day )

## PD SAVERA LLP

Rangia, Assam  
Mortar Plant (40 Tons / Day)

## NABAMLITE BRICKSUDYOG LLP

Arunachal Pradesh  
( 120 M3 / Day )



# ❖ AAC BLOCK PLANT

AAC was first developed in mid 1923 in Sweden. It is also known as Autoclaved Cellular Concrete (ACC) or Autoclaved Lightweight Concrete (ALC). Production process of AAC is fairly simple. It has become one of the most used building materials in Europe and is rapidly growing in many other countries around the world. It is made with a mixture of fly ash, lime, cement, gypsum, an aeration agent and water. Aeration process, imparts it as a cellular light weight structure. AAC products are precast in various sizes and provides structural resistance, insulation, and fire resistance.

Use of Autoclaved Aerated Concrete (AAC) blocks in construction industry in India offers interesting proposition for various segments in the society. when AAC is blended and casted, a few compound responses occur that give AAC its light weight and warm properties. The hydrogen gas froths and copies the volume of the crude blend making gas rises to 3mm ( $\frac{1}{8}$  inch) in distance across. Toward the end of the frothing procedure, the hydrogen escapes into the air and is supplanted via air. For a project developer it means faster and lower cost construction. For environmentally conscious it means eco-friendly products and for those who occupy buildings built with AAC blocks it means better safety and lower energy costs for cooling or heating.

Primary raw material for AAC is fly ash. Thousands of tones of fly ash is generated by thermal power plants everyday and its disposal is a cause of concern. Moreover, using fly ash does not harm the environment at all. In fact using fly ash takes care of issues related to disposal of fly ash. Therefore by using fly ash to produce AAC products provides a sustainable, economic and environment friendly option. At the end it all translates to a better world for future generations.

It is then cut into blocks and placed in autoclave chamber for 12 hours. During this steam pressure hardening process, when the temperature reaches 190° Celsius and the pressure reaches 8 to 12 bars, gives AAC its high strength and other unique properties, AAC blocks are not considered fired brick but a lightweight concrete masonry unit.



# THE PRODUCTION PROCESS

THE PRODUCTION PROCESS IS DIVIDED INTO 6 STAGES :

