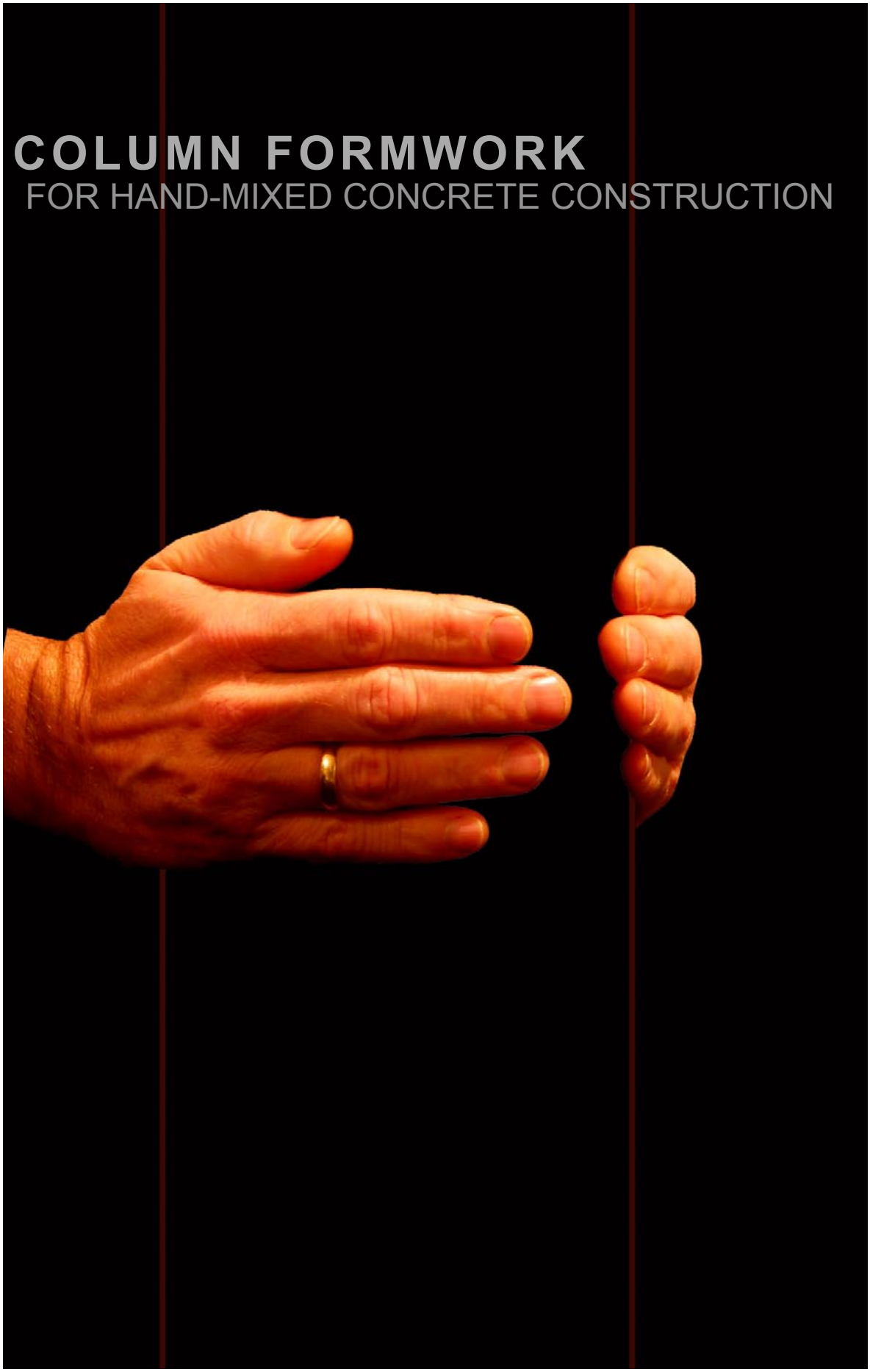
# BATCH COLUMN FORMWORK

## FOR HAND-MIXED CONCRETE CONSTRUCTION



Invented and developed at the Centre for Architectural Structures and Technology (C.A.S.T.)
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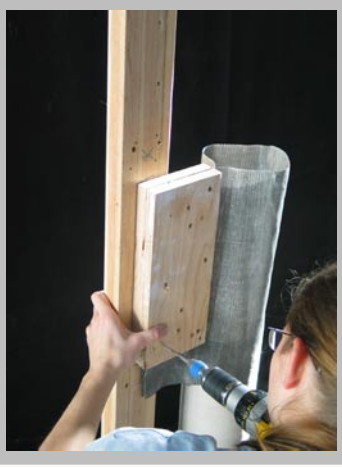
# BATCH COLUMN FORMWORK

