Concrete Block Manufacture

This part of the training package provides information on the manufacture of concrete blocks for houses common in South-East Asia and the South Pacific region. Concrete blocks are manufactured with varying degrees of sophistication and in a range of sizes and shapes.

Manual manufacture of concrete blocks

- Sand, portland cement and water are manually mixed, and then placed into steel moulds to cure.
- The moulds must be well oiled and have a false bottom to permit the blocks to be removed.
- When hardened, the concrete blocks are forced out of the moulds.

Manual manufacture (Trincomalee, Sri Lanka)

“Egg-layer” machine manufacture of concrete blocks

- Stiff concrete is extruded from the mobile “egg-layer” machine onto a concrete slab.
- The machine then moves forward to deposit the concrete for the next block.
- The blocks are allowed to air-cure on the slab.

“Egg-layer” Machine (PNG)

“Egg-layer” Machine (India)

Semi-automated machine manufacture of concrete blocks

- Portland cement is stored in a dry place.
- Sand and aggregate are stock-piled where they are free of contamination.
- The ingredients are mixed, and a little water added.
- The mix is then fed into a concrete block machine, which vibrates and then extrudes the “green” concrete onto timber or steel pallets.
- The pallets of “green” concrete are then removes and stored for curing.

Raw Materials Storage

Sometimes there are problems

Semi-automated machine manufacture
(Colombo & Batticoloa, Sri Lanka)

Semi-automated machine manufacture of soil-cement bricks and blocks

Inexpensive soil/cement blocks may be manufactured using simple block-making equipment.

- The principal materials are red sandy silt, with some cohesion, to which is added a little river sand, and a specified quantity of portland cement.
- This is thoroughly mixed, placed in the feed-hopper and compressed in the machine.
- Finished blocks are then removed from the machine and stacked to dry.



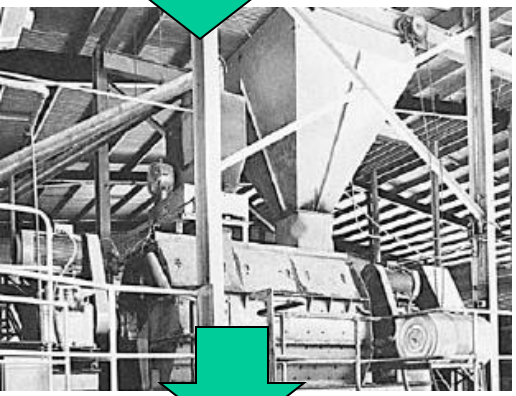


The suitability of the mix must be checked by measuring the penetration of a hand-held penetrometer.

Semi-automated manufacture of soil-cement bricks and blocks (Kanykumari & Pondicherry India)

