STAND 47 CASE STUDY

Building a contemporary, upmarket home using state-of-the-art building materials and considered design processes.

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INTRODUCTION TO STAND 47

Can one use hi-tech light steel and drywall technology almost exclusively to build a luxury South African home that not only embodies the best qualities of design, but also remains adaptable over time (to be relevant to changing needs), resource efficient (to build and to run) and comparable to if not better than traditional building materials? This is the question that The Stand 47 Case Study aims to answer and this document will guide you along the process taken in creating this house.

THE DRIVE BEHIND THE PROJECT

The idea behind Stand 47 is to explore the process of building an upmarket house in South Africa using high-quality contemporary materials and construction techniques featuring Saint-Gobain residential drywall systems. While many examples of this type of construction exist internationally, there are few examples locally that demonstrate their effectiveness within the high-end residential market. The purpose of Stand 47 is therefore to:

− demystify these materials and technologies,
− document building a home in this way,
− and lastly, to demonstrate the quality and benefits of the final product.

In conducting this exploration, the drive behind Stand 47 has evolved and not only includes building better, but also building smarter, so that the house becomes a home that moulds around the long-term needs of a ‘question-mark’ family and promotes feelings of calm, comfort, flexibility, health and safety.

OUR RATIONALE

While building Stand 47 would be able to explain and physically test our ideas, it was clear that in order to demystify the process (and in some cases realign some misconceptions about drywall homes) the actual building process would need to be public. We knew that people had to be part of the process of building the home to experience it themselves, in order to see how drywall systems compare aesthetically and functionally to that of a traditional brick house. However, construction sites are traditionally closed off to the public for practical safety reasons. Therefore, to reach the most people in a highly accessible way, a website was created that could track the development of the project from start to finish in four easy steps. These are:

1. Accommodation Schedule – identifying user needs and the concept for design
2. Design – refining the details of the home to fulfil the vision of the concept
3. Specification – select materials and technology to realise the design intention
4. Construction – create the physical structure to test the theory and design
This sequence of four steps divides project progress into more manageable stages each with their own priorities. Perhaps most importantly, they serve as a basic framework from which any person interested in building their own home can approach its design and construction – and know what to expect!

**DATA COLLECTION**

Dividing the Case Study process into four easy steps made documenting building progress easy to conduct. Each stage was summarised with intentions set out in advance and the outcomes and lessons learned in retrospect (these will be discussed in more detail in the next section). A visual diary was created on the website in which photographs documenting milestones in the project were discussed, and other relevant information was shared. Meetings, site visits and reports from the project team were recorded and formed the basis of the content within the visual diary as well as connecting with followers on Facebook and Twitter.

**DESCRIPTION OF THE PROCESS**

Stand 47 is a high-end home located within the semi-rural setting of Monaghan Farm eco-estate in the northern fringes of Johannesburg near Lanseria Airport. The scenic landscape of Monaghan Farm as well as its design and development ethos is based on conservation of the Highveld grasslands and influenced the design of the case study house. The site is on a hillside next to a row of mature trees that informed the window placement and directed views through the house and the decision to create prospect and refuge in the natural setting.

**Collaborative professional team**

The process involved a close collaboration between an innovative number of individuals and their firms. On-going research and development between the parties in the initial stages of design and later during construction led to the refinement of a building technology that was new to the area. Through close collaboration a high level of innovation and development occurred. A full list of the project collaborators is provided under quick facts.

**The concept**

The concept behind the case study was to build a better home by using considered design that utilises contemporary materials. A large part of this involved exploring how we would achieve this by doing more, with less (which we termed efficiency) and by having a better process to guide the project from start to finish. The project process consists of four clear steps that clearly guided the intent and objectives. This provided an important role to guide the concept in addition to the expectations throughout the development.
Building Stand 47 in four steps

Modern-day building constraints combined with contemporary construction materials and technology led to a review of the traditional process applied to building Stand 47 consisting of four steps:

**Step 1 the accommodation schedule**

The purpose of this step is developing an architectural brief with a detailed accommodation schedule to guide the entire process. For a house to be designed in a considered manner, one must first know how it must work before thinking about how it will look. Knowing how it must work begins by setting up an accommodation schedule that lists the rooms and functions required.

The absence of a ‘real’ family meant that Stand 47’s accommodation schedule had to consider the potential needs of a ‘question-mark’ family. This uncertainty informed how uses fit together to makes the house comfortable and adaptable in future; functional service areas are fixed in service zones, while living areas remain adaptable in living spaces. The objectives can be summarised as:

1) Internal rooms evolve easily overtime without compromising the outer shell of the house or its architectural integrity with the possibility for multi-purpose uses.