STAGE 1      PREPARATION OF RAW MATERIAL

STAGE 2      DOSING & MIXING

STAGE 3      CASTING, RISING & PRE-CURING

STAGE 4      DE-MOLDING & CUTTING

STAGE 5      AUTOCLAVING

STAGE 6      STORAGE & PACKING LINE



# THE PRODUCTION PROCESS

## ❖ STAGE 1 - PREPARATION OF RAW MATERIAL

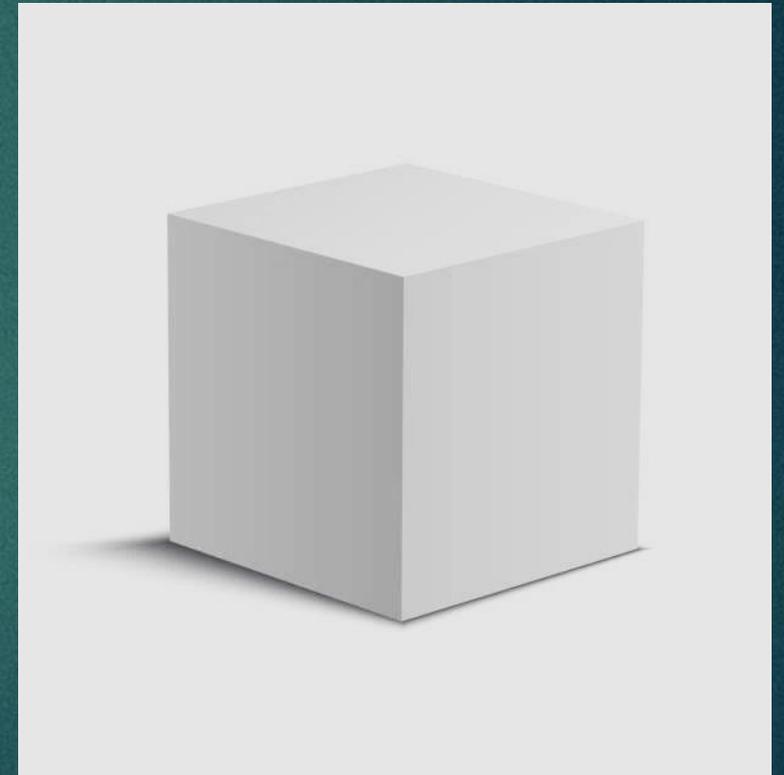
- **Fly ash** - Fly ash is generated in coal-fired thermal power stations and is a major industrial waste. In the past 60 years, over 140 such coal-fired thermal power stations in India have dumped millions and millions of tons of fly ash. Even though fly ash is perceived as waste, it has a magic ingredient called reactive silica in it. One of the principal constituents, about 75 %, of aerated concrete in India is fly ash. However, we must remember that all fly ash is not the same fly ash. The high carbon present in the fly ash is detrimental to the quality of aerated concrete. The fly ash obtained from burning at higher temperatures is more useful. Hence this is the first filter for the use of fly ash in AAC. Fly ash is mixed with water to form a fly ash slurry. The slurry thus formed is mixed with other ingredients like lime powder, cement, gypsum and aluminum powder as per the quantities consistent with the recipe.
- **Quick Lime Powder** - Lime powder which aids strength development as well as helps in the aeration effect is another important ingredient of these blocks. Lime powder once procured is stored in a silo fabricated from mild steel (MS).
- **Cement** - For the manufacturing of AAC blocks, 53-grade Ordinary Portland Cement (OPC) from a reputed manufacturer is required. Cement is procured in bags or bulkers and is also stored in a silo fabricated from mild steel (MS).
- **Gypsum** - Industrial Gypsum procured from the market in powder form is stored in bags.
- **Aluminum powder/paste** - Aluminum powder/paste is easily available from various manufacturers. A very small quantity of Aluminum powder/paste is required to be added to the mixture which is usually weighed manually and added to the mixing unit.



# THE PRODUCTION PROCESS

- The proportions of the raw materials required for making 1 Meter cube of AAC block are as follows :

RAW MATERIAL	QUANTITY (KG)	PERCENTAGE
FLYASH / POND ASH / SAND	440	73.3 %
CEMENT	100	16.7 %
LIME	50	8.3 %
GYPSUM/POP	10	1.7 %
TOTAL	600	100 %



NOTE : Aluminum powder & other chemicals are used in very minute quantities & varies from 1-2 kg/m<sup>3</sup>

# THE PRODUCTION PROCESS

## ❖ STAGE 2 - DOSING & MIXING

- After the raw material is prepared, the next step is dosing and mixing which defines the quality of the final products. It is crucial to maintain the ratio of all ingredients as per the requirement to ensure consistent quality of production. Fly ash is used in a slurry form by mixing it with water in a proportion such that the slurry weighs 1.48 kg/liter and mixed with lime powder and cement which are weighed on load cells with a control system and then discharged into the mixing drum. Steam might also be fed to the unit to maintain the temperature in the range of 40-42°C.

## ❖ STAGE 3 - CASTING, RISING & PRE-CURING

- AAC blocks manufacturing process involves casting, rising, and pre-curing. The ready mix is poured into the molds which vary in size as per the capacity of the plant. It is called the casting of molds. Before casting, molds are coated with a thin layer of mold oil to ensure that the green cake does not stick to the molds. Aluminum reacts with Calcium Hydroxide and water to form Hydrogen gas which releases millions of tiny Hydrogen bubbles. This leads to the formation of tiny unconnected cells causing the slurry mix to expand which may be twice its original volume. The size of these bubbles is usually 2-5mm. These are the reason behind the most popular properties - lightweight and insulation, of AAC blocks. Once the rising process is over, the green cake is allowed to settle and cure for some time. The time required for rising and pre-curing is around 120 minutes. Rising depends on raw material mix and weather conditions which is a major factor affecting the rising process. Hence, provision is made to maintain a constant temperature in the pre-curing area if needed. After ensuring that the hardness is within a range of 150 to 170 mm at the end of the pre-curing process, cakes are sent for wire cutting.



# THE PRODUCTION PROCESS

## ❖ STAGE 4 - DEMOULDING & CUTTING

- Once the green cake has achieved cutting strength, it is ready to be demolded and cut as per requirements. Cutting machine is used for cutting the cake. A horizontal cutting takes place in the first stage, while a vertical cutting in the second stage. The Length & the width of the blocks are fixed but the thickness can vary from (50 - 300 mm) i.e. 600 x 200 x (50-300) mm. Steel wires that are mounted on oscillating heads are used for cutting through the green cake.

