

Cob walling in the twenty first century

BY ROB HADDEN

Cob, clom, witchert, clay dabbins, rad and dab are just some of the English and Welsh nomenclature that describe the process of working with clay/aggregate and/or straw that is used to make walls without the use of moulds, as in adobe bricks or in the complex shuttering techniques of rammed earth. These methods are ancient and have a proven track record throughout the developed world as well as third world countries.

Vernacular architecture is by itself not a slave to fashion cycles and is nearly immutable and, in fact, is mostly unimprovable since it is perfection in itself. It is already hard to appreciate in the twenty first century just how radically different modern building methods are from the traditional technology that has evolved over time and how rapidly, and recently, current building techniques have replaced it.

We need to understand these traditional skills if we are to know how older building technologies

work and how those builders applied this knowledge in tandem with local typologies and climate concerns. Over time I have been very concerned about embodied energy in the products that we use, but now I am also becoming aware of embodied knowledge that is being lost. We are losing our skills base for repairing and maintaining buildings, instead bulldozing them into the ground and starting anew when they are outdated but still perfectly usable. To this end, my quest is to learn more about cob and its place in my building regime as it is an excellent walling material that is in abundance here in Castlemaine.

Cob is, simply put, the Devonian word for earth walling and there are somewhere in the vicinity of twenty thousand plus dwellings still in existence today attesting to their longevity. The technical excellence of the material has enabled walls of extreme durability to be built. Mixing and raising a cob wall is hard work as is

any mass walling technique and these days it is not uncommon to see bobcats and other mechanical devices used to help in the process of mixing and transporting.

As well as mud walling, lime is fundamental to traditional technologies in protection of earth surfaces by being adaptable and tolerant of moisture in the wall and allowing it to pass through, thus letting the wall breathe naturally. When combined with stone and mud, damp proof courses are not needed and a whole new moisture regime is encountered that is entirely different to a modern house. I have followed that thinking with my current house by eliminating the damp course.

Our experience

Most articles I have read about cob walling tend to show examples of people having a great time stomping about in the mud and straw and rolling it up in tarpaulins to mix. I have seen videos on *YouTube.com* showing some young lass making up small balls of clay one at a time and carefully placing on the wall and taking ages to smooth it out. And I think to myself, 'You have got to be kidding!.' Even my current project, which is small by most standards, will take over thirty-five cubic metres of soil – and that is in the finished wall. Dirt, when dug out of the ground will be full of air so you will need much more! (A good excavator should know the formula for that). Rolling up little patties to make a wall involving those quantities will require a lot of people to make any inroads. This is the reality of working with a mud wall.

The walls of our house are only 460mm thick, not much by Devonian standards where the norm is 600mm





1. Early days of cob wall construction.
2. Metal ties were used to key cob to window and door frames.
3. One garden forkful at a time...
4. Lintels span over deep window reveals.
5. Angled stone lintels under windows.
6. The mud mix has a high straw content.
7. Putting straw through a mulcher cut it into shorter lengths so the mix didn't get all tangled in the concrete mixer.
8. Trimmed wall below, still setting lift above.
9. Reo aids wall strength and stability.



