

LIGHT STEEL FRAMED CONSTRUCTION AND MODULAR HOMES

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Abstract: One of the greatest benefits when using these alternative building methods to construct affordable homes is the speed of erection. Delivery of units will be maximized while the quality will also be improved. At the moment one of the biggest problems with the RDP houses is the speed of delivery which causes the housing backlog in South Africa. This system has developed into a construction technology that addresses eight key challenges embodied in the low cost and affordable housing shortages facing developing and design tables to aid rapid selection of light steel sections, depending on the span, the loading and the steel grade used.

KEY WORDS: MODULAR HOMES, FRAMED, TECHNOLOGY, DEVELOPING, DESIGN, CONSTRUCTION.

1. Introduction

These homes must be affordable for households with a median income. In South-Africa more than 60 % of the population falls within this definition. It is not a new realisation though. After the 1994 transition to democracy, it was very important to stabilise all housing provisioning. To overcome the fragmented housing regime with its skewed racial focus and to immediately start delivery. The all ANC's Reconstruction and Development Programme (RDP) stated that there was a lack of adequate housing and basic services in rural settlements and urban townships and that it had reached a point where severe changes had to be made. The ANC also endorsed 'Housing as a human right' and this made one of the RDP's priorities to provide for the homeless. In the last four years and average of 250 000 subsidised houses were built every year. The National Housing Finance Corporation (NHFC) and the banking sector's R42-billion Financial Service Charter commitment to the low income housing market has helped to provide houses through innovative access to housing finance. While a lot of houses were delivered, a problem became apparent between the competing demands of affordability and quality of the delivered houses. Corruption levels were also rising and became very serious. Little attention was given to the areas in which these homes were being built in respect to the supporting social and economic infrastructure. One very important aspect of this housing incentive is to increase its delivery over the next few years. "Reaching the target of 500 000 new housing opportunities requires funding of R345-billion by 2014, if we integrate the delivery of infrastructure and basic

services. We are lobbying for a one-off injection to the budget to kick-start the process of boosting housing delivery," Housing Minister, reported (February 2008) [3]. The National Department of Housing (NDH) developed a plan called the Development of Sustainable human settlements, also known as Breaking New Ground (BNG), through which the government aims to ensure that every citizen has access to permanent housing that provides protection and access to basic services. One of the BNG's objectives is to get rid of all informal settlements by 2014.

2. Low moderate houses

RDP houses are at the lowest level of the affordable housing market, but the shortage also exists in more expensive, but still affordable houses (those costing less than R200 000). The Banking association reported that there is a shortage of 625 000 affordable houses in Kosovo. At the moment 17 000 units are being supplied a year, while 132 000 houses is needed to reduce the shortage by 60% in the next 5 years. The banks committed themselves to provide R42-billion worth of housing finance to low-moderate income households. If there aren't enough houses for households to buy, they won't need loans and the banks won't meet their targets. An analysis was done for the city of Johannesburg demonstrating the skewed housing delivery patterns that occurs notwithstanding the distribution of household affordability for housing. The table shows the number of units delivered per type in Johannesburg, versus the percentage of the population for whom such housing was affordable. The population is skewed towards the bottom of the income pyramid delivery is skewed towards the top end [5].

Table1: Housing delivery according to monthly income.

Monthly household Income category	% population (Johannesburg)		Housing type affordability (indicative)	Number delivered in 2004	% of total delivery
>R10 001	15%	15%	Mortgage >80m ² Sectional title	6,217	36%
R7001-R10000	5%	18%	Mortgage <80m ² Social housing	9,594	56%
R5001-R7000	6%				
R3501-R5000	7%				
R2501-R3500	9%	68%	Subsidised housing (RDP)	1,436	8%
R1501-R2500	10%				
R0-R1501	49%				
Total	100%			17,247	100%

This table also shows the high percentage of households earning less than R3500 a month and who qualify for RDP housing.

