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IndianSteel ASSOCIATION

Constructing the next skyline

Steel for faster, smarter and greener development



November 2026

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Foreword by KPMG in India

India's accelerating urbanisation is changing the economics of development, placing greater emphasis on speed, space efficiency, asset performance and sustainability. As cities expand vertically and projects become increasingly complex, the ability to reduce construction cycles, optimise usable areas and improve lifecycle outcomes is becoming central to investment competitiveness for developers and asset owners. In this evolving environment, steel-intensive construction offers a compelling proposition by combining structural efficiency and precision-led execution with modern methods of construction. Its wider adoption could play a defining role in translating India's urban growth ambitions into scalable, resilient and commercially viable assets.

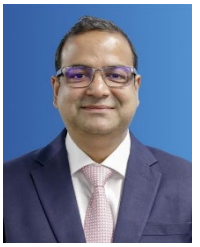
Recognising the importance of advancing this transformation, we are pleased to launch the report 'Constructing the next skyline: Steel for faster, smarter and greener development', as knowledge partner for the ISA Steel InfraBuild Summit 3rd edition, held on November 18, 2026. The report explores the role of steel-led and steel-concrete composite systems in shaping India's next phase of urban development. It analyses the demand drivers shaping high-rise residential, mixed-use and Grade A office developments, while assessing how structural efficiency, domestic steel capacity, technological advancement and evolving planning frameworks have the potential to enable development at scale. The opportunity extends beyond substituting one material for another; it involves rethinking how buildings are designed, manufactured, assembled and operated.

This shift becomes particularly consequential when viewed through the lens of project delivery. Prefabrication, off-site manufacturing, modularisation and advanced structural systems allow fabrication and site activity to progress in parallel, reducing site-intensive work and improving execution certainty. When design, detailing, logistics and assembly are coordinated from the outset, steel's precision translates into shorter construction cycles, adaptable floor plates and earlier asset readiness. For developers and owners, the resulting value lies not merely in speed, but in converting time saved into stronger commercial outcomes and more reliable delivery.

Realising these benefits requires an integrated digital backbone that connects engineering, fabrication and on-site execution. Technologies such as parametric design, building information modelling (BIM), digital twins, artificial intelligence (AI), model-to-machine fabrication and reality capture enable project teams to identify design interfaces early, anticipate cost and schedule risks, reinforce quality control and retain component-level data throughout the asset lifecycle. This connected approach transforms steel construction from a series of standalone activities into a coordinated delivery system, enhancing project visibility, execution certainty and long-term asset performance.

This connected approach also provides a key foundation for the built environment's transition towards greater sustainability. With embodied carbon becoming more material to whole-life building performance, high-strength and verified lower-emission steel, resource-efficient structural design and energy-conscious operations offer complementary pathways for reducing lifecycle impact. These benefits can be further enhanced through circular design practices that promote structural adaptability, component recovery, material traceability and quality-assured recycling. India's green steel taxonomy adds further robustness by establishing a framework for assessing emissions performance, helping procurement decisions distinguish demonstrable progress from unsupported environmental claims.

Translating these benefits into outcomes at scale requires the industry to move beyond technical potential towards consistent commercial delivery. Stronger design and execution capabilities, common digital standards, performance-based procurement and lifecycle-focused investment decisions remain critical to this transition. As these enablers mature, steel is anticipated to evolve from selective application to a mainstream construction model, supporting faster, greener and smarter urban development across India.



Neeraj Bansal

Partner and Head – India Global
KPMG in India

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Foreword by Indian Steel Association (ISA)

India is building at a scale and speed the world has rarely witnessed. By 2036, housing demand is projected to exceed 90 million units, alongside growing requirements for offices, hospitals, schools, metros and industrial parks[1]. How we build may decide how effectively our cities serve the next generation.

Steel offers a compelling solution. Steel-intensive construction enables faster project execution, supports vertical development and facilitates greater adoption of prefabrication and modular construction methods. It is also fully recyclable at the end of its lifecycle. In dense urban environments, where land is constrained, steel-based structures have the potential to support more efficient use of space across residential, commercial and public infrastructure. Combined with modern design tools, prefabrication and modular construction, steel creates value through enhanced speed, precision and efficiency. The Indian steel industry is geared up to meet these evolving requirements. With 220 million tonnes of installed capacity as of FY26 and a clear pathway to 300 million tonnes by 2030 and 604 million tonnes by 2047, the steel industry is well positioned to meet the quality, grades and volume requirements of a steel-led construction model[2,3].