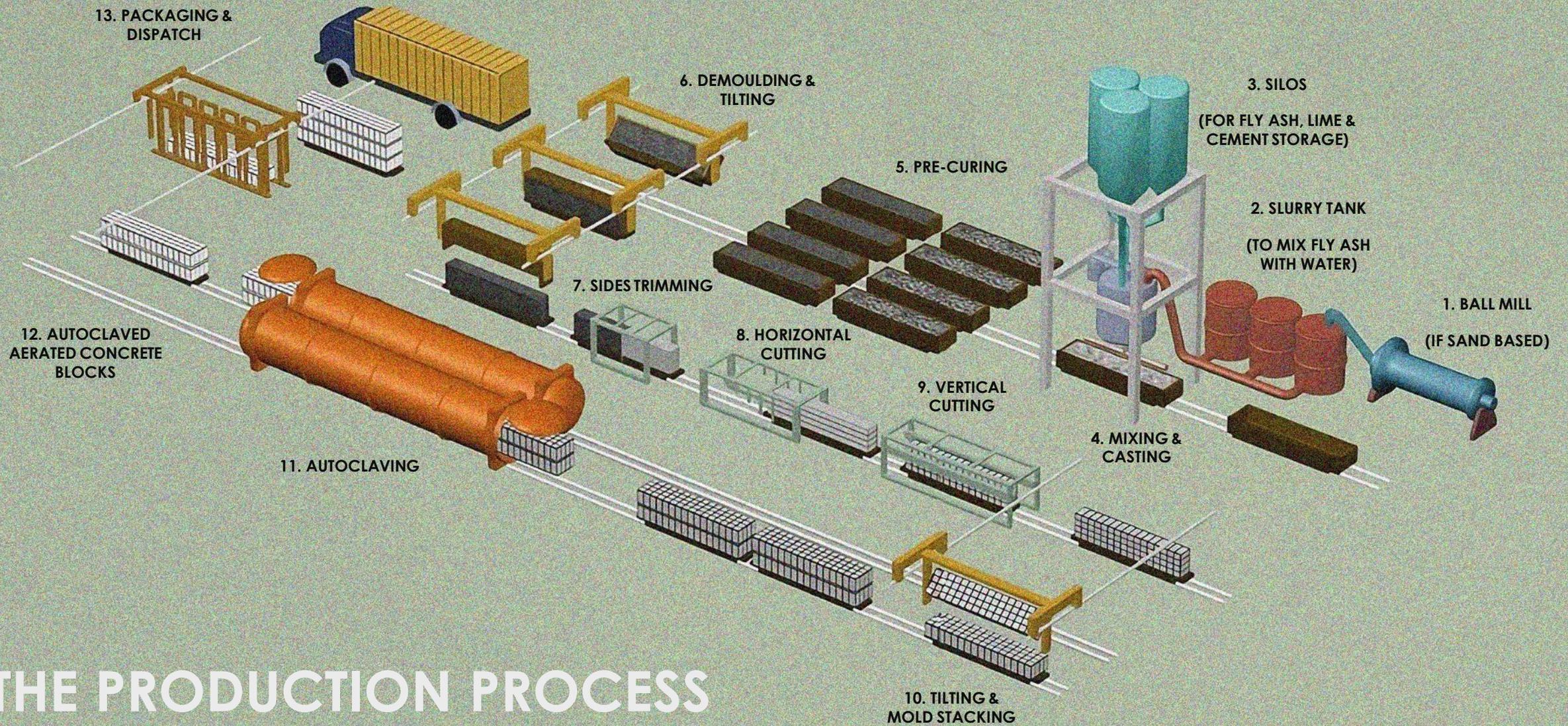
## ❖ STAGE 5 - AUTOCLAVING

- The cut cakes are then sent to the autoclave for a high temperature and high-pressure steam curing. The temperature is maintained at 195°C and a pressure of 12 bars for the steam curing. The time cycle is 12 hours after which the blocks achieve their required strength and are sent to the storage & packing line.