10



11



12



13



14

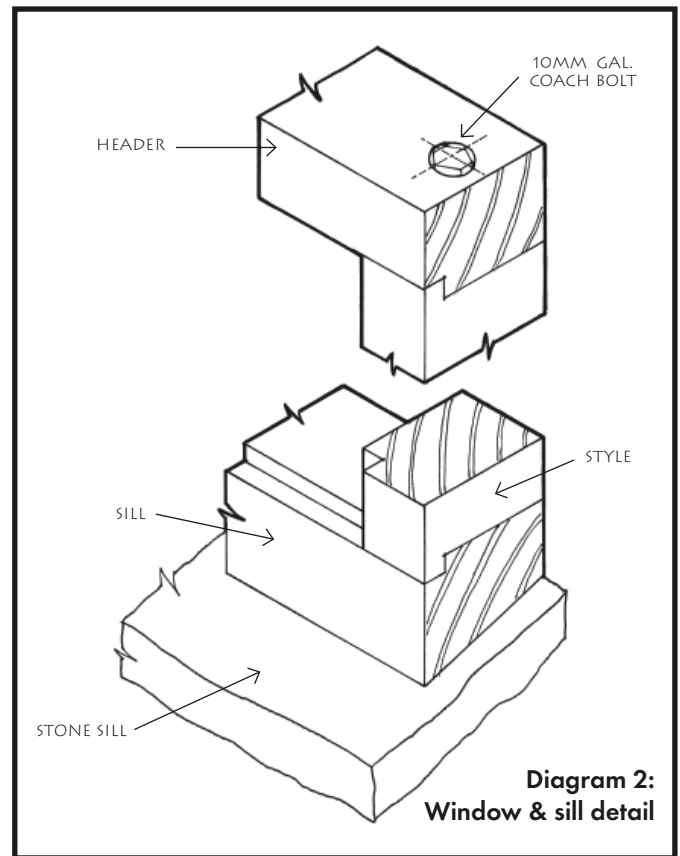
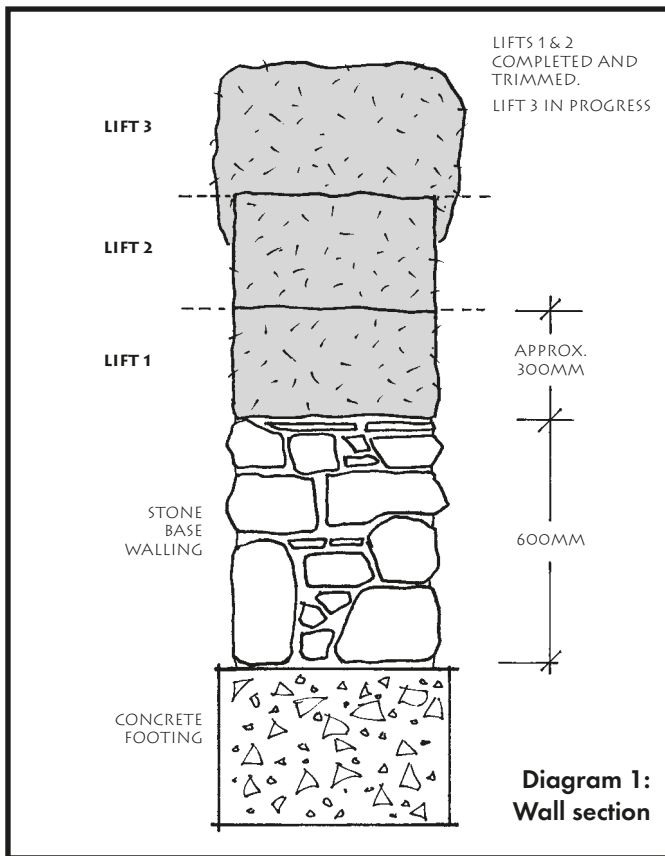


15



16

- 10. Long shuttering in place, ready to fill.
- 11. Joined shuttering sections.
- 12. Section of shuttering filled with moist cob mix setting off.
- 13. Once semi dry, extra cob is trimmed off.
- 14. Sturdy scaffolding was a must once walls got higher.
- 15. Fillets at posts to key cob were either wooden or angle iron, as here.
- 16. Various lifts are obvious here.



to 900mm, but the amount of work required is still enormous and goes on day after day. I decided to try cob, as making mud bricks is just so much more time consuming. Having to make the bricks in the mould, turn them on edge, trim off any excess, stack, move to site, mix the mortar (after sieving the large stones out) and then finally laying them, just seems all too much now. With cob I simply mixed the mud and straw right next to the building, poured it into the wheelbarrow and proceeded to pile it onto the wall. Easy peasy.

Mixing

Before any work could start on the wall, I built a stone footing roughly half a metre in height and mortared with lime and coarse sand. This ensured that the earth was well away from any splashing of rain. Fired bricks could also be substituted in lieu of rock.

I already had about twenty cubic metres of soil ready to use and while we were getting some excavations done, it was timely to have it shifted to site. Typical of Castlemaine, we have alluvial soils that contain about fifty percent of aggregate in the form of stones and our clay tends to be more in the kaolin

range. Not as much plasticity as other clays but extremely durable and hard wearing. You will need to test your clay to find out what, if anything, needs adding. Even though most soils can be used, the best will always be those that have a reasonable amount of clay as well as a good proportion of gravel and small stones. Clay is important as a binder but too much causes cracking and not enough will make the wall friable.

