

STEEL BASED STRUCTURES - BENEFIT TO ALL

Steel: The Consumption Scenario in the Country

Per capita consumption of Steel in India was about 75 kg in 2020 (as per worldsteel Association). This is against world average of 228 kg. China, with whom we get invariably compared, consumed per capita 691 kg in the same period.

India plans to become a \$ 5 Trillion economy in next 3-4 years from the level of \$ 2.7 Trillion now. We believe there is some correlation between GDP and Steel consumption. This is evident from the list of the top ten Economies of the world and their per capita steel consumption. USA, China, Japan, Germany, who are at the top of the list of largest economies are all consuming 300 kg or more steel per capita. South Korea, who are the 10th largest economy has the highest steel consumption at 955 kg. Thus, it is clear, in order to India grow in GDP substantially, the steel consumption has to take off in a big way. Raising consumption of Steel, thus, becomes an economic need for the Country.

The Table below shows the production of Crude steel, Finished steel and Consumption in the country. (**) in Million Tonnes (MT)

	FY 18 (MT)	FY 19 (MT)	FY 20 (MT)	FY 21 (MT)
Production of Crude Steel	103.13	110.92	100	103.54
Production of Finished Steel	126.86	101.29	102.62	96.2
Consumption	90.71	98.71	100.17	94.89

(** Source: JPC/MoS)

In the FY 22, the projected production of Crude steel is about 120 MT and the projected consumption is 111 MT. The steel sector is stated to grow @ 7% in the medium term. However, considering the fact that GDP is likely to grow over 8% in next few years, there is a greater scope of growth for Steel in the Country. National Steel Policy 2017 envisages per capita consumption of 160Kg by 2030. This itself looks to be a very ambitious target, unless concrete steps are taken to raise the consumption level of steel.

In India , steel is mostly consumed in three industries, (i) Housing , Construction & Infrastructure (mostly uses structural steel like I girders, plates, channels, angles, tubular sections etc. and TMTs), (ii) automobile (uses surface treated steel sheets including hot dipped galvanized, electro galvanized as well as galvanized steel sheets) and (iii) Machinery (using steel plates. specialty steels, along with steel sheets, pipes and bars and used in agriculture, mining, public utility and more).

Construction & Infrastructure industry consumes the maximum quantity of steel which is approximately 60-65% of total steel consumption. Our focus should be on how to increase of steel usage in housing sector. The advantages of steel over the other construction materials are to be understood first:

Why Steel?

Steel is far better than other competitive materials of construction with its inherent benefits. The major benefits of Steel Structures, compared to other materials like concrete, are :

- Faster and efficient Construction
- Lighter self-weight of the structure.
- Greater strength to weight ratio.
- Long life of structure
- Higher resistance against earthquake & cyclone.
- More open space for with less columns.
- Cheaper in life cycle cost.
- Added Fire Resistance (now fire-resistant steels are available).
- Versatile applicability
- Aesthetics combined with functionality.
- Colourful and elegant profiles.
- Easy to bend, difficult to break.
- Can be strengthened, changed/ modified if necessary for retrofitting.
- Endlessly recyclable
- Good resale value.
- Environmentally sustainable with low carbon foot print.

Steel vrs other materials of Constructions

Steel vs RCC

Reinforced concrete, which is used in majority of buildings and infrastructures like bridges etc., is a heterogeneous material consisting of cement, sand, stone chips and reinforcement bars. Though concrete can withstand compressive force, concrete structure can collapse suddenly to any disastrous load like earthquake and cyclone without giving sufficient time of damage repair due to its brittle nature. Property of a steel section is much predictable as it is a homogenous material. In comparison with reinforced concrete, steel member can carry higher load with lesser member size and weight, keeping the overall weight of the structure lower than RCC. The foundation cost is also reduced. High ductility and better energy absorption capacity of steel lead to better seismic resistance than concrete. Steel members deform without sudden collapse and give time to repair or

to avoid any damages to assets, or casualties. Speedy and faster construction of steel structure utilizing prefabricated components facilitate quicker return on the invested capital. Steel structure is cost-effective based on life cycle cost (LCC) analysis. Steel structures can be maintained easily and require less frequent repairs. Life of steel structure is much longer than a RCC structure. Cost of formwork, handling and transportation may also be kept lower compared to that of RCC construction because major part of the structure can be fabricated in the workshop.

Steel vs Aluminium

Now-a-days aluminum is also being used in doors and window frames, partition walls & false ceiling roof, external building facades, staircases, railings, shelves, and several other applications, but it is not resistant to heavy load and it can deform in strong wind or seismic and any accidental disastrous load. Light gauge steel members, lighter angles channels and hollow steel sections etc. can replace the aluminum in doors, windows, facades, false ceilings, stair cases and any non-structural applications at much lower cost, and with greater strength. Tata Steel's Pravesh Doors have created many satisfied customers, who have chosen Steel over Wood or Aluminum

In comparison of cost, steel is cheaper (approx. cost of structural steel Rs 70/kg) than aluminum (Rs 250 / kg). Steel will continue to be a preferred material in terms of overall cost, durability and load-bearing virtue.

Steel in Construction Today & Tomorrow- Housing Industry in India

Steel has its own market in Infrastructure, Industrial structures and commercial building construction. Presently use of structural steel section like I-section, channels, angles, tubular sections, coated /galvanized sheets, etc. (other than reinforcement rods which are used in concrete in residential building) is also gaining popularity. Steel has become more adoptable as it can also be used in combination with other construction materials, like glass & aluminum in building facades and different types of sandwiched panels walls or cladding, concrete in flooring using steel deck sheets. Steel deck used in flooring also reduces the cost of formwork. Recyclability of steel also makes steel buildings more popular and useful in its longer life. Rapid construction of steel building is advantageous due to lower disruption to community services, fewer vehicle movement to site, little on-site noise and better waste management. Currently, India's buildings account for around one-fifth of total CO₂ emissions. This implies that India's sustainable development targets cannot be met without a fundamental change in the way the buildings are being constructed. By

developing steel buildings in the upcoming smart cities, and also by improving the nature of constructions in slum resettlement projects, we can achieve the goals of sustainability.

Augmentation in consumption of steel due to growing housing requirements will simultaneously help in growth and advancement of our economy. Steel framing has good use in being adopted in all types of housing in rural areas under PMAY schemes- residential, anganwadis, panchayat halls, school buildings etc. and also in urban habitats, be it in low-rise ones or tall buildings and skyscrapers. Structural steel with dry construction methodology in housing will also help our environment by lower consumption of water, and savings in important natural resources and thus reduce the carbon footprint to a greater extent.

With the varieties of structural steel sections manufactured by major steel producers in India (SAIL, TATA, JSW, RINL, AM/NS,) designers, developers and architects are now able to give an aesthetically pleasing shape to their dream housing projects. Steel buildings are mostly engineered (unlike RCC constructions, most of which are non-engineered) and are built by maintaining highest safety standards under BIS Codes. Hence the assurance of the life of the structure and also value for money is achieved.

Govt Departments, Engineers, Architects, Designers and Academicians all have a great role and responsibility in promoting usage of Steel in long term interests of the economy.

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