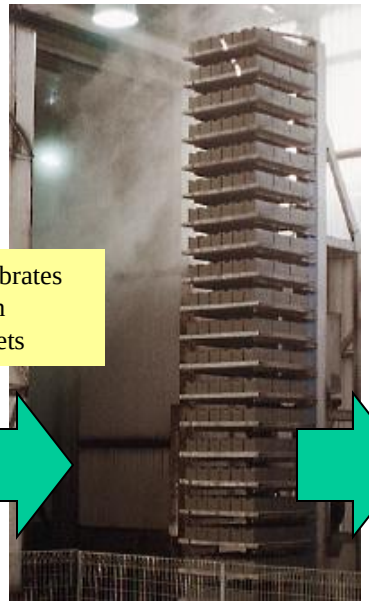

Automated machine manufacture

Raw materials delivery, storage & retreival

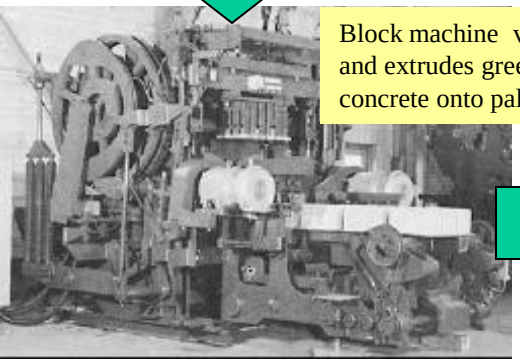


Batching & Mixing

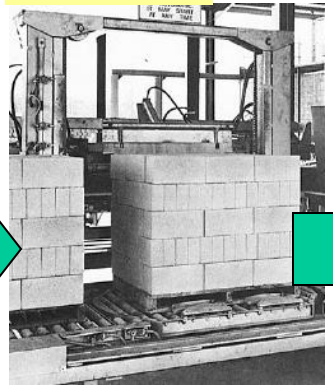
Curing



Block machine vibrates and extrudes green concrete onto pallets



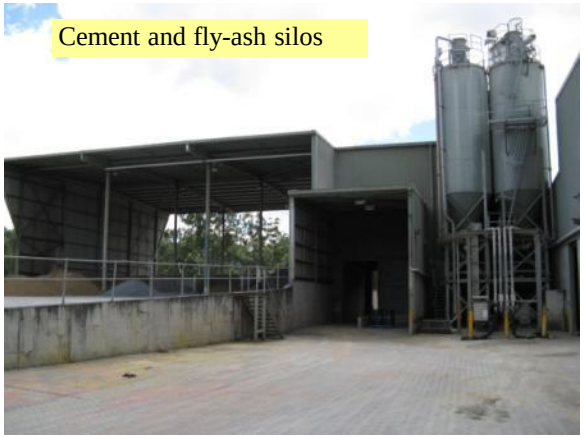
Cubing onto timber pallets



Storage & Delivery

Photos courtesy of Concrete Masonry Association of Australia

Automated machine manufacture

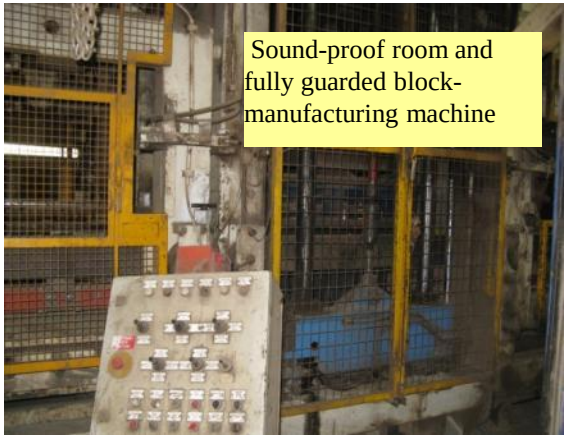

Cement and fly-ash silos


Mixer


Placing “green” blocks in kilns


Protected sand stockpile


Mould racks


Sound-proof room and fully guarded block-manufacturing machine

Photos courtesy W Holt

Concrete Block Manufacture and Testing

Manufacture of Concrete Blocks – Process

Concrete blocks may be manufactured using simple block-making equipment.

The principal materials are clean sand, 5 to 7 mm aggregate (stone) , to which is added approximately 10 % to 15% portland cement. This is thoroughly mixed with a little water, placed in the feed-hopper and compressed in the machine.

Finished blocks are removed on a pallet from the machine and stacked to dry.

Typical Mix for 15 MPa Denseweight Hollow Concrete Blocks

For 1 cubic metre of concrete, the mix should be:

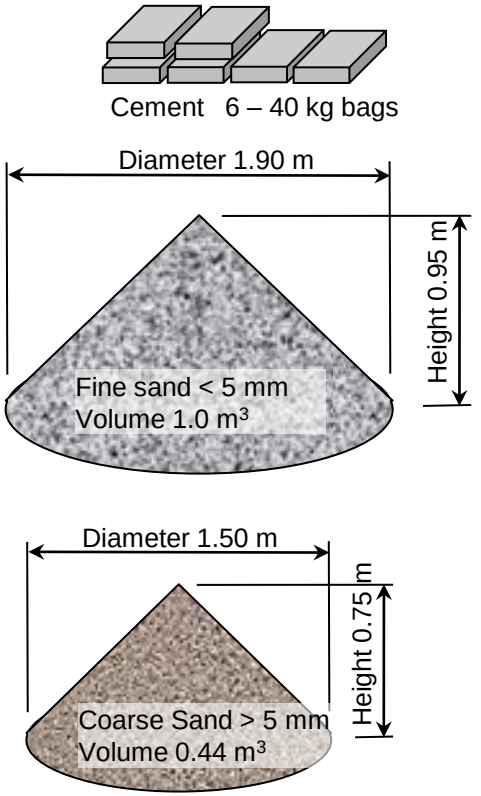
- 6 bags 40 kg each (240 kg) of GP portland cement
  Cement is also available in 20 kg bags, in which case 11 would be required.

- 0.88 m^3 (1,400 kg) of fine sand
  Sand should be clean sharp sand under 1.5 mm nominal size

- 0.44 m^3 (650 kg) of coarse sand and aggregate
  Coarse sand and aggregate should be clean river gravel, crushed aggregate or similar above 1.5 mm nominal size.

- Minimum quantity of water – Approximately 11 20 litre buckets (300 mm diameter x 290 mm deep). Less water should be used if sand or aggregate are damp.

Note:
Fine and coarse sand may be combined as a single aggregate when supplied to the block plant.



Source: Cement Concrete & Aggregates Australia

Manufacturing Checklist

Builder:
Site:
Activity: Manufacture Concrete Blocks

Item or Product	Inspection Required	Accept Criteria	Hold Witness	Date	Inspector	Comment
Block making machine	Trial run	In running order	Hold			
Cement storage	Visual inspection	Clean and dry	Hold			
Materials storage	Visual inspection	Clean	Hold			
Block handling	Visual inspection	In running order	Hold			
Curing facility	Visual inspection	In running order	Hold			
Block storage	Visual inspection	Not crowded	Hold			
Mould shape and dimensions	Accurate measurement	+,- 0.5 mm	Hold			
Mix specification	Calculation check	Correct	Hold			
Cement	Visual	Clean, dry, fresh	Hold			
Sand	Sieve	To grading limits	Hold			
Coarse aggregate	Sieve	To grading limits	Hold			
Admixtures	Visual	Clean, fresh	Hold			

Typical Mixes without Fly Ash for Various Concrete Masonry Units

The mixes below are appropriate to large manufacturing plants, using portland cement without the addition of fly ash.

Typical Concrete Masonry Manufacture							
		Concrete denseweight masonry units	Concrete lightweight masonry units	Concrete retaining wall units	Concrete domestic pavers	Concrete industrial pavers	Concrete bricks
Natural dense weight coarse aggregate (> 5 mm) and dust	tonnes	0.30	0.25	0.23	0.22	0.20	0.25
Natual denseweight fine aggregate (< 5mm) includes sand and ash	tonnes	0.60	0.61	0.63	0.63	0.60	0.65
Portland cement	tonnes	0.10	0.14	0.14	0.15	0.20	0.10
Oxides	tonnes	0.0000	0.0000	0.0045	0.0048	0.0032	0.0000
Admixtures	tonnes	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015
Total	tonnes	1.00	1.00	1.00	1.00	1.00	1.00
Average Mix							
Total aggregates		90.0%	86.0%	85.5%	84.5%	79.7%	90.0%
Total cementicious (including fly ash, blast furnce slag, admixtures)		10.0%	14.0%	14.5%	15.5%	20.3%	10.0%

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