2) Fixed services (service zone): kitchen, scullery, bathrooms, garages, domestic quarters, and storerooms. Flexible spaces (living spaces): Living areas, bedrooms, study, patios, and corridors. While lifestyles evolve, needs satisfied by the service zone undergo less radical changes, so the ‘living spaces’ must adapt to change more easily.

The house incorporates the best-suited contemporary technologies to create a state-of-the-art home that has capacity to adapt to change, while still feel homely.

**Step 2 design**

The purpose of this step is to create an architectural design concept that builds on a clear accommodation schedule and brief to direct the decision-making involved in resolving and detailing a building. Design requires constant adjustments to technical necessities by exploring possibilities before construction, and in Stand 47 design materialises in the concept of ‘building better by doing more with less’.
Stand 47’s site inspires a design sensitivity toward the landscape by incorporating views, working with the slope, integrating passive strategies for orientation, ventilation, light and thermal comfort, acoustics and water harvesting. It also incorporates principles from the Modern Movement and the Transvaal Regionalists of the mid-1900s that illustrated a contextual sensitivity to site while adopting contemporary materials and technology. The layout consists of two distinct zones; a fixed service area and a flexible living area.

Generating the sketch plan, sections and elevations from the accommodation schedule, site analysis, precedent study and functional layout, provides the architectural quality and spatial character of the house. It is not primarily about ‘looks’. Stand 47’s design qualities include flexibility (fixed outer shell), fixed versus flexible zones (adaptable internal walls freeing up living space), planes (continuous floor and ceiling planes to create the possibility to reposition the internal drywalls), grid (a 900mm x 900mm module making repositioning of internal walls easier), skin (the roof and solar screens), contrast (through zones, structure, and transparency).

Stand 47’s design emerges from a process that always refers back to Step 1’s Fixed vs. Flexible approach, to do more with less. The design also incorporates hi-tech functionality and contemporary building strategies and technologies without losing the feeling of ‘home’ by using organic materials, connections to nature and references to traditional design.

**Step 3 is specification**

The purpose of this step is to adjust the sketch design to material requirements, structural integrity and technical feedback received from the quantity surveyor and structural engineer, while keeping to the accommodation schedule and concept. After a few design iterations, documentation is finalised and the approval processes begin at the various regulatory bodies (estate committees and municipal councils).

Contemporary materials, systems and technologies that meet the objectives of Step 1 and Step 2 are analysed for their impacts on the design. These adjustments are reflected either in layout changes or technical detailing. Stand 47’s specification process refined technical requirements based on the best contemporary options available (such as building systems from Saint-Gobain) to meet the state-of-the-art deliverable that is the vision for Stand 47. Cost projections generated by the quantity surveyor and feedback regarding product performance, alternatives or requirements and alternative energy solutions influence design refinement. Decisions are also often informed by building costs versus the escalating long-term operational costs and energy savings at this point.

Selected state-of-the-art materials and products that influenced the design were:

- Light Steel frame construction (and subsequent ‘training’ of municipal staff)
- Saint-Gobain drywall and ceiling systems
- Saint-Gobain Insulation systems in the walls, ceiling and floor
- Symbiosis of ‘organic’ homely materials versus hi-tech materials
- Integration of Solar PV power
- Approval from the local municipal council for light-steel

Stand 47’s specification is generated by referring back to Step 1’s Fixed vs. Flexible approach, to do more with less and Step 2’s hi-tech functionality, contemporary design and aesthetic. It is a constant processes of refinement before being sent in for approvals or out to tender.

*The final step in our 4 step process is construction*
The purpose of the fourth and final step is to monitor the construction process on site, to work out unexpected issues that might arise from specification or unknown site conditions and to manage timelines and costs. It begins after building plans are approved after which the tender process is opened to interested or selected contractors. The tender closes when the main contractor is appointed based on their tender submission. Stand 47’s high quality materials and vision required that the contractor emulate this excellence in workmanship and construction experience. Collaboration and regular meetings with the contractor and subcontractors, QS, architects, and clients ensure that building work is well monitored, inspected, adapted and executed as per updated drawings to ensure quality control.

The construction process at Stand 47 is guided by the objectives of the preceding three steps. In addition, the decision to document the construction process has formed an archive of valuable lessons, which can guide similar projects and also contribute toward creating a network of like-minded individuals that can build better using contemporary housing solutions in South Africa. Some of areas where the focus lay on building better were:

- Seamless integration between masonry, stone, drywall systems and light steel.
- The installation of drywall systems results in much less wastage, cleaner environment and faster building time.
- The light steel frames with drywall cladding provide a high thermal insulation and improve internal air quality as well as acoustic value and fire safety.
- The use of thermal insulation on the floor slab
- The use of Rhino Wood as a sustainable alternative for door and window frames fitted with 6,38mm Intruderprufe Clear PVB Laminated Safety Glass double-glazed with a 6mm cavity to limit heat transfer through the windows.