A formwork designed specifically for low-capital building economies and informal construction using hand-mixed concrete in small batches. Each column form contains only the volume of one hand-mixed batch of concrete. This formwork uses an absolute minimum of material and may be reused many times.

Much of the world builds reinforced concrete structures without centralized batching plants, transit-mix trucks, concrete pumps, or other large-scale construction infrastructure. Instead, low-capital building economies use small hand-mixed batches of concrete. We developed Batch Column Formwork for this kind of construction environment where structures are made through small incremental additions of concrete. This method scales the formwork to the volume of each small batch, allowing a small work crew to construct reinforced concrete columns of any height or diameter with very little material.

This method requires a “guide post” to keep the column formwork in place and to assure that the finished column is correctly located in space. Because each section of the column is cast separately, the joints between individual casts are un-bonded (i.e. the concrete column will not be monolithic). The individually cast sections are primarily connected by the column’s reinforcing steel. *The constructions shown in this article are models and do not include reinforcing.*

The photographs below describe the basic construction sequence, using a model formwork. Left to Right: The Batch column formwork is attached to a “guide post”, filled with concrete, and removed after concrete is sufficiently hardened. Details and instructions for two methods of Batch Column construction are given in the pages that follow.



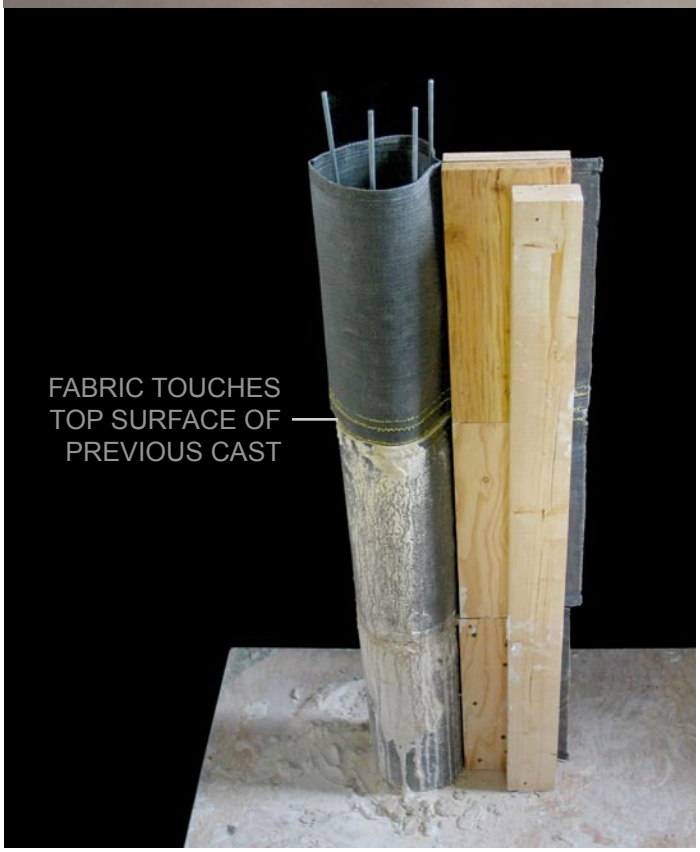
# TWO BATCH COLUMN METHODS

We have developed two versions of this formwork. The only difference between them is the way the formwork attaches to the previous cast below it. Both use a small rectangle of polyolefin (polyethylene or polypropylene) geotextile fabric (essentially a small scrap of plastic tarp). This rectangle of fabric is sized to create a cylinder with the same volume as a single batch of concrete. Two small rectangular pieces of wood (we use plywood) are attached to the ends of the fabric (we use staples). A cylindrical formwork tube is made by aligning and attaching the two wood pieces to each other, and aigning this tube to a vertical ‘guide post’. The guide post is located and braced to keep the cast column alligned correctly throughout its construction. Concete will not adhere to this fabric so the polyolefin tube may be easily removed and reused.