## ❖ STAGE 6 - STORAGE & PACKING LINE

- After autoclaving, the hardened cakes are sent to the storage & packing line. Here they are loaded in the trucks with a robotic grabber crane and dispatched to the required sites.



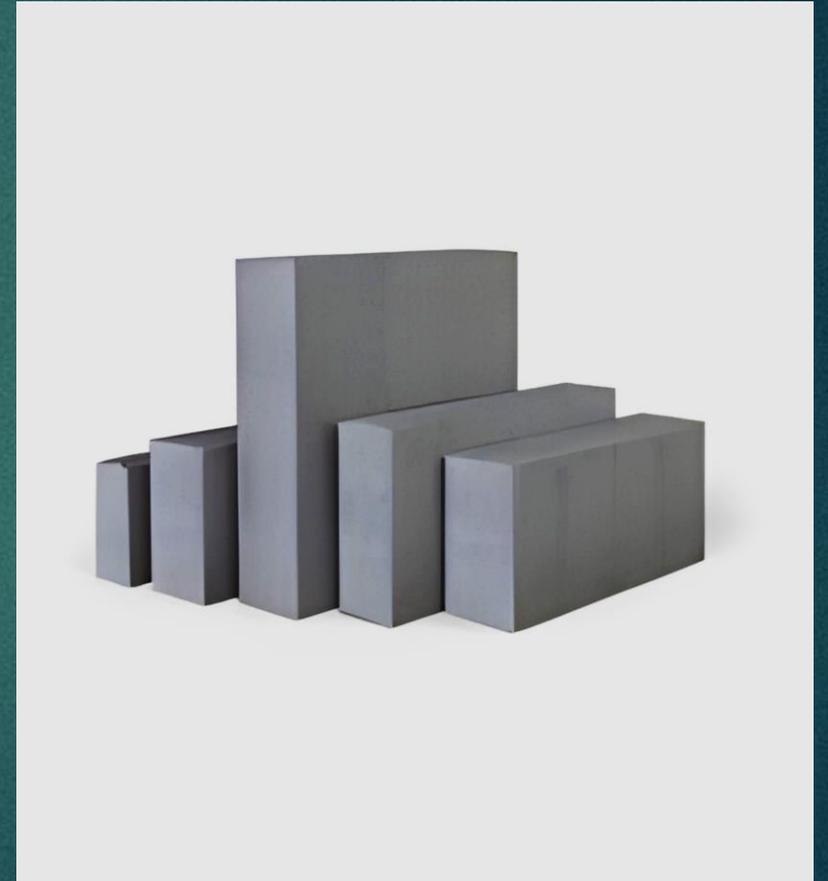


# THE PRODUCTION PROCESS

(STEP BY STEP)

# STANDARD SIZES

SR. NO.	PARTICULAR (MM)	BLOCKS PER M3	WEIGHT (KGS)
1	600 X 200 X 100	83.33	7.5 - 8.5
2	600 X 200 X 150	55.55	9.5 - 10.5
3	600 X 200 X 200	41.66	13
4	600 X 200 X 225	37.03	20
5	600 X 200 X 250	33.33	24
6	600 X 200 X 300	27.77	27



# ADVANTAGES OF AAC BLOCKS

	LIGHT WEIGHT		BETTER SOUND INSULATION		LONGER LIFE
	HIGH WORKABILITY		ENVIRONMENTALLY FRIENDLY		ACCURACY IN SIZE
	COST EFFECTIVE		FASTER CONSTRUCTION		FIRE RESISTANCE

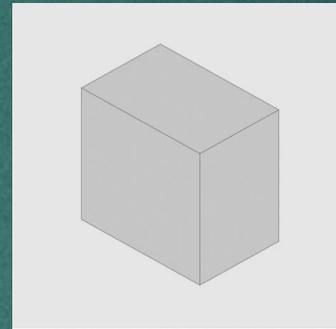
# COMPARATIVE ANALYSIS

PARAMETER	AAC BLOCK	CONCRETE BLOCK	BRICK
SIZE	600 X 200 X (100 – 3000) MM	400 X 200 X (100 – 200) MM	230 X 115 X 75 MM
VARIATION IN DIMENSIONS	+/- 1 MM	+/- 3 MM	+/- 5 MM
COMPRESSIVE STRENGTH	30-50 KG/CM2	40-50 KG/CM2	25 – 30 KG/CM2
DRY DENSITY	550-700 KG/M3	1800 KG/M3	1950 KG/M3
FIRE RESISTANCE	4 – 6 HOURS DEPENDING UPON THICKNESS	4 HOURS	2 HOURS
SOUND REDUCTION INDEX (DB)	60 FOR 200 MM THICK WALL	30 FOR 200 MM THICK WALL	40 FOR 200 MM THICK WALL
THERMAL CONDUCTIVITY W(K-M)	0.122	0.51	0.81

