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COMPARATIVE STUDY BETWEEN LGSF BUILDING AND CONVENTIONAL BUILDING

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ABSTRACT

As load-bearing and non-load-bearing parts in commercial and residential structures, light gauge steel frames are becoming more prevalent. The study and design of light gauge steel structures using STRAP software is the goal of this work. After some time, the house structure sector has developed better materials and development tactics, leading to fabricating systems that are as excellent as ever. Homes are now more livable, sturdy, safe, economical, and environmentally friendly because to advancements in construction materials and building methods. In both load-bearing and non-load-bearing components, Light Gauge Steel Frame (LSF) divider frameworks are often used in residential, commercial, and land current constructions. We use the codes IS: 801-1975 for cold formed light gauge and IS: 801-1987 for member requirements for cold formed light gauge. Software called Strap is used to model and examine the building. The findings and conclusions of the study are presented, and it is suggested that we design structures using light gauge steel.

Keywords: Light Gauge Framing System, Cold Formed Steel, STRAP Software.

1. INTRODUCTION

Light gauge steel framed buildings (LGSF), which are mostly based on items fabricated of galvanised light gauge metal in manufacturing facilities, are now gaining popularity. The basic building components of light gauge metallic body are bloodless formed pieces that may be manufactured on the website using special connection procedures. Website shape penal excellent wall and ground shaped metallic frame construction. Unique types of screws and bolts are used for mounting. Bloodless formed materials are widely employed in construction, including residential apartments, commercial buildings, office buildings, and hotels, and are becoming increasingly appealing. within the housing industry. In North America, Australia, and Japan, LGSF is already well-established in residential construction, and it is expanding in India. The LGSF is constructed according to a codal machine with load requirements that are commensurate with Indian regulations and is based on a long-standing system of mild gauge metallic systems. LGSF is often appropriate for one to three storey high rise buildings, including residences, apartments, and office buildings. This technology offers a lot of potential for countries like India because of its adaptability, speed of development, and durability. A composite deck made of metal and concrete may be used with the LGSF light steel frames for walls. Along with the possibility of public housing, LGSF may be utilised for short- or long-term permanent structures, such as college and lecture halls, military and civilian housing needs, submit disaster relief structures, and commercial dwellings. The proper span for LGSF houses is 7.5 metres. Light gauge framing is often utilised in high-rise commercial and multi-family residential construction to support internal walls, outside walls, and cladding. However, the whole structural machine may be built with a light gauge in numerous mid upward push coffee rise packages. The creation of a light gauge body. A metallic part. Due to the shape's non-flammability, wood has a lot of promise and a sustainable option. Comparing the development speed to the traditional RCC approach, it is much quicker.

2. OBJECTIVES

A comparison between light gauge steel framing (LGSF) and traditional building techniques aims to assess the advantages, disadvantages, and overall effectiveness of each type of construction. Insights on a number of factors, such as structural integrity, cost efficiency, construction time, sustainability, design flexibility, and durability are sought for by the research. The research may assist stakeholders, including architects, engineers, contractors, and developers, in making knowledgeable judgements when selecting the most appropriate construction style for a particular project by comparing these two building techniques.

3. METHODOLOGY

1) Thinking about a single G+1 residential building plan

2) Create a Strap software model of the building

3) The structural model analysis below has an effect on the subsequently chosen loads. According to IS 875 Part 1, dead loads

Set loads in accordance with IS 875 Part 2

4) Analyse the wind loads in accordance with IS 875 Part 3 and design the structure utilising strap software.

Description of the model

The research takes into account residential construction. Each floor is 3 metres high, and the beams and columns are made of channels with lips on both the back-to-back and front-to-front sides. Design uses steel grade fy 500. Floors and Roofing utilised Galvanised sheet. Live loads for the roof are 0.65 kn/m2, all rooms on the floor are 2 kn/m2, and the balcony is 3 kn/m2, correspondingly. In STRAP, a 3D model of the building is created. For the research, a G+1 story building is taken into account. Figure 1 depicts a building plan.