## STACK METHOD

Makes no positive connection to the previous cast at all, but only touches the top of the cast below.

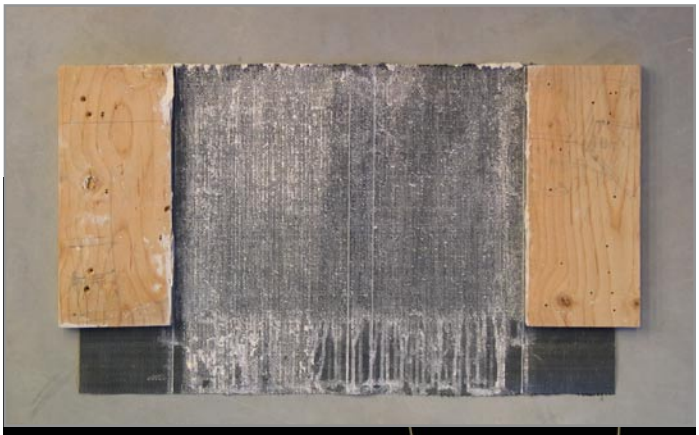
Top: Stack Method Formwork laid flat
Bottom: Photo showing how the stack method formwork is held above the previous cast

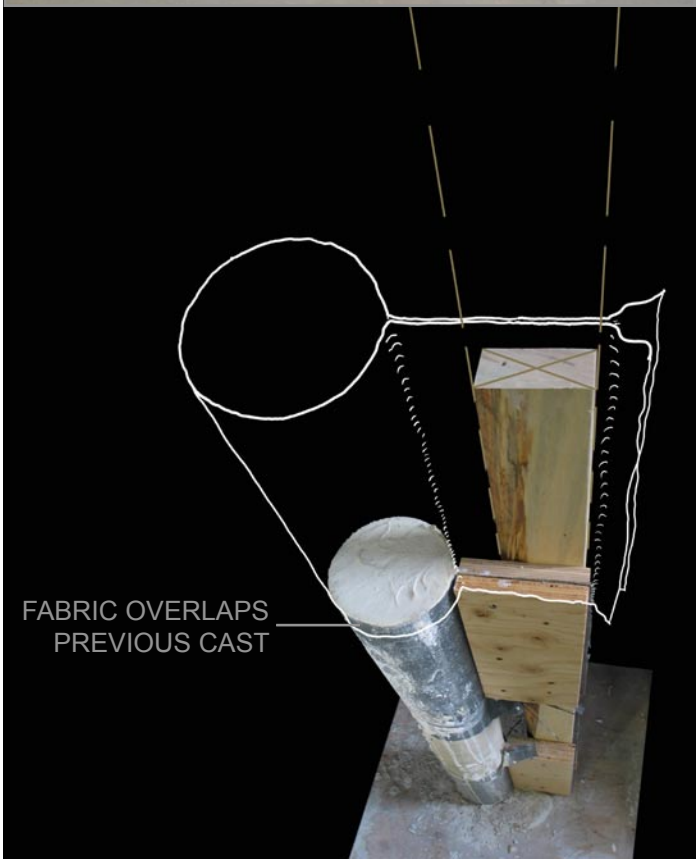



## OVERLAP METHOD

Connects to the cast below by having its fabric overlap the previous cast.