# PLANT VARIANTS

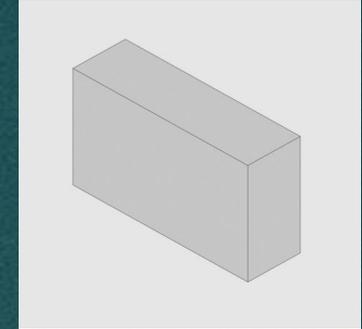
- ❖ There are 4 plant variants that we offer which varies on the basis of the mold (cake) size, namely Variant A, B, C, & D. The per day production capacity of the plant variant depends upon the number of autoclaves in use. All of the 4 variants have the provision of maximum 6 autoclaves.
- ❖ **24 HOUR PLANT CYCLE :**
  - The time required for Stage 2 : Dosing & Mixing of cement, lime with fly ash slurry along with aluminum powder & other chemicals before discharging it into the mold box takes about 8.5 minutes.
  - Therefore the plant can produce :
    - 24 Hours = 1440 Min
    - $1440 / 8.5 \text{ Min} = 168 \text{ Molds / Day}$
  - After casting the mold the time required for the rising & pre-curing of the mold takes about 2 hours before it proceeds to the demolding & cutting stage & further for Autoclaving process.
  - The time required for Stage 5 : Autoclaving is about 12 Hours after pre-curing. Therefore 1 Autoclave can process 2 cycle per day i.e. in 24 Hours
  - 1 Autoclave can steam 11 Molds / Cycle in variant A i.e. 22 molds in 24 hours & 14 Molds/Cycle in variant B,C,& D i.e. 28 molds in 24 Hours.

