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LITERATURE PAPER ON COMPOSITE STRUCTURE

ROSHAN BHATIA[1], RUDRADATT JADHAV[1], MAYUR JOSHI[1], NIL SHAH[1], MEET VAGHELA[1], ABHIJITSINH PARMAR[2], DHAVAL M PATEL[2]

1. U. G. student, Civil Department, SVBIT, Gandhinagar, Gujarat – 382650
2. Assistant Professor, Civil Department, SVBIT, Gandhinagar, Gujarat – 382650

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Abstract: Since last few decades we have seen outstanding advances of composite structures in real life for constructing durable, long lasting, strong buildings. [1] By using this research, we will try to explore composite structure by various means. Main goal of the project to provide sustainable, Durable and economical structure to the society. Structural members are design to resist all forces like compression, tension, stress; axial force etc. members are casted by different material or combination of different material. Every material has different properties like concrete strong in compression and weak in tension and opposite to that steel is strong in tension and week in compression. All flexural members in structure neutral axis, which separates compression and tension zone

Keywords: Composite Structure, Composite Material, Strength, Durability, Reinforced Cement Concrete, Steel, Long Life.

Corresponding Author: ROSHAN BHATIA

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INTRODUCTION

Composite Structure: Structural members that are made up of two or more different materials are known as **composite elements or composite structural members**. The Structure made up of these elements is called **Composite Structure**. The main benefit of composite elements is that the properties of each material can be combined to form a single unit that performs better overall than its separate constituent parts. Hence, it gives more strength to the structure with compared to the structures made with normal materials. The most common form of composite element in construction is a steel-concrete composite, however, other types of composites include; steel-timber, timber-concrete, plastic-concrete, and so on.

Composite Beam: Composite beam is a structural member composed of two or more dissimilar materials joined together to act as a unit. An example in civil structures is the steel-concrete composite beam in which a steel wide-flange shape (i.e. I shape) is attached to a concrete floor slab.[15] The many other kinds of composite beam include steel-wood, wood-concrete, and plastic-concrete or advanced composite materials–concrete. [2],[15]

Composite Slab: The composite slab have now become a common practice of construction of floor decks in major buildings. In this, the profile sheet is used as permanent formwork and as tensile reinforcement. In this slabs there is 30 percent saving in concrete material, resulting in reduced structural weight. It favours fast and easy construction and also it proves to be economical.[3]

Composite column: Composite column is mainly made of steel and concrete. A steel-concrete composite column is a compression member in the structure, comprising either a concrete encased hot-rolled steel section or a concrete filled tubular section of hot-rolled steel and is generally used as a load-bearing member in a composite framed structure. Typical cross-sections of composite columns with fully and partially concrete encased steel sections. Note that there is no requirement to provide additional reinforcing steel for composite concrete filled tubular sections, except for requirements of fire resistance where appropriate.[4]

Concrete: Concrete is a composite material composed of fine and coarse aggregate bonded together with a cement paste that hardens over time. There are various types of concrete from which most concretes used are lime-based concretes such as Portland cement concrete or concretes made with other hydraulic cements, such as calcium aluminate cements. Polymer concretes are sometimes used in the composite structure where the cementing material is a polymer.[5]

Girder (steel): Girder is a support beam used in construction. It is the main horizontal support of a structure which supports smaller beams. Girders often have an I-beam cross

section composed of two load-bearing *flanges* separated by a stabilizing *web*, but may also have a box shape, Z shape and other forms. A girder is commonly used to build bridges. In traditional timber framing a girder is called a girt. Small steel girders are rolled into shape. Larger girders (1 m/3 feet deep or more) are made as **plate girders**, welded or bolted together from separate pieces of steel plate.[6]

LITERATURE REVIEW:

P. A.Sarode P 1 P; Dr. S. R. ParekarP, June 2016
Composite slabs which consists of profiled steel deck with reinforced concrete topping. The decking not only acts as a permanent formwork to the concrete, but also provides sufficient shear bond with the concrete and acts compositely. Because of light weight of the composite slabs, construction cost came down to low and durability increadsed against natural disasters. The paper presents the recommendations given by British Standards and Euro codes to use profiled steel deck in composite slab. It also includes the test results of the researchers in composite slab along with shear connectors.[7]

Dimitrios Papastergioua, Jean-Paul Lebetba, February 2014
This paper deals with the design and the experimental verification of a new type of steel–concrete composite beam under static and fatigue loading. The connection is an alternative solution for steel–concrete composite bridges suitable for prefabrication and fast erection, while guaranteeing durability. The resistance of the connection to longitudinal shear is based on the development of shear stresses in the confined interfaces that form the connection. The interfaces include a steel–cement grout interface and a rough concrete–cement grout interface. Confinement is provided by the reinforced concrete slab that encloses the connection. A composite beam was designed according to the design method for such type of composite beams in order to resist cyclic loading and to guarantee in the sequence its bearing capacity at ultimate limit state. The beam was initially subjected to cyclic loading and did not present signs of important damage after five million cycles. The damage on such type of connections is expressed by the development of a small residual slip in the interface which with the appropriate design stabilizes with the number of cycles. Finally the composite beam was statically loaded up to failure. The results show the capability of such a composite beam to develop its plastic moment at ultimate limit state.[8]