Most how-to books will tell you that you cannot use a concrete mixer to make cob – well, in our case that is certainly not true. I have perfected a technique that works quite well and does not ‘ball up’ in the mixer as predicted. Perhaps it is our type of clay that works well and with so much aggregate in it, it is able to mix better.

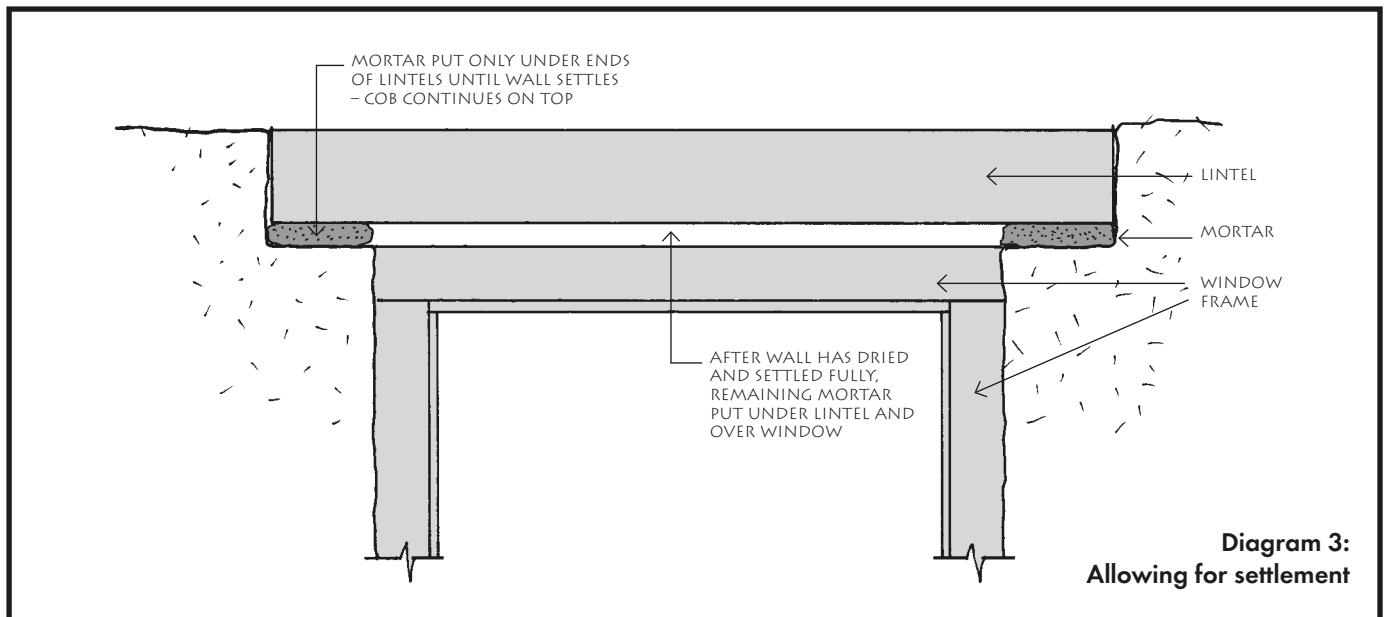
The straw is first put through the mulcher to chop it into small lengths. Used straight from the bale it is too long and gets tangled in the blades of the mixer and balls up. I put two nine-litre buckets of water into the mixer and then two buckets of straw. This seems optimal for our soil and is about fifty percent of the mix by volume for the straw. Once the mixer is turned on, I begin shovelling in the dirt. This can be as few as 20

shovelfuls or as many as 25; it depends on how moist or how dry the dirt is. If you pour it out into the wheelbarrow and it is too sloppy, you can add more straw and mix with the garden fork. This will stiffen it up somewhat.

At about 20 shovelfuls I stab the mix with the shovel to mix it better and push all the straw through. It also has the effect of distributing the sloppier internal part to the edges to add more dirt to. When the whole mix appears to be quite stiff (you will learn to judge how much), then you can empty it into the wheelbarrow and take it to the wall.

