

Article : Is Light Steel Frame Homes cheaper than Conventional Homes ?

This question is so often asked , however as always in life it is not a simple answer. One will try answer it in 2 ways

1. Conventional Build vs Cavity wall construction (of which LSF (light steel frame or sometimes called LGS in USA) is a subset so we will talk primarily about this)
2. Comparisons where Conventional Build has no comparison

1. Conventional vs LSF

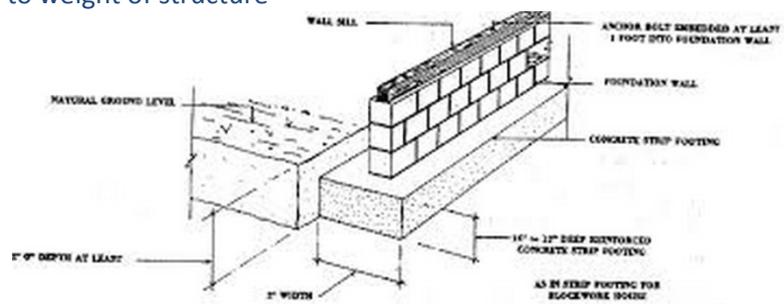
- a. Where does one compare this and where not?
 - i. Well we have to exclude
 1. The flooring finish as this can vary from R80/m2 to R400/m2
 2. Kitchen – well this is from say R40 000 to R500 000
 3. Roof tiles – Again from steel sheeting to slate
 4. Electrical finishings
 5. Doors and windows (again from basic to double glazing)
 6. Paint finishes (high quality Velvagio and to cheap no-name brand)

- ii. What have we left over

1. Foundation

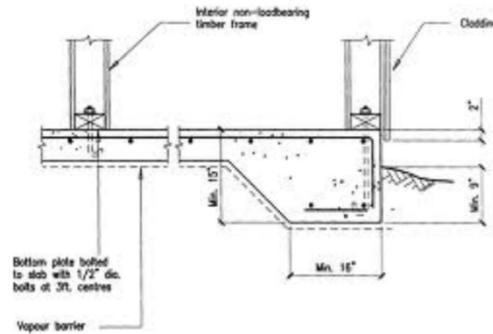
Conventional

Ok in a conventional build one has to carry the weight of bricks, lintels and a whole lot more . So here one normally digs down to a solid ground base , creates a footing foundation then builds up walls to the level of where final floors will sit. Compaction and fill is then introduced to get ground level and ready for DPC and casting the foundation. Here internal walls sometimes also have to have similar footings due to weight of structure



LSF Construction

As the complete weight of the whole building will be about 20 – 35% the weight of the brick structure , one does not need to have such a heavy foundation.



So here one can go for a strip foundation. This is done with possibly a bit of cut and fill, however is considerably quicker and cheaper. Notice the cladding is lower on outside to prevent water penetration. Also often we put polystyrene inside the ring of thicker foundation – this adds considerably to insulation of the structure

For purposes of the discussion we will leave out complications like reinforced concrete piers, cantilever structures, etc.



LSF Foundations are considerably cheaper



A good idea that one cannot do with Conventional build is that there is no walls or items obstructing the casting of the whole floor. Here one can use a Terrasol colour Hardner and polish it into the whole floor. This could save up to R400/m² on house as one does screed, bed down tiles and grout, etc

2. Walls

Ok this is where the most interesting comparison comes. It is also the most difficult to compare, so one has to look at the options available to both construct methods

Brick and mortar can be either cement brick or ROC (Red Oxide Clay) bricks that are then plastered inside and out. Alternatively one goes for a facebrick on outside and ROC/Cement on inside. This price can range from R2/brick to R5/brick or R400/m² to R650/m² (prices approx end of 2013)

New rules in the 10400xa code states that some insulation must be put on perimeter wall between inside and outside to get a higher insulation factor. This adds up to more expense

LSF has numerous choices. As it has excellent insulation one does not need the double brick with insulation in cavity. So the cost saving here is considerable. However there are various finishes – so cost will be determined by the finish one is looking for

- a. Normal boarding of 10mm outside fibrecement with inside Gypsum board 15mm with insulation in cavity. The finishes on these will once plastered give pretty much the same as a normal conventional brick house. Price

saving is considerable as the speed of doing this is 5x faster than brick as well as the price of the wall in its finished state. Can be around R300/m2



- b. Another popular finish is that of shiplap or staggered boards. Very popular for coastal homes as well as 'country feel'.



Both these pictures are of existing finished structures made from our LSF machines. The shiplap house was owner/builder built – He had no previous building experience



LSF Walls are considerably cheaper than brick wall construction and have superior insulation and sound insulation (if correct procedure is followed)



Another huge cost saving and speed is the utilities. In other words the electrical , plumbing , aircon pipes , IT cables. These are all put in after the walls and doors and windows are put in but before inside boards are clad. Plumbing can be checked thoroughly before boarding up , so no 'post' chasing is required.