VARIANT A



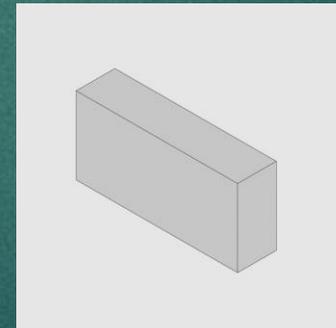
1.2 x 1.2 x 0.8 M

VARIANT B



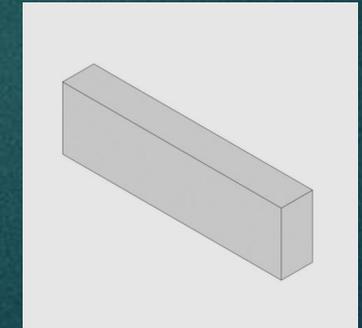
2.0 x 1.2 x 0.6 M

VARIANT C



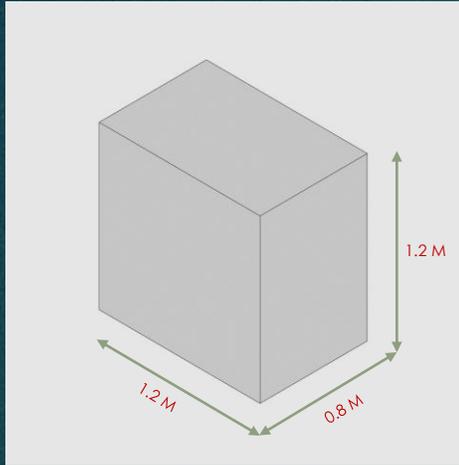
2.5 x 1.2 x 0.6 M

VARIANT D



4.2 x 1.2 x 0.6 M

# VARIANT A

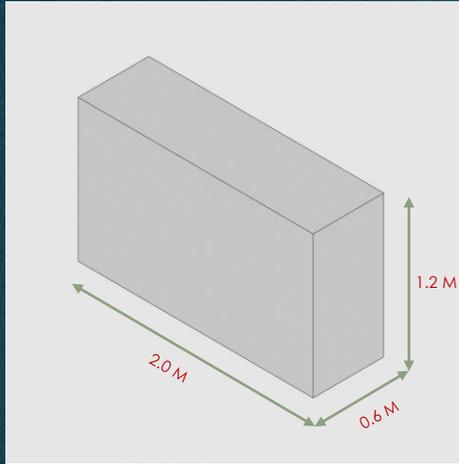


DETAILS OF VARIANT-A (FLY ASH BASED)	
MAXIMUM EXPANDABLE CAPACITY	150 M3
POWER INSTALLATION REQUIRED	100 KW
LAND REQUIREMENT	1.5 - 2 ACRES
SHED AREA	1000 TO 1500 M2
BOILER	1 TON 15 KG/CM2
AUTOCLAVE	1.6 M DIA X 15 M LONG ( THICKNESS 12MM )
MOLD (CAKE FINISHED)	1.2 X 1.2 X 0.8 M (1.152 M3 PER MOLD )
NO. OF MOLDS PER AUTOCLAVE	11 NOS ( PER AUTOCLAVE )
AUTOCLAVE YIELD / 12 HOUR CYCLE	12.5 M3 / 12 HOUR CYCLE ( 25 M3 / DAY )

PLANT CAPACITY	
1 Autoclave - 22 Molds/Day	1 Mold Volume – 1.152 M3
No. Of Autoclave In Use	Per Day Production (M3)
1 - (22 molds/day)	25
2 - (44 molds/day)	50
3 - (66 molds/day)	75
4 - (88 molds/day)	100
5 - (110 molds/day)	125
6 - (132 molds/day)	150

SR.NO	BLOCK SIZE (MM)	BLOCK PER M3	NO. OF AUTOCLAVE IN USE					
			1 - 25	2 - 50	3 - 75	4 - 100	5 - 125	6 - 150
1	600X200X100	<b>83.33</b>	2,083	4,166	6,249	8,333	10,416	12,499
2	600X200X150	<b>55.55</b>	1,388	2,777	4,166	5,555	6,943	8,332
3	600X200X200	<b>41.66</b>	1,041	2,083	3,124	4,166	5,207	6,249
4	600X200X225	<b>37.03</b>	925	1,851	2,777	3,703	4,628	5,554
5	600X200X250	<b>33.33</b>	833	1,666	2,499	3,333	4,166	4,999
6	600X200X300	<b>27.77</b>	694	1,388	2,082	2,777	3,471	4,165

# VARIANT B

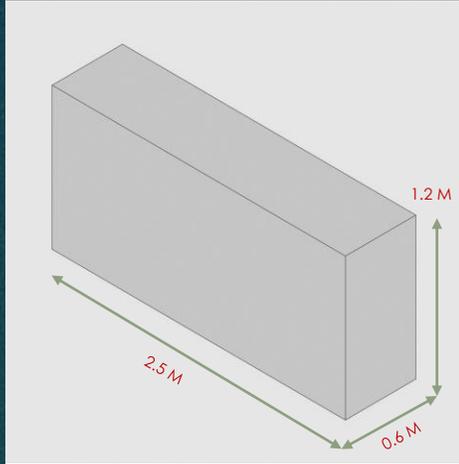


DETAILS OF VARIANT-B (FLY ASH BASED)	
MAXIMUM EXPANDABLE CAPACITY	240 M3
POWER INSTALLATION REQUIRED	200 KW
LAND REQUIREMENT	2 - 2.5 ACRES
SHED AREA	1700 TO 2000 M2
BOILER	3 TON 15 KG/CM2
AUTOCLAVE	2.1 M DIA. X 15.6 M LONG ( THICKNESS 12MM )
MOLD ( CAKE FINISHED )	2.0 X 1.2 X 0.6 M ( 1.44 M3 PER MOLD )
NO. OF MOLDS PER AUTOCLAVE	14 NOS ( PER AUTOCLAVE )
AUTOCLAVE YIELD / 12 HOUR CYCLE	20 M3 / 12 HOUR CYCLE ( 40 M3 / DAY )

PLANT CAPACITY	
1 Autoclave - 28 Molds/Day	1 Mold Volume – 1.44 M3
No. Of Autoclave In Use	Per Day Production (M3)
1 - (28 molds/day)	40
2 - (56 molds/day)	80
3 - (84 molds/day)	120
4 - (112 molds/day)	160
5 - (140 molds/day)	200
6 - (168 molds/day)	240