Shweta A. Wagh, Dr. U. P. Waghe April 2014.
Steel-concrete composite construction has gained so much popularity in costruction field worldwide as an alternative to pure steel and pure concrete construction. The use of steel in construction industry is very low in India compared to many developing countries because of climate conditions (i.e temperature, etc.). There is a great potential and possibility for increasing the volume of steel in construction, especially in the current development needs in India and not using steel as an alternative construction material. This paper study is for Four

various multistoried commercial buildings i.e. G+12, G+16, G+20, G+24 which are analysed by using STAAD-Pro software.[9]

Shweta A. Wagh, Dr. U. P. Waghe April 2014.
Composite column is a compression member which is mainly of steel-concrete, comprising either of a concrete encased hot rolled steel section or a concrete filled hollow section of hot rolled steel. It is generally used as a load bearing member in a composite framed structure. Composite members are mainly subjected to compression and bending. At present there is no Indian standard code covering the design of composite column. In this paper design method is largely follows EC4, which incorporates latest research on composite construction. Though there is instruction for composite structure in Indian standard IS 11384-1985 but it doesn't make any specific reference to composite columns. This method also adopts the European bucking curves for steel columns as a basic of column design.[10]

You-FuYanga, Lin-Hai Hanbca, December 2006.
In this paper there is a series of tests on steel tubular columns of circular and square section filled with normal concrete and recycled aggregate concrete. In Thirty specimens, including 24 recycled aggregate concrete filled steel tubular (RACFST) columns and 6 normal concrete filled steel tubular (CFST) columns, were tested to investigate the effect of variations in the tube shape, circular or square, concrete type, normal concrete and recycled aggregate concrete, and load eccentricity ratio, from 0 to 0.53 on the performance of such composite columns. The results of this paper show that both types of filled columns failed due to overall buckling.[11]

Materials used in composite structure:

Reinforced concrete: Reinforced concrete (RC) is a composite material in which concrete's strength (shear & tensile) and ductility is very much increased by the addition of reinforcement having higher tensile strength or ductility. The reinforcement is usually, steel reinforcing bars (rebar) embedded passively in the concrete before the concrete sets. Reinforcing schemes are generally designed to resist tensile stresses in particular **parts** of the concrete that might cause unacceptable cracking and/or structural failure. Modern reinforced concrete can contain varied reinforcing materials made of steel, polymers or alternate composite material**.** Reinforced concrete may also be permanently stressed (in tension), so as to improve the behaviour of the final structure under working loads. In the United States, the most common methods of doing this is known as pre-tensioning and post-tensioning. [12]

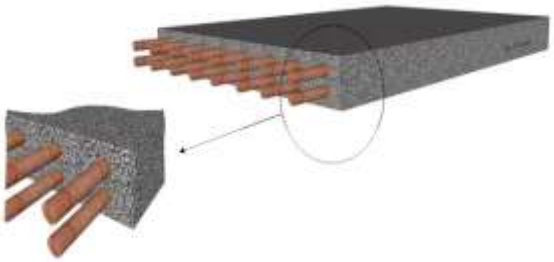

Fig. (a) concrete (https://images.google.com/rcc) **Fig. (b) R.C.C concrete (https://images.google.com/rcc)**

Composite wood Material: Structural members having strength properties comparable or superior to those of solid wood are made from a composite wood material comprised of elongated wood flakes bonded together with a binder. The grain direction of the flakes extend generally parallel to their longitudinal axis and the flakes are oriented so that the longitudinal axis of at least a majority is generally parallel to the longitudinal axis of the structural member. The structural member is formed as a solid one-piece unit or assembled from two or more structural components which are made from the composite wood material and are joined together in angular relationship with an adhesive.[13]

Fig. (c) Concrete with plywood (https://images.google.com/)

Stainless steel: Stainless steels are notable for their corrosion resistance, which increases with increasing chromium content. Molybdenum additions increase corrosion resistance in reducing acids and against pitting attack in chloride solutions. Thus, there are numerous grades of stainless steel with varying chromium and molybdenum contents to suit the environment the alloy must endure.

Stainless steel differs from carbon steel due to the presence of chromium. Unprotected carbon steel rusts readily when exposed to the combination of air and moisture. The resulting iron

oxide surface layer (the rust) is porous and fragile. Since iron oxide occupies a larger volume than the original steel this layer expands and tends to flake and fall away exposing the underlying steel to further attack. In comparison, stainless steels contain sufficient chromium to undergo passivation, spontaneously forming a microscopically thin inert surface film of chromium oxide by reaction with the oxygen in air and even the small amount of dissolved oxygen in water.[14]

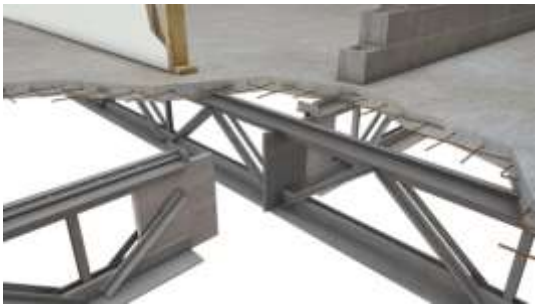

Fig.;(d) steel https://images.google.com/ **Fig. (e) steel https://images.google.com/**

CONCLUSION :

In this paper, we studied about the composite structure and composite materials. Composite structure is more beneficiary than the structure made with cement and reinforcement. From this study we came at the conclusion that composite structure is rapidly spreading world wide and will be in regular practice shorlty. These types of buildings have more strength than ordinary structures, can bear more load, and has longer life expectancy than building made with normal elements(i.e only concrete) and this type of structure is cheaper than normal buildings. Hence, it is beneficiary in all the means.

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