The next step is to develop an ecosystem of designers, fabricators, standards, procurement practices and resilient supply chains to make steel-based construction a natural choice for India's future growth in modern buildings and infrastructure.

Steel has a vital role to play in realising the vision of Viksit Bharat articulated by our Hon'ble Prime Minister, particularly as India builds the modern cities and infrastructure required to support its future growth.

I thank KPMG in India, our Knowledge Partner for the 3rd ISA Steel InfraBuild Summit, for this insightful report. I am confident that the report would help encourage architects, developers, policymakers and the steel industry to work together in shaping India's next skyline.



Naveen Jindal

President
Indian Steel Association (ISA)

1. Indian Real Estate Industry, IBEF, May 2026
2. National Steel Policy: Vision 2047, Government of steel, October 2026
3. National Steel Policy (NSP) 2017, Ministry of Steel, Government of India, accessed on 12 November 2026



Executive summary

India's construction sector is being reshaped by rapid urbanisation, evolving development patterns and rising expectations around speed, quality and sustainability. As cities become denser, taller and more complex, a growing share of development activity is expected to be concentrated in high-rise residential and commercial assets, increasing the relevance of construction systems suited to vertical urban development. Rising demands for productivity, delivery certainty and long-term performance are also challenging traditional construction approaches and creating opportunities for alternative delivery models. In this context, steel-intensive construction is emerging as a potential enabler of faster, more scalable and performance-driven development, capable of supporting the next phase of urban growth.

Urban growth and development demand

93 million units
Projected housing demand in India by 2036

~55 million sq. ft.
Expected office space absorption in CY26

Steel sector readiness

220 MTPA
Crude steel capacity (FY26)

411 MTPA
Projected crude steel capacity by FY36, with per capita consumption projected to rise by ~90 per cent

MTPA: Million tonnes per annum

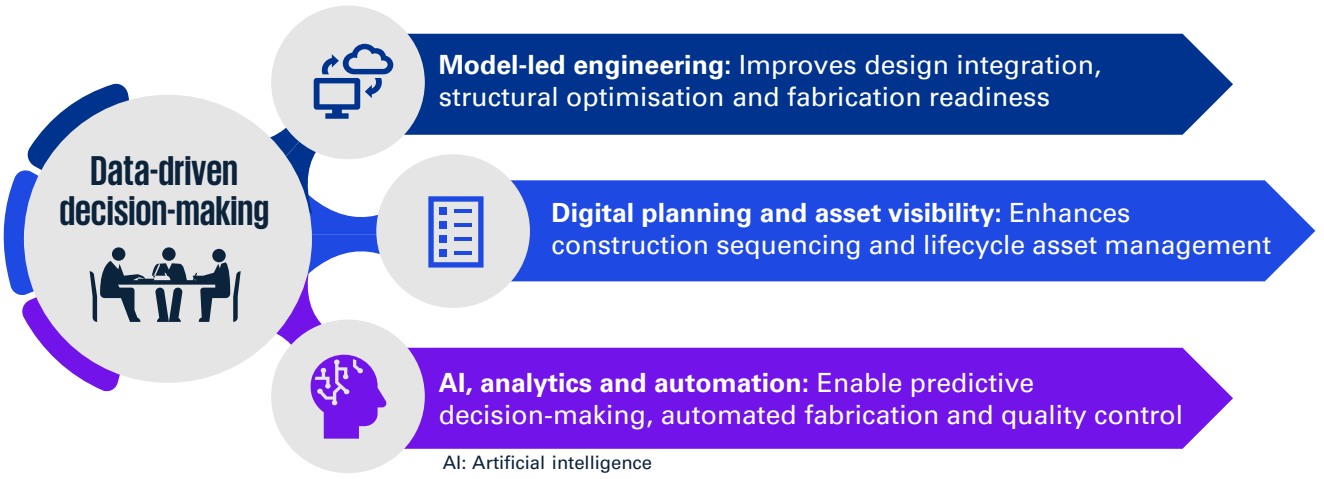
Steel-intensive construction enhancing project delivery efficiency

- Support high-rise development through steel and steel-composite systems that offer structural efficiency, longer spans and greater design flexibility
- Enable fabrication-led construction through advanced structural systems, prefabrication, off-site manufacturing and modular construction approaches
- Improve project delivery performance through parallel execution, faster project delivery and greater execution certainty.