3. Roof truss system

Not another simple subject once again. So let's look at

Conventional build

Here it is normally a wood truss system that is nailed together. The purlins are spaced depending on if Steel, cement tile or slate ,etc. However a Light steel frame truss system can be used on top of the brick structure. In 2012/2013 this

was the largest growth of Light Steel Framing in South Africa as more people realise the advantages of Steel trusses.

Steel Frame Home

Here one normally sticks to steel Web trusses or a steel panel roof. Ok , another curved ball .

Web Truss.

A web truss is the traditional shape of a truss that has a bottom plate , a top plate and some lattice webs in between.



A rather messy structure of wood and hence the roof area (Attic) is invariably unusable as a space

Panel Roof Structure

Here they are flat panels put on the roof structure with an apex or load bearing walls carrying the load. Normally used for Coloured steel roof due to weight bearing of the roof.

Very quick assembly method and economical



Roof structures are complicated due to the type of roof finish required , however like on like comparison – light guage steel trusses have

more versatility however on a price basis maybe 15% cheaper due to accuracy and speed. LSF Panel roof construction comes in a total winner regarding added 'free space' in an Attic and price



Amazing Attics can be created or double volume rooms are created with this that conventional wood trusses cannot do. One can easily however do this with brick walls and conventional building method to eave height. Even timber truss companies recommend steel trusses when span goes more than 8 – 10 metres. Steel trusses can span up to 18m with a record of up to 24m in light gauge steel has been achieved



IN SUMMARY

Light Steel Frame structures are cheaper due to

1. Foundations are cheaper
2. Walls are cheaper to build
3. Optional savings on Roof can be made

2. Comparisons where Conventional Build can't compare

- Speed on construction: LSF is about 4x faster to build than conventional build. Reduced time for construction allowing earlier occupation , faster return on investment . Less having to lease temporary home while house getting built.
- Waste about maybe 3m³ will be hauled away with a LSF home vs probably 40m³ or 20 tons of wasted sand, cement , bricks , wood , etc
- Water usage is absolutely minimal
- Energy saving of home to heat up and cool down is considerable and will save over 75% of the electricity bill in heating/cooling component

The concept of the thermal jacket that LSF (or cavity wall) creates is exactly that - it insulates itself from the temperature variances outside. However if one opens all windows and doors on a hot day - it will warm up faster than a 'high mass' house (eg brick or concrete) . This is called the thermal mass.

One can compare it to a VW GTI vs a truck. The GTI can acclerate and decelerate quickly , while a truck gets to speed over long time and slows down over long period. Another comparison is a flywheel - it is there for inertia.

So ones argument is that LSF can get hot quicker if windows are left open etc on a hot day . However much like a fridge (identical principal) , if you keep doors and windows closed (and even close the curtains) then it remains cool inside (and with maybe a 15min blast from a small aircon can cool a house down by 10 Deg C in comparison to 5

aircons running 24/7 cant cool the thermal mass of a hot house) Bricks retain their heat for a long time - Why did Spur have the hot rock = retains heat longer.....

So in simple terms Thermal Insulation vs Thermal Mass will be the eternal argument between cavity vs solid walls. The secret is to fuse the best of both worlds and have a thermal fly-wheel in a house somewhere. Situated in such a way that it balances the insulated structure . This then moves toward the concept of a ZERO footprint home.

The above argument is same in winter times just heat has to be put in . A heck of a lot with a brick house and a tiny bit with a thermally insulated house

- Theft and pilferage is reduced as only items required are delivered to site. Once the place is closed up and can be locked (sometimes up to 4 months prior to a conventional build) then control can be exercised
- Fire Resistant rating is higher as there is no combustible materials to burn – unlike wooded trusses in conventional house .
- Totally Green construction with Steel , fibrecement (uses recycled paper) and gypsum (uses dust from Coal power stations) are all made from a large component of recycled material
- Termite free – same reason . No organic materials used.
- Accuracy – The complete structure is generated using CAD/CAM technology . So accuracies of up to 10mm can be achieved in a 5x5m room. This implies you could get your kitchen made with tops when construction begins. Building no longer is linear but concurrent building methods can be used. Walls are straight and corners are precise.
- Energy saving of home to heat up and cool down is considerable and will save over 75% of the electricity bill in heating/cooling component
- Extra space . Imagine a house with an area of 15x15m = 225m². The walls around the house would be at least 15x4 = 60lm . As a normal brick house must be at least 250mm and the LSF house will end up with boards on either side about 120mm .

This implies that there is an extra 250-120 = 130mm x 60m in space or nearly 8m² extra space. This is virtually a complete bathroom extra – for free !!!

- Much more versatility in construction methods
- Steel will last up to 600 years so no problem with longevity
- LSF can withstand earth tremours and earthquakes and subsidence far less than conventional brick buildings.
- Large saving in transport costs of building materials.
- This method can be used in areas that are eco-sensitive , below flood plains , on top of mountains that access is not possible (eg a complete LSF village was built in St Helena Island to house the construction team building a new Airport – All materials where shipped from South Africa)
- Quality control – As most items are produced in a factory with assistance from computers the end product will be much better quality . However all construction methods have their failings . Likewise a bad LSF builder can cut corners and make a hash up. This is why the South African National Standards has created a code called SANS517 that builders must conform to.