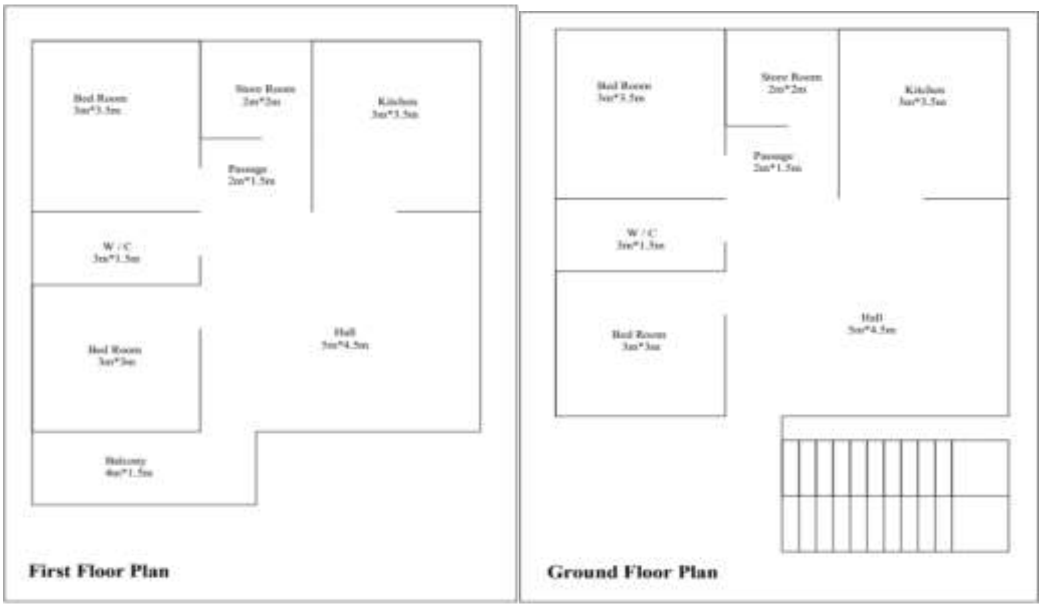

Figure 1: Ground floor and first floor plan of conventional Building

4. MODELING AND ANALYSIS

STRAP software is used to simulate the light gauge steel construction. Light gauge steel was utilised throughout the construction for analysis and design.

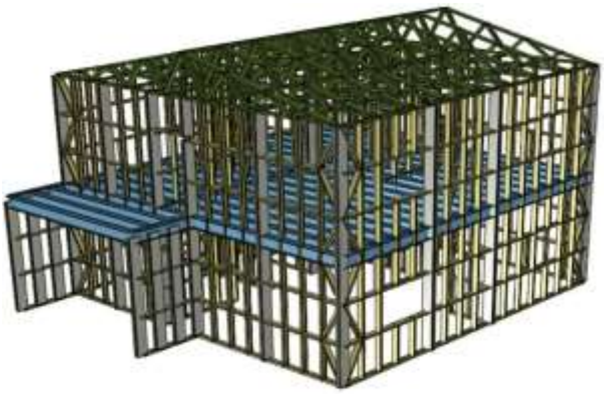

Figure 2: 3D Render view of building.