Sustainability and lifecycle benefits reinforcing steel adoption

- Retains material value through circular construction approaches
- Supports resource efficiency through material recovery and recycling
- Enhances lifecycle performance through resilient and durable design

Digital tools improving project visibility and control



AI: Artificial intelligence

Note: Sources for the data indicated here are provided in the subsequent sections

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Key considerations for scaling steel-intensive construction

- RCC dominance and familiarity with conventional construction systems
- Structural complexity and performance requirements in high-rise development
- Commercial viability and project economics of steel-intensive construction
- Execution readiness across design, fabrication and erection

RCC: Reinforced cement concrete

Strategic priorities for wider adoption



Note: Sources for the data indicated here are provided in the subsequent sections



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01

The next skyline: Redefining construction for a new era



India's urban growth enters a new phase

Cities across the country are evolving rapidly in response to changing patterns of growth and development. Rapid urbanisation, shifting patterns of urban development and rising expectations from the built environment are reshaping how cities are planned, constructed and occupied. As urban areas expand and new economic hubs emerge, demand for residential, commercial, industrial and infrastructure assets continues to rise, creating new opportunities while placing increasing pressure on the construction sector.

93 million units

Projected housing demand in India by CY36[1]

~55 million sq. ft.

Expected office space absorption in CY26[1]

The scale of this urban transition is redefining the role of construction, increasing the focus on delivery efficiency, quality and project certainty. As urban development grows in scale and complexity, the next phase of growth may be shaped not only by how much is built, but by how effectively it is delivered.

Evolving urban development patterns shaping construction needs

India's growing urban population, changing development patterns and increasing land constraints are creating new demands on how buildings are planned and delivered. As cities pursue greater density and more efficient land utilisation, a growing share of future urban floor-space additions is expected to be concentrated in high-rise residential and commercial assets. These building segments often involve taller structures, larger floor plates and more complex built forms, making them well-suited to steel-intensive construction systems.

Steel adoption is likely to vary across low-rise, mid-rise and high-rise developments, reflecting differences in structural requirements, steel intensity and project economics.

High-rise residential and mixed-use developments: Increasing urban density and land constraints are driving vertical development that maximises land utilisation and supports higher-density growth

Grade A offices and commercial developments: Rising demand for future-ready workspaces is driving more sophisticated commercial assets, focused on flexibility, sustainability and performance.

Policy spotlight: Planning frameworks supporting vertical growth

- **National Transit Oriented Development (TOD) Policy:** Encourages dense mixed-use development within transit influence zones, supporting compact urban growth and more efficient land utilisation
- **Floor Area Ratio (FAR) reforms:** Cities are revising development controls to enable greater density and vertical growth
  - Under DCPR 2034, Mumbai permits FSI of up to 3.0 in the island city and up to 2.5 in suburban areas for residential and commercial development through a combination of base FSI, premium FSI and admissible TDR. Similarly, the Master Plan for Delhi 2047 allows FAR of up to 500 (equivalent to FSI 5.0) in TOD zones[2,3].

DCPR: Development Control and Promotion Regulation, FSI: Floor space index, TDR: Transferable development rights

1. Indian Real Estate Industry, IBEF, May 2026
2. Development Control and Promotion Regulation 2034, Municipal Corporation of Greater Mumbai, 8 May 2018
3. Master plan for Delhi – 2047, Delhi Development Authority, 20 August 2026

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Rising performance expectations are reshaping construction priorities

The demands placed on the construction sector in the current environment extend beyond the creation of additional built space. As projects grow in scale, height and complexity, stakeholders increasingly expect construction approaches that can deliver enhanced efficiency, sustainability and long-term performance.