Laying up

I have found the traditional way of using the garden fork to lay the mix on the wall the best. Luckily I have a small fork that holds the perfect amount to place two loads across the width of the wall. Trial and error will tell you how best to lay on the walls. You can walk backwards along the wall and place the cob in front of you or you can stand beside the wall to load it on from in front. I allow it to overhang a bit so that later it can be trimmed off with the edge of the shovel. My mix is not stiff enough that it can be walked on immediately as



most books state can be done. However, if you go all the way around with your first layer of say 100mm thick, it should be firm enough to stand on for the next round. Bear in mind that cob walling needs to be done in summer when it will be hot, so it should firm up reasonably fast. The nature of my mix means that it is not firm enough to stomp on to compress, but it is not *that* stiff that you cannot firm it up with the garden fork instead. All the books I have read state that it is walked on to compress, but our clay mix does not need it and, I have seen clom walls being made in Wales that only had lifts of about 200 - 250mm and were *not* compressed by marching upon. See diagram 1

The rapidity with which the growth of the walls progress is quite astonishing, as you are virtually laying both mortar and brick together as if it was an adobe wall. I have been working on my walls for only three days a week from mid January to end March, making about thirty six days all up, and the walls are up to the second storey already. The room measures 7x5 metres and has some time consuming angles to do. Given I work by myself, that is a reasonable amount of wall constructed.

The straw content makes it easy to get onto the fork and gives it the cohesiveness to hold together without falling off. The job of the straw in the mix is to distribute the fine hairline cracks that develop as it dries and to retard the shrinkage. A monolithic wall such as this should shrink a lot but I

have found that on average, about four millimetres of gap open up around the windows. That's not bad at all.

Once you have been around about three to four times and have built a lift of about 300mm (height will depend on how much or how little your clay slumps) allow it to harden (not dry out entirely) and then pare it plumb with the edge of the shovel. You can do it by crack of eye alone or get fussy and use a level. Choose your poison...

In order to help prevent cracking and to stabilise the walls, I have installed 3 bar 8mm trench mesh right the way around at the base of the windows' height and above the lintel height. The corners are all welded together to make it a cohesive whole and they in effect reinforce the whole wall like a foundation. It was most likely not necessary, but I felt the small cost was justified for peace of mind.

Windows and doors

I have made door frames from recycled 75x100mm hardwood bearers, placed them in position and braced them, usually central to the thickness of the wall. On the outside I have placed either fillets of pine or 50mm angle iron. These help to locate the posts in the wall and also to eliminate any gaps as the mud shrinks. Along with these I also place wall ties every 300mm or so. The door frames are very secure and there is no movement at all.

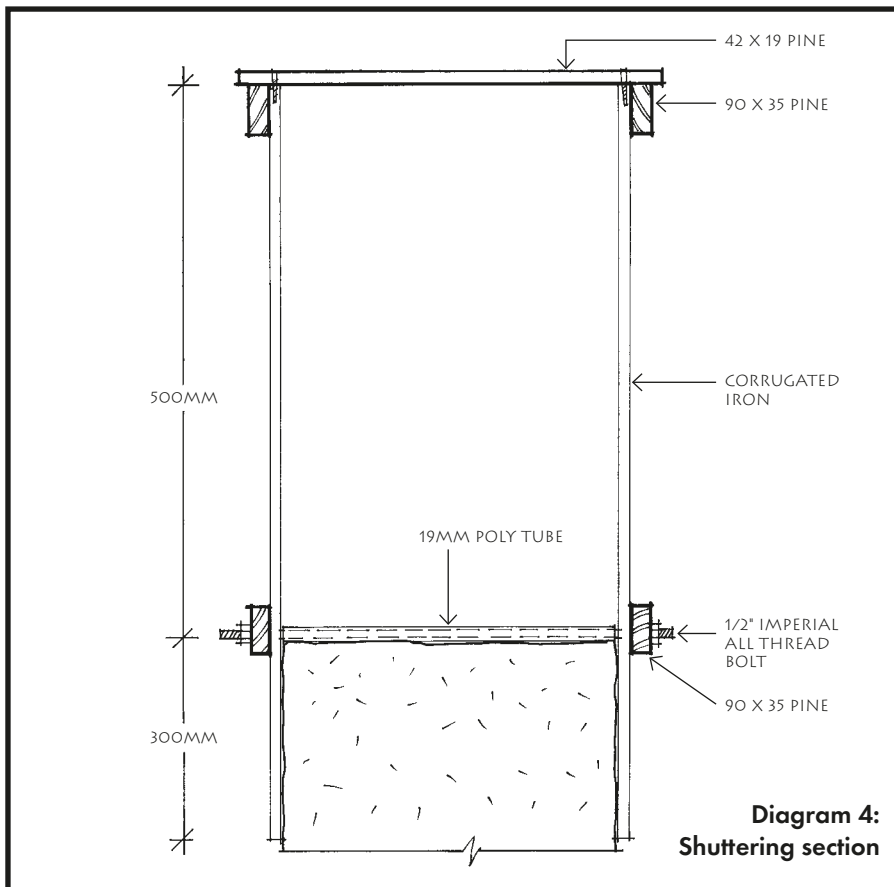
Window frames come in for the same treatment. These are made from