The final product (see http://www.stand47.co.za/take-the-tour.html)
The case study house rests on the landscape elegantly along an edge of the property – from a distance during the day it blends into the veld and at night only its lights are visible. It has two distinct zones that have different qualities and in turn are experienced differently. The service zones are compact spaces while the living zones contain generous volumes flooded with natural light and views to the landscape. One enters the house in the living zone of the plan where the social heart of the home lies in the open plan living room and dining room totalling 68.5 m² and contains a few prominent elements:

- a stone clad wall that is seamlessly integrated with Saint-Gobain’s drywall systems (the contrast of cool natural and warm man-made materials)
- a clerestory window made from Rhino modified wood and double glazing framing the view toward a row of trees beyond the property
- a continuous parquet floor and ceiling plane to make future subdivisions neater to accomplish
- All the walls with exception of the stonewall contain no masonry…they are warm to touch, have high acoustic, thermal and fire properties and overall outperform that of masonry.

The house contains three spacious bedrooms within the living zone making up 83m² of the floor area. With exception of the master bedroom, the two complementary bedrooms have customised furniture that can be adapted to accommodate different functions in the room such as children’s bedrooms, guest-bedrooms or a study or home office. The bedrooms have special features which include:

- Drywall and ceiling systems from Saint-Gobain that decrease the transfer of sounds and isolate noise within the rooms, provide high levels of thermal insulation, and also products that can improve the indoor air quality reducing the level of VOCs within rooms.
- The doorframes made from Rhinowood that use sustainable technologies to treat pine to a more hardwearing and durable state, along with double glazing which limits the transfer of heat and sound.
- The placement of the doors not only frames views but also make it easier to change the size of rooms in future without having to change the size of windows.
- In the spare rooms, custom-designed cupboards with shelves and a built in desk from which a section can be pulled down to reveal a ¾ bed.

The service areas contain the kitchen and bathrooms as well as the ancillary fixed services that are more difficult to adapt. These spaces consist of about 56m² have also been designed to provide a fair amount of flexibility of use. The second bathroom is designed so that the bath, basin, toilet or shower can be used separately at the same time, and the kitchen services and pantry (including the heat pumps, and PV computers and meters) have been separated from the main kitchen area. Special features within these spaces include:

- Moisture resistance drywall systems from Saint-Gobain with water repellent additives in the core and can be used in wet areas like bathrooms and kitchens.
- The design of a large opening window in the kitchen that assists with the flow of air through the living area for passive ventilation also creates a direct link to the herb garden outside.
- The tiled floors in the service areas provide a more hardwearing surface than the parquet.

Stand 47 integrates sustainable technologies like PV roof panels and rainwater tanks within the design and makes the most of design features like a large over-hang on the northern façade and solar screens on the east and west. This design solution limits the amount of overheating in the home in summer, improving the thermal efficiency in the home by using a north facing orientation which also allows for the home to open up to its indigenous garden and sweeping views of the farm. Its architecture combines the best in Modernist design principles, but roots them to the local context and contemporary needs. Its systems ensure that the home is as self-sustaining as possible. Its landscape shelters it, contrasting openness with enclosure. Its materials and
construction systems are state-of-the-art and demonstrate that a quality home using efficient alternative materials that embody the high innovation talent in South Africa can be built.

**FINAL CONCLUSIONS**

The Stand 47 Case Study explored whether it is feasible to build a contemporary, upmarket, efficient and comfortable South African home using light steel and contemporary drywall technology. Over two years following the four step process, we were able to design a luxury house that embodies the best qualities of design, remains adaptable over time, is resource efficient and of high construction quality. We built a better luxury home using contemporary materials that achieve more with less.

Stand 47 has been able to:

- **demystify** materials and technologies through a number of posts on the website,
- **document** building a home in this way, through the visual diary, Facebook and Twitter sites,
- and lastly, **demonstrate** the quality and benefits of the final product by building a home that people can visit and experience for themselves.

By building better, Stand 47 gave rise to building smarter: a home that moulds around the long-term needs of a question-mark family and promotes feelings of calm, comfort, flexibility, health and safety.

**LESSONS LEARNED**

Case study houses always offer a few lessons to make things easier next time round. In Stand 47’s case, the lessons were widespread, from needing to tackle myths about light-steel construction with dry walling to pioneering risks taken in using some materials and technologies for the first time.

