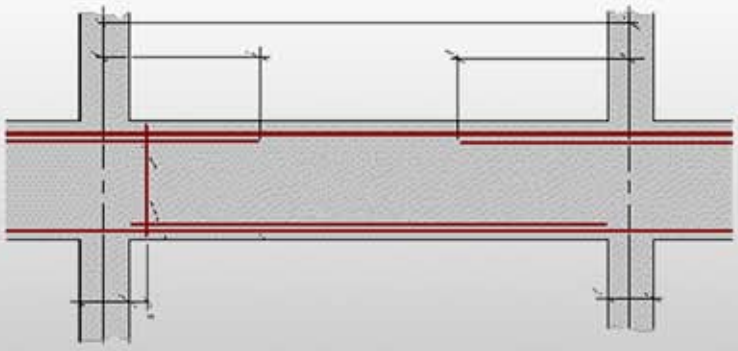
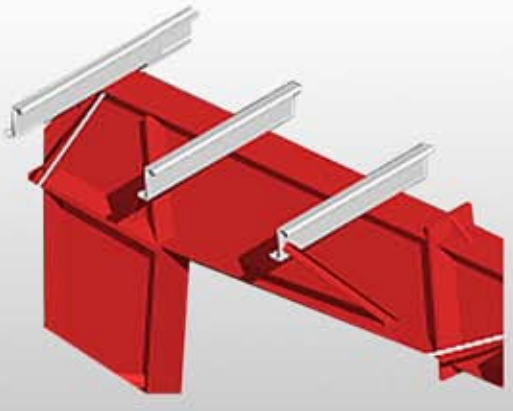
DONVEY
INFRA & ENERGY DEVELOPER

DONVEY Steel Difference

Steel Buildings Vs. Concrete Buildings



Reinforced Concrete Framing



Steel Framing

LOW-RISE STEEL BUILDINGS VS. CONCRETE BUILDINGS

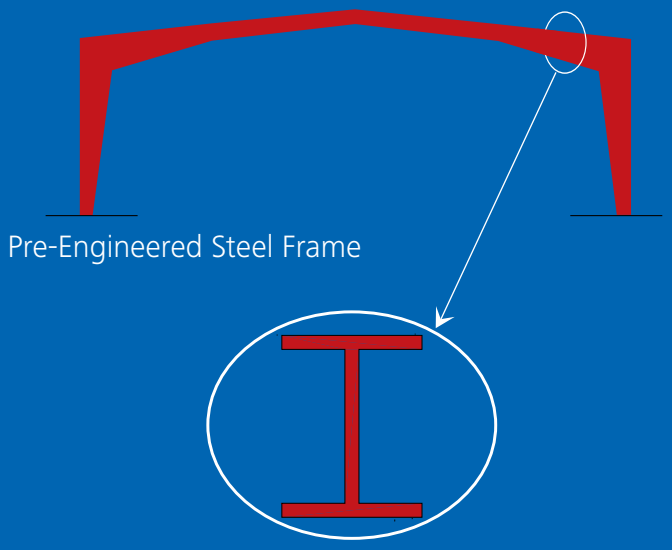
Introduction

We've come a long way in modern engineering and the ability to manipulate concrete and steel. The world of architecture today reveals vast areas punctuated by buildings so grand and renowned for their special aesthetics and functionality.

Steel is a highly homogeneous material which can work equally well in stress reversal conditions of either tension or compression. On the other hand, concrete's homogeneity is always hard to attain, and it is a brittle material that performs remarkably good under compressive stresses, but miserably under tensile stress conditions.

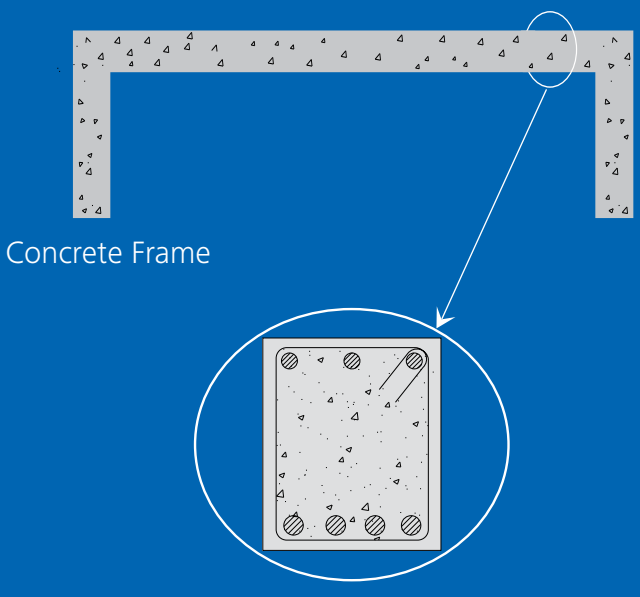
Steel's strength and ductility, combined with solid engineering and design, make it a safe choice in seismic zones. Steel framing does very well under high lateral (wind) loads because it is ductile, which means it has the ability to bend without breaking and can absorb that kind of energy.