3. Quality of low income housing

The CSIR (March 2013) showed significant performance and sustainability enhancements for low income housing. Crucial planning is imperative to investigate how urban growth can be made more effective, especially regarding how urban growth can be developed cost effectively. The CSIR is researching solutions, through pilot projects, to some problems existing within the subsidy housing projects. The pilot project was started by the Department of Science and technology (DST), were the CSIR will assist in evaluating the efficacy of alternative technologies to improve the sustainability of the two housing projects in the Western and Eastern Cape. If one wants to look at the sustainability and self efficiency of the housing development, it has to include any environmental, technological and ecological issues. "To achieve this, certain basic research questions must be answered, such as what the thresholds/tipping points are of the approach (income, rainfall, wind speed, number of solar hours, number of units, size of land, access to jobs); and what technology is available to extend and maximise these thresholds", CSIR architect (April 2013) [4]. To assist research into innovative technologies in general, and their performance-enhancing capabilities in particular, the CSIR has built two pilot houses on its test site in Pretoria to investigate technology options. In recommending technologies to the DST, a fundamental component of the CSIR's research is addressing anticipated energy and water shortages facing the country. Certain technologies that are known to offer other benefits, such as job creation, are also being targeted. Similarly, the potential of the specific geographic conditions of the sites and the surrounding areas - for example local soils - must be investigated to see whether it could add value to the development. The location of the sites and the connections of these to existing and adjoining sites - such as public open space systems - must also be explored to ensure that these connections are maximised. "For our development proposal to serve as a model, it must not burden the financial sustainability of local authorities. One of the ways this can be done is to reduce the dependence of the development on municipal services, for example, use a range of technologies such as wind generators in conjunction with solar collectors. The introduction and implementation of sustainable urban drainage systems can also be considered together with a range of water treatment technologies."

4. Alternative for affordable housing

It is recognised that some contractors working in the low income market often do not lay foundations to standard. To eliminate cracked walls resulting from sub standard foundations, a CSIR - developed housing alternative technology - ultra-thin continuously - reinforced concrete used for roads - was adapted to form the foundation slab of the house. "Local labour can be used to construct such foundations (October 2008) [1]. One big difference to current houses is that the design of the bathroom/kitchen area was rationalised, and a waste outlet manifold used that is pre-manufactured, quality-tested and installed on site. This has reduced the extent of the plumbing installation substantially while ensuring that the installation is done to the required standard. Low income houses have no ceiling at present and thus no insulation, which results in incredible variations in temperatures. The thermal performance of the roof was improved dramatically with the addition of an insulation material that doubles up as a ceiling.

5. Prefabricated houses for low income housing

Prefabricated houses can be pre-assembled and delivered to site. A feature of prefabricated houses is:

- Low cost
 - Convenient
 - Durable
- They are all made of standardized components, and connected by bolts. We can design;
- Make the prefab house according to the customer's is specific requirements.
 - The houses can be assembled and disassembled for dozens of times and can be removed 10 times.
 - All the steel components are painted and anti-rust which can be normally used for more than 20 years.
- The steel structure makes the house resisting heavy wind of 100km/h and 7 grade earthquakes [2]. The wall system of colour steel sandwich panel has a good fire proof and heat insulation performance.
- Waterproof design of all steel structure.
 - Environment - protection without any building rubbish.
 - The transportation is convenient and one 40HQ container can load about 250 m².



Figure1. Basic prefabricated house

5. Conclusions

There is a housing problem in South Africa and the subsidized housing backlog is putting a lot of pressure on the government to deliver these types of housing. A study done by the CSIR shows those modular homes can be used for RDP houses and also to enlarge the existing houses. By using modular homes and light steel construction, the delivery would speed up, and better quality homes could be built for less.

Modular homes and light steel framed structures can both be used for low income housing and people would benefit from building or even renting these houses. The delivery of low income houses can be scaled up through the short construction periods and these construction methods also have the advantage of pre-assembly or factory assembly which would stop any unnecessary mistakes creeping in. The light steel construction industry is rapidly growing and SASFA already has 36 companies who are members who manufacture and erect these homes. The government has to do something about the housing backlog and these alternative building methods might just be the answer.

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