POPULARITY OF MULTI-STOREY STEEL FRAME BUILDINGS **ON THE RISE**

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The recently completed Raceworx KTM Building in Little Falls makes use of a steel framed system with non-composite cellular beams to support the floors. Steel was a common feature throughout the structure and this aided in producing faster erection times, thus reducing costs.

Cellular beams are commonly used in steel-framed building applications due to their versatility. They are produced by using a patented profiling process which splits the beam into two tees. The two tees are then welded to form a cellular profile which is approximately 40 – 60% deeper than the parent section. This results in a final section size 2.5 times stronger than its parent section. They provide the ideal solution for long span-column free designs, maximising the flexibility in use and future adaptability of buildings. Faster steel erection times are achieved thus being much quicker/cheaper to build.

Cellular Beams can be incorporated with various types of floor systems and can play a significant role in steel framed buildings. They provide a technically better solution for service integration which can allow for extra floors to be provided in multi-storey building applications and offer further optimisation opportunities such as reducing floor to floor height, which reduces cladding costs.

Various steel profiles were used for the cellular beams for the Raceworx KTM Building project, with the 533 x 210 x 82.2 [759.1 x 210 x 82.2 (533mm @ 800mm) cellular beam] being the heaviest section used. Large services were able to be accommodated through the cellular voids.

Precast hollow core slabs were used as the flooring system, and placed once the steel frame was erected. This created an added benefit of creating a working platform for the construction workers.

A component of steel framed-buildings is the choice of flooring system. There are different options in floor systems, each with its-own benefits, as follows below:

Composite slabs

Composite floor systems consist of concrete reinforced with mesh, casted onto a profiled steel deck with connecting shear studs onto the steel beam. The concrete acts together with the steel to create a stiffer floor. This contributes to decreasing the weight of the structure, thus producing a less expensive structure, as decrease in weight may decrease foundation costs.

Precast slabs

Precast floor systems consist of precast and prestressed solid or hollow-core units used in conjunction with

structural steel frames. They provide faster speed of erection due to fewer beams being needed as opposed to conventional metal decking applications.

Shallow floors

Building requirement may dictate the height of floors either to minimize overall height of a building or maximizing the number of floors for a particular building height. Ultra-Shallow Floor Beams (USFB) offer a solution to this. USFBs are designed to meet the client's required floor depth, and can be as shallow as 160mm. USFBs are formed by welding two asymmetric cellular tees. The deck or slab sits on the wide bottom flange, producing a very shallow overall construction zone. The regularly spaced cells in the web allow for the passage of reinforcement tie bars, and can also be used for service integration if required.

WHY CHOOSE STEEL FOR **A MULTI-STOREY BUILDING?**

The use of steel in multi-storey building construction is based on tangible client-related benefits including the ability to provide column free floor spans, efficient circulation space, integration of building services, and the influence of the site and local access conditions on the construction process. For city projects, speed of construction and minimum storage of materials on-site require a high level of pre-fabrication, which steel-framed systems can provide.

In many large commercial buildings, a two-stage construction process means that the tenant is responsible for the servicing and fit-out, and so the building structure has to be sufficiently flexible to cope with these differing requirements. Many smaller buildings are designed for natural ventilation and with a high proportion of renewable energy technologies built into them. Many solutions are possible using steel construction.

The commercial sector demands buildings that are rapid to construct, of high quality, flexible and adaptable in application, and energy efficient in use.

Speed of construction

All steel construction uses pre-fabricated components that are rapidly installed on site. Short construction periods leads to savings in site preliminaries, earlier return on investment and reduced interest charges. Time related savings can easily amount to 3 to 5% of the overall project value, reducing the client's requirements for working capital and improving cash flow. In many inner city projects, it is important to reduce disruption to nearby buildings and roads. Steel construction dramatically reduces the impact of the construction operation on the locality.

Flexibility and adaptability

Long spans allow the space to be arranged to suit open plan offices, different layouts of cellular offices and variations in office layout throughout the height of the building. Where integrated beam construction is used, the flat soffit gives complete flexibility of layout allowing all internal walls to be relocated, leading to fully adaptable buildings.

Sustainability

Many of the intrinsic properties of steel usage in construction have significant environmental benefits. For example, the steel structure is 100% recyclable, repeatedly and without any degradation. The speed of construction and reduced disruption of the site gives local environmental benefits and the flexibility and adaptability of steel structures maximise the economic life of the building as it can accommodate radical changes in use.