

Difference Between Steel Truss and Composite Truss of Foot Bridge

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Abstract: The Steel-concrete composite construction has become increasingly popular because of its speed in construction and economy also. Research has been carried out on composite structures from last decade. Many researchers have carried out research on composite foot bridge for a span of 10m. The paper aims at analyzing a foot bridge of span 24m using STAAD. Pro for the various loads acting on the steel truss and composite truss structure. It is found that reduced selfweight of composite elements has a knock-on effect by reducing the forces in those elements supporting them and the maximum deflection obtained is well within the limit.

Keywords: Steel Truss, Composite Truss

1. Introduction

Steel has a high strength/weight ratio. Thus, the dead weight of steel structure is relatively small. This property makes steel a very attractive structural material for High rise building, long span bridges etc. But Composite floors using profiled sheet decking have become very popular in the West for high-rise buildings and the long span bridges¹. Composite roof slabs are generally competitive when the concrete floor needs to be completed quickly and where the average level of fire protection for steel work is sufficient. Composite action between steel and concrete is achieved through the sheet steel deck to the steel top chord after the deck is installed. Composite trusses can be proportioned for larger strength and stiffness when compared to composite joist systems, making them more suitable for long span applications or column free areas. In a composite beam there is high strength of the concrete in compression and the high strength of the steel in tension⁶. The fact that each material is used to its maximum advantage makes the composite construction in steel and concrete very efficient and economical. The study has been proposed especially for pedestrian safety considerations, where the bridge cross over structure will serves as a best for both pedestrians and the fastest moving traffic. The study proposes analysis of composite bridge structure, the span of 24m.

2. Advantage of composite construction compare to steel

- The most effective realization of steel and concrete is achieved.
- Due to their greater rigidity, composite beams have

less deflection than steel beams.

- Keeping the span and loading unchanged, a more economical
- steel section (in terms of depth and weight) is achievable in composite construction compared with conventional non-composite construction.
- Composite construction is comfortable to “fast-track” construction because of use of rolled steel and pre-fabricated components, rather than case-in-situ concrete

3. Truss modeling

In this model truss of span 24m is considered. The properties of the both (steel and composite) models considered are detailed below.

Data: Type of truss- Warren type (pedestrian bridge)

Span = 24m, Material: steel, concrete, Width of walkway = 4m, Panel length = 3m

Loading:

- Dead load: i) self-weight ii) slab load iii) floor finish
- Live load: i) Pedestrian live load⁵

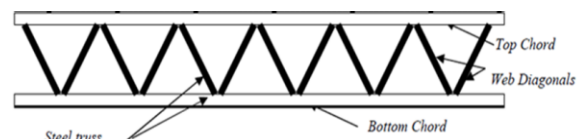


Fig. 1. Geometrical steel truss system

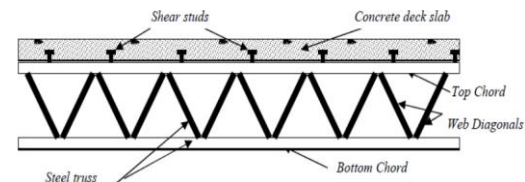


Fig. 2. Geometrical composite truss system

In the above composite truss modelling the top chord is analyze as concrete and other truss member is designed as steel. The support is fixed but type support. On the basis of above data steel truss & composite truss is analyzed.

The steel truss and composite truss is analysed by STAAD-PRO SOFTWARE along with IS-CODE. Moreover STAAD-

PRO has a greater advantage as compare to manually calculation as it gives more accurate result than the manual calculation.

4. Modeling

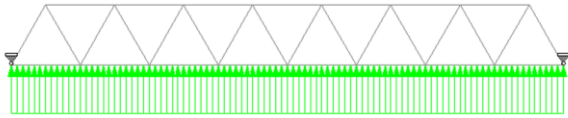


Fig. 3. Block diagram

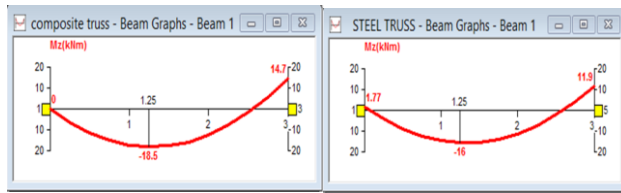


Fig. 4. Beam Graph (Moment) of Beam 31

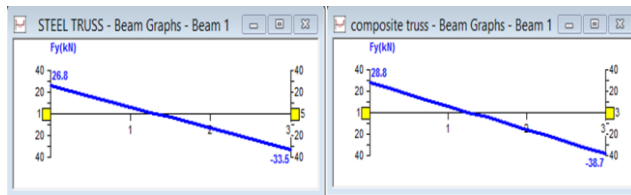


Fig. 5. Shear Force Diagram of Beam 1

5. Conclusions

The analysis of both the trusses is carried out and the following conclusions are drawn,

- The analysis depends upon the property of the end sections.
- It also depends upon the bottom chord of the truss.
- Shear force is maximum in composite truss as compare to steel truss and also bending moment shows that composite truss is more satisfactory.

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