either 75x100mm or 50x100mm recycled hardwoods. They are placed about 50-75mm from the external face of the wall. Internal reveals are roughly 45° and done by crack of eye. Windows are either leaded lights or four and six pane wooden windows picked up for peanuts at the local wreckers. Cost is absolutely minimal. Effect is fantastic. Stone sills were placed on first and sloped to shed the water. The bottom of each window frame was angled to reflect the slope. See diagram 2.

Wide off-cuts of 75mm planks of grey box, sycamore and oak formed the lintels that were put in place after the walls (up to lintel height) had dried out. Bearing in mind that they may still settle for some time, I only mortared them on the mud wall either side of the window/door. I left a 15mm gap above the door/window in case of settlement. These gaps I will fill in with mortar later. See diagram 3.

Shuttering

Well, I just had to have a go, didn't I? Shuttering was traditionally also known to be used (although rarely) if the mix was not stiff enough and the walls were on the thin side (less than 460mm). I wanted to retain the rough finish of the pared down walls so I made the shuttering from old roofing iron screwed to 90x35mm pine and bolted together with half inch zinc all thread (which is still sold as imperial, but galvanised is metric and would be 12.5mm) and wing nuts. To stop the top wandering,



I screwed three bits of 42x19mm pine to it. The three lengths of all thread supported it. Not having to worry about placement of the mix meant that it was even faster to put in and only needed to 'cure' for one day before the shuttering was taken off. To use this method all the time I would have to make cut outs for the stone window sills that protrude out 75mm. The height of the lift was 500mm and when the shuttering was removed and the corrugations pared off, there was no difference to the finish of the wall. Total length of shuttering was 2.3 metres and total height is 800mm with the all thread put through the bottom strip of pine 300mm from the bottom. See diagram 4.

As the height of the wall increases, so to does the effort involved in getting the mud up and onto the wall. At present I am using extendable trestles and having to climb up the ladder with a pitchfork full of mud and straw. Holding the mud in front of me keeps my balance as I ascend the ladder to place yet another load on to the wall. If you have a helper to fork up the mud while you stay up on said trestles, then it will be so much easier and quicker.

The nature of the process guides you as you go along. Trial and error soon sorts out the best approach and before long you will have worked out your optimal method of building a cob wall. I have jumped in where angels fear to tread and it only took half a day to sort out the best way to respond to my materials and situation. When the walls were about half their present height, and not fully dry (one section only a day old) we received 100mm rain over two days and the walls didn't even show any signs of erosion or wear. They were uncovered the whole time.

This is an edited account of my method of cob walling and anybody wanting more in-depth reading can obtain books on the subject, two of which are available from the TOB Bookshop section: *Building a House in a Day* by Edwards, *Building with Cob* by Weismann and Bryce, and *The Hand-Sculpted House* by Evans, Smith and Smiley.

Other good books include: *Clay and Cob Buildings* by John McCann (Shire Books 2008 2/e) and *Devon Building - An Introduction To Local Traditions* edited by Peter Beacham (Devon Books 2001 2/e). ■

The Green Building Resource That Will Save You Time!

The online go-to place to begin your research on green building strategies and environmentally preferable products.

- Well-researched information
- Independent product reviews
- Case studies of green buildings
- Thought leadership
- Environmental perspectives



FREE email bulletin
BuildingGreen.com

GRIMES & SONS

- Mud Brick Renders and Finishes
- Timber Stains and Oils
- Porter's Paints (Approved Retailer)
- Timber Fire Retardants
- Non Toxic, Low Odour, Timber Floor Coatings and Maintenance Systems

1/1637 Main Rd, Research
03 9437 0733

www.grimesandsons.com