SR.NO	BLOCK SIZE (MM)	BLOCK PER M3	NO. OF AUTOCLAVE IN USE					
			1 - 40	2 - 80	3 - 120	4 - 160	5 - 200	6 - 240
1	600X200X100	<b>83.33</b>	3,333	6,666	9,999	13,332	16,666	19,999
2	600X200X150	<b>55.55</b>	2,222	4,444	6,666	8,888	11,110	13,332
3	600X200X200	<b>41.66</b>	1,666	3,332	4,999	6,665	8,332	9,998
4	600X200X225	<b>37.03</b>	1,481	2,962	4,443	5,924	7,406	8,887
5	600X200X250	<b>33.33</b>	1,333	2,666	3,999	5,332	6,666	7,999
6	600X200X300	<b>27.77</b>	1,110	2,221	3,332	4,443	5,554	6,664

# VARIANT C

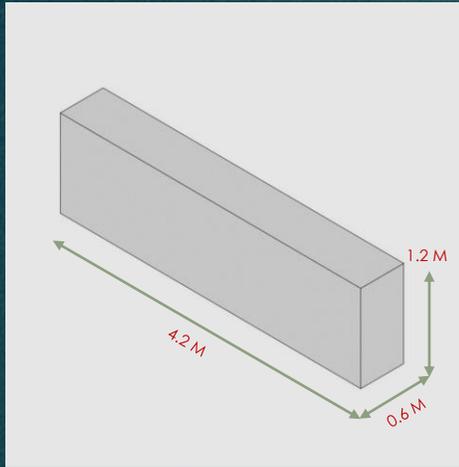


DETAILS OF VARIANT-C (FLY ASH BASED)	
MAXIMUM EXPANDABLE CAPACITY	315 M3
POWER INSTALLATION REQUIRED	250 KW
LAND REQUIREMENT	3 - 3.5 ACRES
SHED AREA	2500 TO 2700 M2
BOILER	3.5 TON 15 KG/CM2
AUTOCLAVE	2.1 M DIA. X 19.5 M LONG ( THICKNESS 16 MM )
MOLD (CAKE FINISHED)	2.5 X 1.2 X 0.6 M ( 1.875 M3 PER MOLD )
NO. OF MOLDS PER AUTOCLAVE	14 NOS ( PER AUTOCLAVE )
AUTOCLAVE YIELD / 12 HOUR CYCLE	26.25 M3 / 12 HOUR CYCLE ( 52.5 M3 / DAY )

PLANT CAPACITY	
1 Autoclave - 28 Molds/Day	1 Mold Volume – 1.875 M3
No. Of Autoclave In Use	Per Day Production (M3)
1 - (28 molds/day)	52
2 - (56 molds/day)	105
3 - (84 molds/day)	157
4 - (112 molds/day)	210
5 - (140 molds/day)	262
6 - (168 molds/day)	315

SR.NO	BLOCK SIZE (MM)	BLOCK PER M3	NO. OF AUTOCLAVE IN USE					
			1 - 52	2 - 105	3 - 157	4 - 210	5 - 262	6 - 315
1	600X200X100	<b>83.33</b>	4,333	8,749	13,082	17,499	21,832	26,248
2	600X200X150	<b>55.55</b>	2,888	5,832	8,721	11,665	14,554	17,498
3	600X200X200	<b>41.66</b>	2,166	4,374	6,540	8,748	10,914	13,122
4	600X200X225	<b>37.03</b>	1,925	3,888	5,813	7,776	9,701	11,664
5	600X200X250	<b>33.33</b>	1,733	3,499	5,232	6,999	8,732	10,498
6	600X200X300	<b>27.77</b>	1,444	2,915	4,359	5,831	7,275	8,747

# VARIANT D



DETAILS OF VARIANT-D (FLY ASH BASED)	
MAXIMUM EXPANDABLE CAPACITY	504 M3
POWER INSTALLATION REQUIRED	450 KW
LAND REQUIREMENT	3.5 - 4.5 ACRES
SHED AREA	3000 TO 3200 M3
BOILER	6 TON 15 KG/CM2
AUTOCLAVE	2 M DIA. X 32 M LONG ( THICKNESS 16 MM )
MOLD ( CAKE FINISHED )	4.2 X 1.2 X 0.6 M ( 3.0 M3 PER MOLD )
NO. OF MOLDS PER AUTOCLAVE	14 NOS ( PER AUTOCLAVE )
AUTOCLAVE YIELD / 12 HOUR CYCLE	42 M3 / 12 HOUR CYCLE ( 84 M3 / DAY )