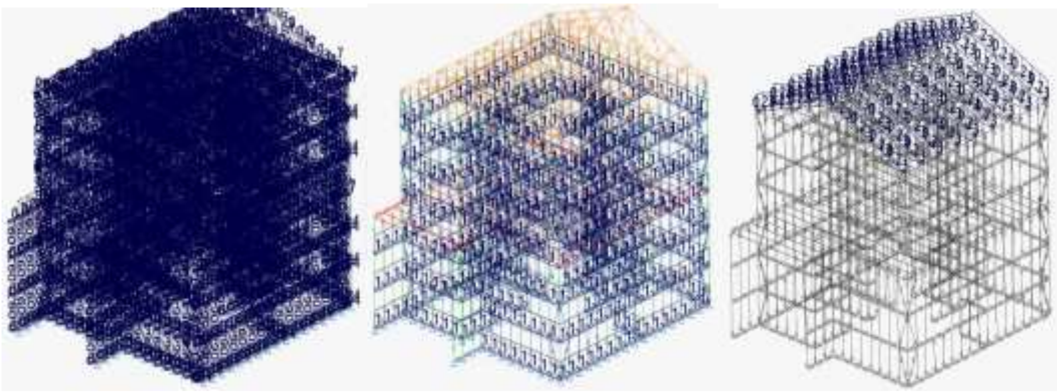

Figure 3: Self weight and Dead load

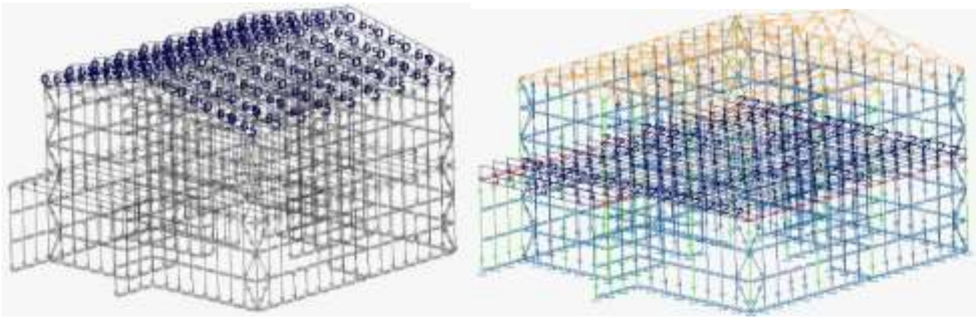

Figure 4: Live load on roof and floor

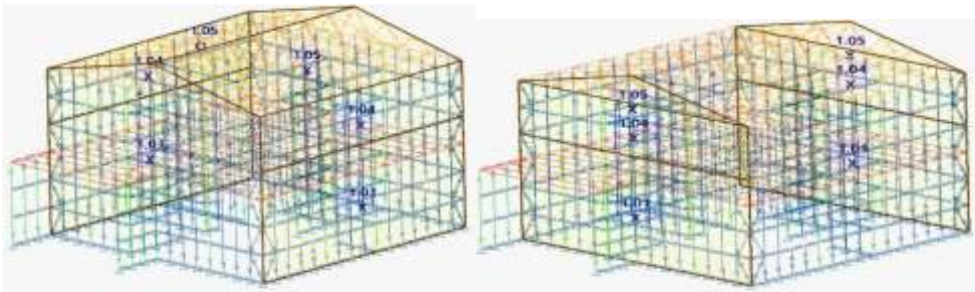

Figure 5: Wind load on structural model

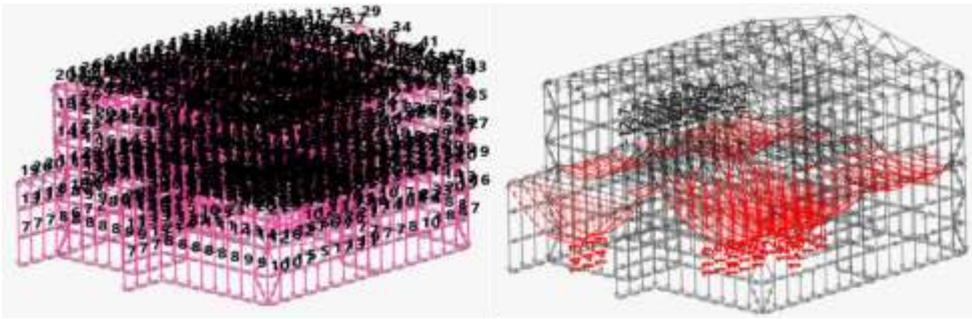

Figure 6: Displacement and Bending moment

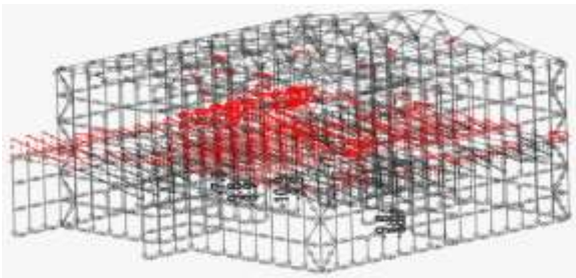

Figure 7: Shear Force

5. RESULTS AND DISCUSSION

Analysis results of displacement

The maximum displacement of the nodes getting after analysis of the structure. All the defection are with in the allowable limit.

Table 1. Maximum deflection

Node	Direction	Maximum deflection in ‘m’
1022	X1	0.00073
1108	X2	0.00062
1019	X3	-0.00479
830	X4	-0.004576
1025	X5	0.0052519
1007	X6	0.0012767

Analysis results of support reaction

The support are getting after the analysis of the structure using STRAP software

Table 2. Support reaction

	Node	X1	Node	X2	Node	X3
Max	69	1.453 kN	17	2.123 kN	364	47.236 Kn
Min	85	-1.313 kN	85	-1.938 kN	82	1.693 kN

Analysis results of max shear force and max bending moment

Table 3. Maximum Shear Force and Bending Moment

	Beam number	Maximum	Unit
v2	2007	21.582	kN
v3	1946	89.539	kN
m2	1945	43.567	kN-m
m3	2271	10.789	kN-m

Table 4. minimum shear force and bending moment

	Beam number	Minimum	Unit
v2	2007	-21.538	kN
v3	1488	-89.586	kN
m2	1488	-44.273	kN -m
m3	2271	-10.79	kN -m

Section Summery

The table below displays a summary of the sections that the manual assigns to the programme. Using manually defined sections, software analysis is used to develop the structure. Following completion of all sections, the summary section is provided below.

Table 5. Summery manually given section

Sections Summary Table			
Section	Total length (m)	Weight (kN)	Sub-total (kN)
CLB2B 304.8x177.8x25x3.4	357	48.92	100.428
CLF2F 127x50.8x15x3.4	799.57	51.508	
CLIPS C120x50x2.0	328.35	12.21	23.318
CLIPS C250x50x1.6	239.8	11.108	
Total weight:	123.746		

The below table shows the section summery after optimisation of the structure. Software analysis and design taking automatically best section for the member and design the structure. Section summery given below.

Table 6. Summery of software chosen section

Sections Summary Table			
Section	Total length (m)	Weight (kN)	Sub total (kN)
C+LIPS 12x3.5x0.135	357	48.92	89.597
C+LIPS 5x2x0.105	799.47	40.677	
CLIPS C100x50x1.9	328.35	10.644	21.761
CLIPS C250x50x1.6	240	11.117	
Total weight:	111.357		

6. CONCLUSION

1) The structure is basic and adaptable at any point in its service life.

2) The characteristics and benefits of light gauge steel sections are examined in general. Cold-formed steel sections have excellent performance all throughout the globe. in order to protect our structure, our lives, our environment, our society, and the next generation.

3) Light gauge steel has excellent flexural behaviour. Both the building's vertical and horizontal displacements are insufficient to give the impression that it is stable. Stiff frames make up the floor plane and the roof plane. The residential building has adequate capacity under restraint, according to the findings. Due to its apparent lower cost, light gauge steel has a bright future as a structural material.

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