Steel has the highest strength-to-weight ratio of any construction material. And with new efficient and fast construction methods, steel buildings remain a popular choice for low-rise as well as for high-rise applications.



Pre-Engineered Steel Frame

Steel Beam



Concrete Frame

Concrete Beam

LOW-RISE STEEL BUILDINGS VS. CONCRETE BUILDINGS

Evaluation Criteria	PEB BUILDING	CONCRETE BUILDING	STEEL ADVANTAGE
Design & Dimensions	• Suitable for spans 20-30m. Can sustain much larger spans (i.e. 90+meters). • Building's light weight requires reduced size foundations. • Far-spaced columns requires less number of footings. • Cantilevers are easy to design and construct at no additional costs.	• Suitable for short span buildings, 5-8m. Becomes complex and heavy for larger spans. • Heavy concrete buildings require sizable foundations. • Closer column spacing requires more footings. • Cantilevers are expensive, demanding extensive form work to hold the concrete until it cures.	12-50% Cost saving for long span steel building.
Architectural Flexibility	• Architectural needs may change by time, steel buildings have the highest flexibility to meet future needs. • Expansion is easy. Longitudinal expansion is about adding more bays and connecting the secondary members and the sheeting to the old building.	• It is nearly impossible to modify a concrete building to meet changing future needs. • To expand, the contractor has to build a new structure with foundations, columns and might have to break part of the old structure in order to expand it.	Lower modification cost.
Industrial Applications	• Can easily handle equipment such as multiple cranes within buildings. • Sways can be controlled. • Precision can be achieved during installation.	• Heavy equipment usage such as cranes is limited. • To solve precision problems, contractors use steel I beams and platforms in concrete buildings.	Saving on maintenance cost.
Fabrication	• Members fabricated in a controlled environment. • Precise fabrication. • Optimum automation possible.	• Fabrication done on site. • Requires building the reinforcement cage and shuttering work prior to pouring.	90% saving in fabrication time on site.

LOW-RISE STEEL BUILDINGS VS. CONCRETE BUILDINGS

Evaluation Criteria	PEB BUILDING	CONCRETE BUILDING	STEEL ADVANTAGE
Quality	Quality of steel is guaranteed because: • It is a homogeneous product. • Pieces are tailored according to shop drawings. • Precise machinery is used for fabrication. • It is fabricated under shop control. • Quality is not affected by site weather conditions.	Many factors lead to quality deterioration: • Concrete is not a homogeneous product. • Concrete mix ingredient ratios are difficult to maintain. • Quality of water used may vary, which affects concrete quality. • Concrete is susceptible to weather conditions of site. • Temperature variances have diverse effect on concrete. • Adequate use of vibrators. • Using proper curing methods. • Concrete shrinkage. • Intensive site labor weakens quality control.	Less time is spent to maintain steel quality.
Delivery and Logistics	• Can be delivered anywhere in the world. • Can be properly sequenced.	• Might have to build batch plant on site if site is secluded or huge.	Capital Investment saving.
Project Time	• During steel fabrication at shop, concrete foundations are executed on site in parallel which shortens the project schedule. • Fast erection. Virtually no idle time. • Fast and shorter mobilization and demobilization.	• Slow erection and time consuming because activities are done in series. • Pouring should take place in a limited time frame. If exceeded, the concrete quality may be jeopardized. • The contractor will have to wait for the previous cast to harden (14-28 days) to attain strength and cast another batch.	50% saving in construction time.
Erection Cost	• Low man power count needed. • Erection cost is low at site.	• Construction cost is high at site.	Lower site cost

LOW-RISE STEEL BUILDINGS VS. CONCRETE BUILDINGS

Evaluation Criteria	PEB BUILDING	CONCRETE BUILDING	STEEL ADVANTAGE
Error Modification	• Easy to modify on site, even after erection. • Modification can be done by cutting, welding or attaching steel pieces.	• Have to break concrete if modification is necessary.	Lower remedial cost.
Consistency and Reliability	• Strength is assured from design. • Steel properties are stable with time.	• Strength cannot be guaranteed without testing. • Concrete properties may change over time and environmental conditions.	Longer life expectancy.
Safety	• Ductility of steel provides flexible behaviour under seismic loads. Light Steel structures minimize the seismic effect on the structure. • Steel density (7700 kg/ m^3) is heavier than concrete (1850 kg/ m^3) but is 18 times stronger. A steel member can hold 6 times its own weight. • Ductility provides early signs of failure when overloaded, allowing to fix the problem.	• Poor flexibility under seismic loads. Heavy structures maximize the seismic effect on the structure. • Heavy self weight. Large portion of concrete strength consumed to resist effect of its own weight. • Steel reinforcement is used to prevent brittle failure.	Steel building requires less costly safety measures.
Environment	• Steel is fully recyclable. Steel recycling technology is mature and standardized. • Recycled steel results in better quality than Iron Ore. • Construction is dust free utilising dry techniques. • The energy used in producing steel from recycled steel is roughly one-third of that for new steel.	• On- going efforts are being done on recycling of concrete. • No standards adopted. • Quality Problems. • On-site noise, dust and water pollution during construction.	Steel residual value depends on steel process.

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