PLANT CAPACITY	
1 Autoclave - 28 Molds/Day	1 Mold Volume – 3.0 M3
No. Of Autoclave In Use	Per Day Production (M3)
1 - (28 molds/day)	84
2 - (56 molds/day)	168
3 - (84 molds/day)	252
4 - (112 molds/day)	336
5 - (140 molds/day)	420
6 - (168 molds/day)	504

SR.NO	BLOCK SIZE (MM)	BLOCK PER M3	NO. OF AUTOCLAVE IN USE					
			1 - 84	2 - 168	3 - 252	4 - 336	5 - 420	6 - 504
1	600X200X100	<b>83.33</b>	6,999	13,999	20,999	27,998	34,998	41,998
2	600X200X150	<b>55.55</b>	4,666	9,332	13,998	18,664	23,331	27,997
3	600X200X200	<b>41.66</b>	3,499	6,998	10,498	13,997	17,497	20,996
4	600X200X225	<b>37.03</b>	3,110	6,221	9,331	12,442	15,552	18,663
5	600X200X250	<b>33.33</b>	2,799	5,599	8,399	11,198	13,998	16,798
6	600X200X300	<b>27.77</b>	2,332	4,665	6,998	9,330	11,663	13,996

## INCLUSIONS

- Project conceptualization as per the client's requirement.
- Layout of the plant & civil foundation drawings.
- Supervision of civil works as per our design.
- Civil execution with office buildings & PEB shed ( on request ).
- Complete installation of the plant up to the 1<sup>st</sup> trial production.
- Supply of the machines & equipment's for the plant as per the agreed list.
- Load / Pressure test & dry run of machines & equipment.
- Site In-charge to ensure execution as desired.
- Production process training for smooth operation.
- One year warranty against any defects in manufacturing.
- Life time free consultation for smooth operation of the plant.

## EXCLUSIONS

- Dg of suitable capacity
- Street lighting, office furniture, weighing bridge, fork lift for movement of finished goods to load in the trucks for dispatch & Boiler furnace brick work.
- Laboratory apparatus and equipment. ( list shall be provided )
- Any type of government fees like boiler approval ,license, electricity security deposit etc.
- Any statutory obligation and related fees.
- Factory shed, civil & plumbing works.
- Transformer and VCB ( If required as per government norms )
- GST (18%) and transportation of equipment from source of manufacturing to project site.
- Safety and security of equipment and machines dispatched at site up to completion of installation.
- Raw material and man power during trial production.
- Water and temporary electricity during installation.
- Laying and supply of main power LT/HT cable from transformer to main PCC panel.

## SERVICE

- All machines are indigenous with sale and service in India & warranted for one year.
- Delivery of final products as per BIS standards.
- Mixing and cutting machines are automated using GE / Siemens programmable logic controller. (Back ups provided)
- Cranes, car trolleys and cutting machine are equipped with variable frequency drives (ABB / Schneider) to maintain synchronization and automisation. Mechanical hardware are from sew Germany.
- Capacity utilization as per requirement.
- Designed according to steam and energy conservation.
- Autoclaves are designed & manufactured as per ASME SECTION VIII / IX .
- All motors are from CG / Siemens / Bharat Bijli.
- All electrical components are from Schneider/ L&T / Siemens or equivalent makers.
- All major gear boxes are from Kavitsu / Bonfigli / Sumico Make / Sew.
- Completion of project in agreed stipulated time.
- Operational consultancy included.
- Back up support from KMAAC team for smooth operation.

## TECHNOLOGY

- Plant is designed with inherent zero buffer green waste, no top & bottom waste layer.
- Horizontal loading in autoclaves results in no sticking among layers, no separating crane is required.
- Six dimensional movement in cranes facilitating quick approach for cutting of varied hardness of cakes.
- Back tilting mechanism for trimming the mold & recycling the waste to again use it as raw material for the casting.



# KAMAAC

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