Top: Overlap Method Formwork laid flat
Bottom: Drawing of how the overlap formwork is connected to previous casts and to the alignment scaffolding pole



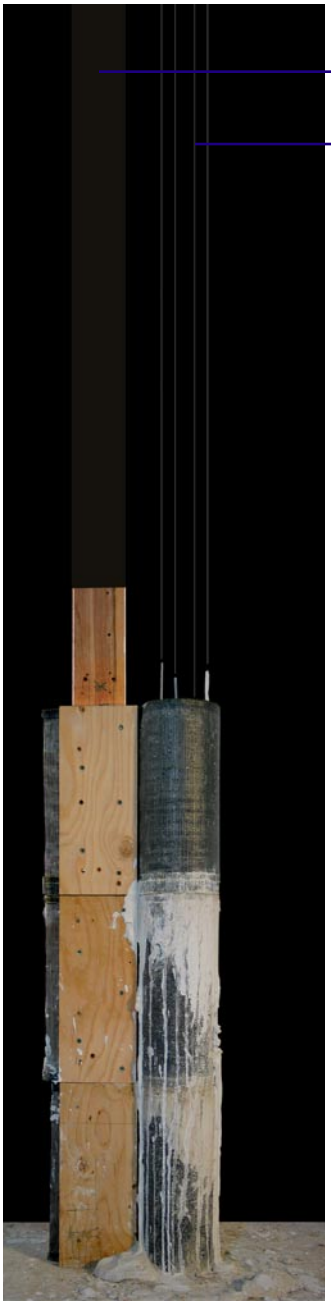


## STACK METHOD

The Stack Method is the simpler of these two methods. An empty formwork tube is located directly above the previous cast, and then filled with concrete (no fixed connection is needed). The bottom of the formwork tube must be held in place until the wet concrete has reached several centimeters in height. After this, the fabric tube becomes tensioned by the pressure of the wet concrete and does not need to be held. The fabric formwork tube of the previous cast may be left on the concrete below as 'splash protection', protecting it from the wet concrete that will drip down from above.

## OVERLAP METHOD

The Overlap method connects the fabric of the empty formwork tube to the previous cast. This is done by using a small rope to temporarily bind a fabric flap to the concrete cylinder below. This method does not require an extra pair of hands to hold the empty formwork tube in place when pouring the wet concrete. Because the fresh concrete slightly overlaps the previous cast, the previous fabric sheet must be removed prior to connecting the new formwork tube. A fabric covering of some sort (we use rags) is recommended as 'splash protection' to protect the previously cast concrete from the wet concrete that will drip down from above.

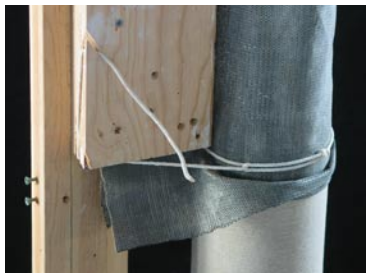


A braced 'Guide Post' is placed to control the location and orientation of the column.

Reinforcing steel can also be held in place by bracing it to the Guide Post

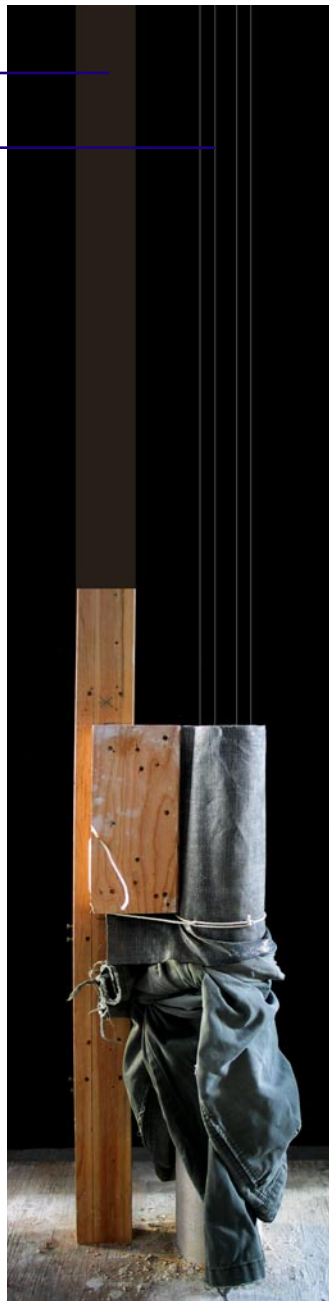
The new formwork tube sits above the previous cast with no fixed connection between itself and the cast below.

The connection must be held in place by hand until the first few centimeters of wet concrete tensions the fabric enough that the formwork tube becomes stiff enough to be left alone.