General Lessons included:

- A good process and concept: Undertaking an innovative experiment like a case study requires a lot of pre-planning based on a good architectural design to develop detailed documentation for construction. The four-step process provided clarity for realising Stand 47.
- Training: The need to ‘train’ the local municipal councils of the benefits and properties of light-steel construction with drywall systems from Saint-Gobain was necessary in order to get building plans approvals. A workshop with local plans officials demonstrated to them the technical quality, performance and energy benefits of this construction system.
- Contractor selection: Having a main contractor that understands the construction contracts and can manage all the sub-contractors on site becomes very important. In Stand 47, it was essential to determine whether subcontractors had the capacity and expertise to execute their contracts within the prescribed timeframes. A good main contractor and suppliers are essential to the success of a project.
- Delays: A number of delays can wreak havoc with the construction process and sequence of activities on site. It is important to provide for a few scenarios within the extended timelines where realistic delays due to climate, industrial action, product research or supplier related delays might significantly prolong the progress of key aspects of construction work.

Specific lessons learned:
- Research and development: many of the systems, materials, technologies and products are used for the first time in such an integrated manner in South Africa. This requires a great deal of research and at times decisions have to happen quickly. The cost (in delays and budget) of this type of pioneering activity can be higher that using standard systems, and must be considered early on in the project through some form of buffer.

- Collaboration: the collaborative process is essential to the design and realisation of a case study house but there are implications that might slow down the process when too many people get involved and there are no clear structures for communication and decision-making.

Stand 47 provides lessons regarding the integration of various contemporary building materials and technologies with traditional ones as well as a greater appreciation of the number of alternative high-quality building solutions readily available in South Africa. From this perspective, Stand 47 was successful in providing an opportunity to iron out some of the technical issues that might arise in building a home with these systems, while simultaneously educating and generating interest in the building sector and the public by providing them with an example that they can experience the benefits of themselves. It is not a hypothetical project – it is the real deal!

CONCLUDING SUMMARY

Stand 47 as a case study project aimed to test the hypothesis that a luxury house can be built just the same if not better, using contemporary building systems rather than a masonry house. In testing this hypothesis, it has proven that it is not only possible but that by following a clear process the results can out-perform what we expect from housing in South Africa: better performance, better comfort, better safety and better health. The entire process that comprises Stand 47’s development and construction can be found in a Visual Diary on the website and creates a platform for sharing our findings, the products used and the benefits that this type of construction can offer homeowners. This is also the focus of the website going forward.

STAND 47 QUICK FACTS

Location: Monaghan Farm, an eco-estate near Lanseria Airport just north of Johannesburg

Site: Stand 47 is located on a North facing plot, predominantly covered by veld grasses and indigenous aloes. The house is sunk into a gently sloping site that falls 3m toward the East with extensive views toward the Magaliesberg valleys. Framed on the South by a line of mature trees, the site plan is defined by strict architectural guidelines set up by the estate aesthetics committee. With a maximum coverage of 1298sqm, Stand 47 may not exceed one storey and 1000sqm in size, and has ‘earthy’ external walls and roofs that do not increase visual bulk, but blend into the landscape.

Size of Stand: 3766m²

Size of House: 333m² plus a 41m² enclosed carport

Size of open plan living room and dining room: 68.5m²

Number of bedrooms: 4

Number of bathrooms: 3
Special Features (Materials and Systems):

- Light Steel frame structure
- Saint-Gobain Gyproc internal drywalls including Gyproc RhinoBoard, MoistureResistant, Duraline, FireStop & Activ’Air plasterboard and RhinoLite gypsum plaster.
- Saint-Gobain Weber external drywalls using the ETICS system
- Saint-Gobain Isover insulation systems including Aerolite and Cavitybatt
- Saint-Gobain Isover PolitermBlu floor insulation
- Rhino Wood timber door and window frames
- Intruderprufe Clear PVB Laminated Safety Glass double-glazed with a 6mm cavity
- Photovoltaic panels with battery packs
- Rainwater harvesting tanks
- Integrated heat pump
- Gas stove

Collaborators:

Gavin Rooke (owner, developer & founder)
Saint-Gobain (lightweight buildings systems and products – www.saint-gobain.co.za)
Thomashoff + Partner Architects (architects – www.thomashoffstudio.co.za)
Style Projects (main contractor - www.styleprojects.net)
Rhino Wood (timber supplier for door and window frames - www.rhinowood.co.za)
Amoretti (specialist Rhino Wood window and door Manufacturer - www.amoretti.co.za)
Ample Power (photo-voltaic sub-contractor - www.amplepower.co.za)
Ebony Design (furniture and fine art curators - www.ebonydesign.co.za)
The New Order (Consumer Strategy – www.theneworder.co.za)
Edna Peres – content development

The extended version of this case study is available online:
www.stand47.co.za
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