

Steel Formwork for RCC Construction

Sajal Kr Ghorai, Sr Manager (C&S)

Institute for Steel development and Growth

Formwork, also known as shuttering, is a temporary structure used as a mould to pour the concrete. It is a vertical or horizontal arrangement made to keep concrete in position until the same gains strength & shape. It should be strong enough to withstand different forms of loads such as dead load of green concrete, live load due to working labour, Impact effect at the time of pouring concrete, compacting concrete by mechanical equipment (vibrator, needle vibrator, plate vibrator and so on). It should be leakage proof, waterproof and rigid enough to avoid deflection. The materials used for making formwork should resist warping, bulking, and weathering.

Traditionally wooden formwork has been a part of all construction activities. Due to a variety of reasons such as environmental and cost considerations, wooden formwork is gradually getting replaced by steel formwork.

Why steel formwork is preferred:

- The steel forms are more sturdy, durable and last longer when compared to wooden formworks; plus, their reuse is more frequent.
- Steel formworks can be installed and removed easily and quickly.
- Using steel formworks ensures a better quality of the concrete surface and suitable for applying paints directly.
- Steel formworks do not absorb moisture from concrete.
- Steel formworks do not shrink and deform.
- Steel formworks can be re-utilised far more times than the wooden formworks.
- Waste steel scrapped for re-use, less waste produced.
- Steel formworks are environment friendly & therefore, sustainable.

The materials used for the construction of formwork should be easily available, reusable, durable and cheap. They can be made from steel, timber, aluminum etc. Fabrication of steel formwork requires a minimal manufacturing process. There are many ways to make steel formwork, one of which is computer modeling. The digital modeling process ensures that the steel is formed correctly the first time, the same is created and formed, thereby minimizing rework. If the steel formwork can be manufactured quickly and correctly, the speed of fieldwork will also be accelerated. Development of adjustable and telescopic type of formwork is also possible depending upon customised requirements. Thanks to the reusability and recyclability of steel, steel formwork can be regarded as a sustainable building material. Now a days, more and more companies are making sustainable development choices to reduce environmental damage.

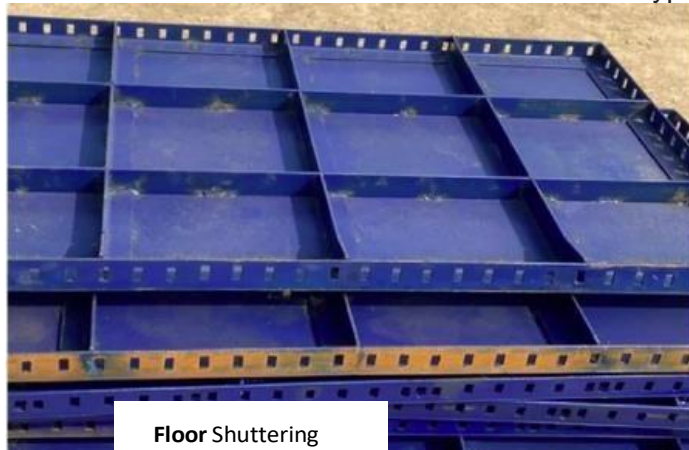
Steel Formworks are made of thin steel plates stiffened along the edges by small steel angles. The panels can be manufactured in large amounts, in any desired modular shape or size. The steel formwork is widely used in large projects or where a large number of formwork reuses are necessary. This type of formwork is considered the most suitable for circular or curved structures.

Formwork is classified based on where they are used. Some of them are briefly described below:

- **Formworks for column footing** - Formwork used for column footing depends upon the shape of footing. Usually, square and rectangular formwork is used accompanied by vertical sides or steps of sloping sides.
- **Formwork for columns** - Formwork for columns includes boxes prepared with four sides which are assembled and concrete is poured and cured. Forms are removed after the concrete matures.
- **Formwork for walls** - Formwork for walls consists the frame , steel plates/ sheets and accessories.



- **Formwork for floors** - Formwork for floors consists of a platform to receive concrete usually made of small steel beams at top and rows of vertical posts.
- **Formwork for beams** - Formwork for the beam is a type of formwork similar to formwork for floors.



- **Formwork for stairs** - Formwork for stairs consists of stringers, sheets, joists, bearers and vertical post.

A detail rate analysis of steel formwork/shuttering for RCC construction project has been considered, One 4mm thick (900 mm x 1200 mm) plate with 50x50x6 mm angle etc, for 40 uses..

- Rate of steel shuttering for concrete considering 40 uses Rs. 216.94 / sq. m
(Source: INSDAG publication-INS/PUB/058)
- PWD rate (year 2017) for the use of hardwood plank formwork in ordinary residential building range between Rs.335 to Rs.348 per sq. m. per term of usage.

The rate of steel formwork with 40 nos of usage, Rs.216.94 per sq. m is cheaper by 35% than ordinary hardwood plank formwork even if compared with direct cost (Rs. 350 per sq. m). If the steel formwork are efficiently and effectively maintained, number of usage can be as high as 80 to 100 times which in turn makes steel formwork cheaper by more than 70% in comparison to ordinary hardwood plank formwork.

INSDAG has made some work in respect of steel formworks, and at various levels, highlighted the effective use of various types of steel intensive formwork including the method and sequence of erection by elaborating through sketches and drawings. Design method including stipulations in national as well as foreign codes has been highlighted and elaborated in detail with detail drawings.

At present, Steel Authority of India Ltd (SAIL), Tata Steel Ltd (TSL), JSW Steel Ltd (JSW), ArcelorMittal & Nippon Steel (AM/NS), Rashtriya Ispat Nigam Ltd (RINL) are a few of major producers manufacturing steel sheets/plates and angles which are used for steel formwork in construction industry.

For more details, please contact INSDAG, 793, Anandapur, Kolkata - 700107. Email- ins.steel@gmail.com