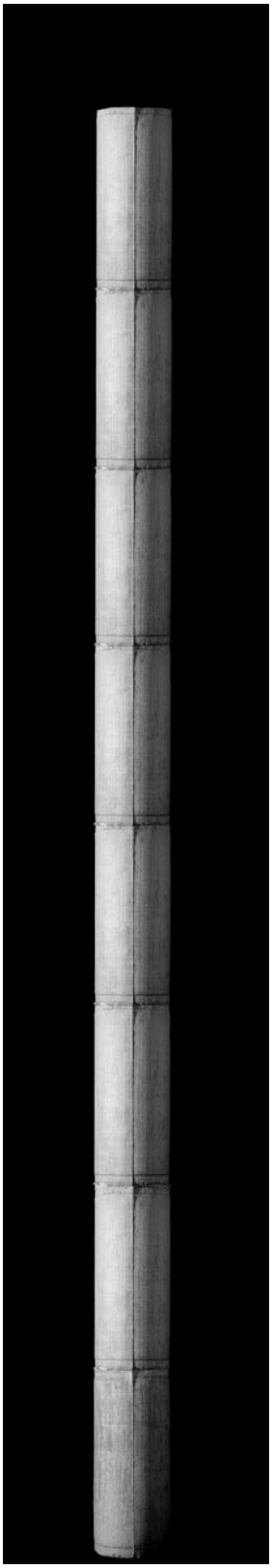
The new formwork tube is sized to overlap the previous cast below it. A simple loop of rope binds the fabric to the concrete cylinder below.

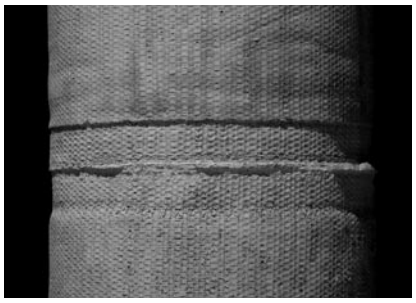
The binding rope is secured without knots; instead, a "jam cleat" is provided by making wedge-shaped cuts in the wood blocks.



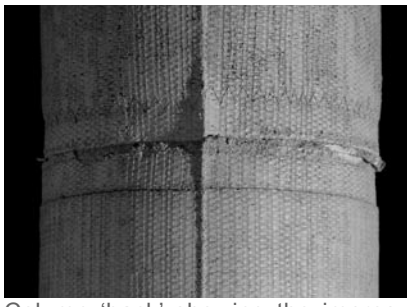
## STACK METHOD

A finished column constructed with the Stack Method will clearly show the joints between successive casts, particularly if the top and bottom edges of the fabric sheet are hemmed. This can make the column look a bit like a unit masonry construction.





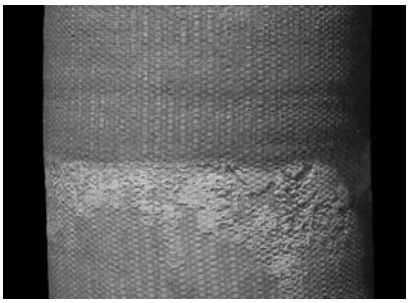
Column ‘front’ showing impressions of hemmed fabric formwork edges.



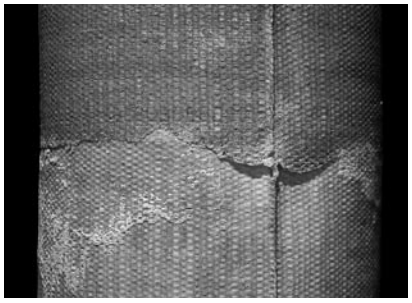
Column ‘back’ showing the impressions of the hemmed fabric formwork edges and the vertical joint between the wood blocks.

## OVERLAP METHOD

A finished column constructed with the Overlap Method will be ‘smoother’ in appearance. Some ‘leaking’ of cement paste may occur at the joints between pours, as seen in the photographs below. This can be controlled, to some extent, by the skill and care of the builders.



Column ‘front’ showing the smooth joint between pours, and the slight leakage of cement paste.



Column ‘back’ showing the typical overlapping ‘bump’ of cement paste at the joint between wood blocks.