Structural efficiency is becoming central to high-rise viability

As buildings grow taller, structural systems are increasingly required to optimise higher loads and stability demands while maximising usable space and supporting efficient vertical development.



Precision-led fabrication raising expectations for delivery certainty

With speed-to-market and operational readiness gaining importance, developers are increasingly prioritising construction approaches that can shorten project timelines while maintaining quality and performance.



Integrated coordination across project lifecycles

The growing prominence of complex and high-rise developments is increasing the need for digital coordination across planning, design and execution activities, enabling stakeholders for better decision-making, enhance collaboration and reduce delivery risks.



Sustainability expectations are expanding across the building lifecycle

Stakeholders increasingly expect buildings to deliver stronger environmental performance, with greater emphasis on resource efficiency, lifecycle impacts and embodied carbon, reflecting its growing significance in whole-life building emissions.

Collectively, these trends are creating pressure on traditional construction models and encouraging the industry to explore new methods capable of improving productivity, enhancing delivery certainty and supporting superior project outcomes. At the same time, evolving requirements across residential and commercial developments are driving demand for buildings that are faster to construct, more adaptable, durable and environmentally responsible.

A new construction paradigm is emerging

As Indian cities become denser and vertical development gains prominence, balancing structural efficiency, faster project delivery and sustainability objectives is becoming increasingly important. These trends are reinforcing the need for construction approaches that could accommodate higher structural demands while offering greater design flexibility and enhanced building performance. Against this backdrop, steel-intensive and steel-composite construction presents a compelling opportunity to meet the evolving requirements of next-generation urban development.

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02

Delivering faster: Transforming project delivery through steel-led innovation

Evolving building requirements are increasing the need for structural systems that may accommodate greater heights, longer spans, higher loads and flexible floor plates while enabling faster and more efficient construction. Steel and steel-concrete composite systems could help address these requirements through lighter structural frameworks, prefabricated components and efficient load-transfer mechanisms.

Strengthening supply readiness through steel capacity expansion

As demand for steel-intensive construction grows, the ability to meet future requirements may increasingly depend on the strength of the domestic steel ecosystem. Ongoing capacity expansion and policy support are helping strengthen long-term steel availability, supporting future urban and infrastructure development.

9.7 per cent	7.6 per cent	220 MTPA	411 MTPA	~90 per cent
Y-o-Y rise in finished steel production (FY26)[1]	Y-o-Y rise in finished steel consumption (FY26)[1]	Crude steel capacity (FY26)[2]	Projected crude steel capacity by FY36[2]	Projected increase in per capita consumption from FY26 to FY36[2]

- Under the National Steel Policy Vision 2047, steelmaking capacity is expected to expand by ~87 per cent by FY36, strengthening the supply base for steel-intensive development[2]
- Per-capita steel consumption is expected to increase from ~116 kg in FY26 to ~220 kg by FY36, signalling growing demand from urban and rural infrastructure development[2].

Beyond capacity expansion, steel-intensive high-rise construction depends on the availability of specialised structural products, fabrication capabilities, fire protection systems, logistics and erection expertise.

Product availability	Fabrication readiness	Building performance	Delivery and erection
Heavy sections, plates, structural tubes and decking systems	Processing capabilities, connection detailing and complex fabrication	Fire protection systems and associated performance requirements	Transport logistics, lifting, sequencing and on-site erection

India's steel sector operated at approximately 77 per cent capacity utilisation in FY26, providing headroom for future demand growth[1]. Domestic production spans structural sections, plates and hollow sections, while imports supplement select product categories and specifications, alongside exports across key steel segments. Together, domestic production, trade flows and ongoing capacity expansion support the availability of structural steel products required for future urban development.

India as a net exporter of finished steel (FY26)[1]

Export	6.60 MT
Import	6.52 MT

MT: Million tonnes

Steel and steel-composite systems enabling structural efficiency and design flexibility

Growing adoption across high-rise and complex developments reflects the ability to combine structural efficiency with greater design flexibility. By leveraging the strengths of steel and concrete, these systems could support high-rise structures, longer spans while enhancing construction efficiency and project delivery.

The use of higher-strength structural steel grades in construction may support material optimisation, potentially reduce steel consumption and improve space utilisation compared with conventional steel grades. Domestic producers are expanding their portfolio of high-strength, fire-resistant and seismic-compliant structural steel grades to address evolving building requirements.

1. Monthly economic report, Ministry of Steel, March 2026
2. National Steel Policy: Vision 2047, Government of steel, October 2026

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High-rise and vertical development

- Steel-concrete composite frames combine the complementary strengths of concrete and steel to deliver efficient beam, column and floor systems, with CFST and concrete-encased steel columns among the commonly adopted solutions
- Prefabricated steel components and bolted connections may support faster frame erection, enabling construction activities progress across multiple floors
- Reduced structural depth could help preserve clear floor-to-floor height and accommodate building services.

Large-span and complex structures

- Steel trusses and other long-span systems may create large column-free spaces, supporting complex building configurations and greater design flexibility
- Prefabricated structural elements may reduce the extent of on-site fabrication required
- Structural systems could be configured to meet project-specific requirements, including passenger movement, sightline optimisation and operational flexibility.

CFST: Concrete-filled steel tube

Fabrication and assembly-led approaches enhancing project delivery

Prefabricated steel construction and off-site manufacturing may enable component production to progress alongside site preparation and foundation works. Shifting activities such as cutting, welding and assembly to controlled manufacturing environments may enhance quality control, reduce on-site fabrication, material handling and rework and support faster and more predictable project delivery.

Advanced structural systems

- Profiled steel decking acts as both permanent formwork and a working platform, supporting efficient floor-by-floor construction
- Lightweight construction solutions may reduce dead loads, potentially lowering foundation requirements where project conditions permit
- Engineered systems could enhance precision, quality consistency and constructability, contributing to more efficient project execution.

Key examples of advanced structural systems	Composite frames, long-span trusses, metal-deck floors, hybrid steel-concrete systems

Prefabrication and off-site manufacturing

- Structural components may be fabricated and prepared off-site before being transported for installation at the construction site
- Factory-based fabrication may proceed in parallel with foundations and substructure works
- Standardised components and connections could reduce repetitive site-based fabrication activities
- Sequenced dispatch and mechanised erection may support enhance coordination between material delivery and work-front readiness.

Key examples of off-site manufacturing activities	Component fabrication, quality assurance, logistics planning, transportation and on-site assembly

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Modular and assembly-led construction

- Modularisation shifts a greater proportion of construction activities into a controlled manufacturing environment
- Pre-engineered interfaces and bolted assemblies may reduce cutting and welding requirements at site
- Repeatable structural grids and components could support efficient installation across projects with standardised requirements.

Key examples of modular manufacturing activities	Pre-engineered building systems, factory-fabricated structural components and panelised construction systems

Accelerating delivery through parallel construction

Concurrent fabrication and site execution

- Off-site fabrication of steel members may proceed in parallel with site preparation and foundation works, helping shorten overall project timelines
- Composite metal decking may serve as an immediate working platform, enabling structural works, building services installation and fit-outs to progress simultaneously across floors
- Standardised bolted connections and prefabricated components could simplify on-site assembly, supporting faster floor-to-floor construction cycles.

Key project delivery outcomes

Faster project delivery

Factory fabrication and site works may progress simultaneously

Reduced on-site activity

Less cutting, welding and temporary works at site

Structural efficiency

Lighter frames and longer spans

Execution certainty

Sequenced fabrication, logistics and erection

Advancing construction through steel-led innovation

Steel-intensive construction supports more efficient project delivery through advanced structural systems, prefabrication and modular construction approaches. As these methods require greater coordination across design, fabrication, logistics and site execution, effective management of information and workflows becomes critical across the project lifecycle. This is elevating the role of digital technologies in connecting project stakeholders and enabling greater visibility, coordination and decision-making from design through construction and into asset operations.

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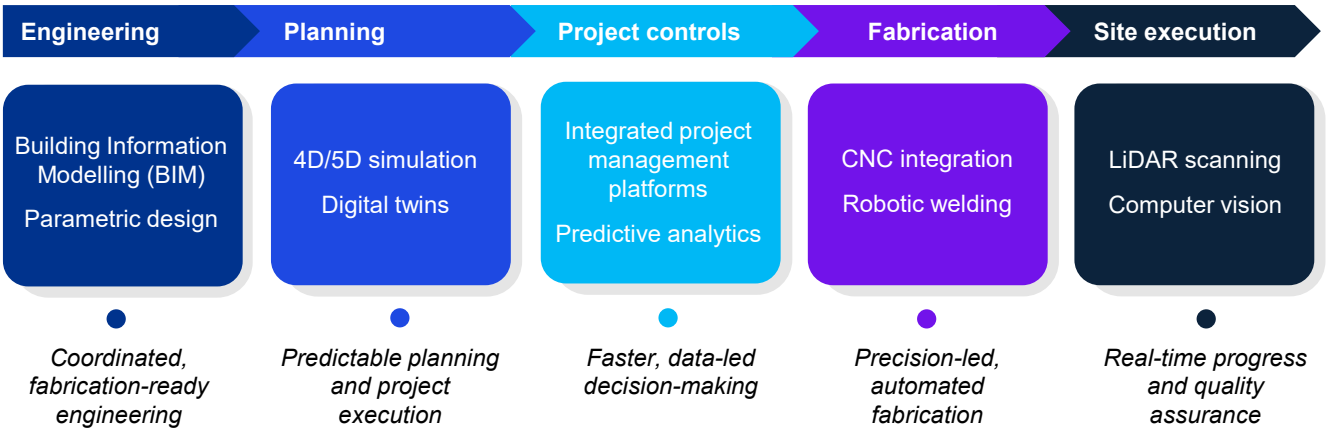
03

Building smarter: Establishing a digital thread from steel design to asset performance

As buildings become taller, more complex and increasingly performance-driven, digital technologies are playing an important role in transforming how projects are designed, coordinated and delivered. This is particularly relevant in steel-intensive and high-rise construction environments, where effective design coordination, information management and execution efficiency are critical to successful project delivery.

Growing demands for speed, productivity, precision and lifecycle performance are encouraging stakeholders to adopt more integrated and data-driven approaches to project delivery. By improving information visibility, collaboration and decision-making across project stages, digital technologies could help improve project outcomes throughout the asset lifecycle.

Key digital technologies transforming project delivery lifecycle



CNC: Computer numerical control, LiDAR: Light detection and ranging

Together, these technologies establish a connected digital thread across the steel construction value chain, enabling design and project information to flow seamlessly from engineering and planning through fabrication and site execution. This integration may strengthen multidisciplinary coordination, enhance schedule and cost predictability, support precision-led fabrication and enable real-time progress monitoring and quality assurance.

Model-led engineering and coordination

BIM:

- Creates a coordinated digital model of steel columns, beams, connections, decking and MEP interfaces, enabling clashes and access constraints to be identified and resolved before fabrication
- Connects structural design with steel detailing and shop drawings, helping maintain design intent and component-level information through fabrication and erection.

Parametric design:

- Enables rapid evaluation of structural grids, floor spans, member depths and framing systems to balance steel tonnage, leasable space and structural performance
- Supports repeatable design across standardised floor plates, façade systems and modular steel components, accelerating engineering for high-rise and commercial developments.

MEP: Mechanical, electrical and plumbing

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Simulation-led planning and visibility

4D/5D simulation:

- Links steel components to construction schedules, enabling sequencing activities to be visualised and coordinated before execution
- Connects model-based steel quantities with cost information, enabling assessment of budget impacts and supporting cost control throughout project delivery.

Digital twins:

- Integrates steel model information with real-time project data to provide a continuously updated view of fabrication, delivery and erection progress, improving visibility across the construction process
- Links operational, inspection and asset performance data with the completed steel structure, supporting ongoing monitoring, maintenance planning and lifecycle management beyond handover.

Data-driven project controls

Integrated project management platforms

- Consolidates schedule, cost and progress information within a common data environment (CDE), improving visibility across the delivery of steel-intensive developments
- Manages project correspondence, reviews and approvals through connected workflows, supporting information sharing and alignment across detailing, fabrication and construction teams.

Predictive analytics

- Analyse detailing, procurement, fabrication and erection data to anticipate potential delays across critical steel packages before disruptions affect the wider construction programme
- Identifies trends in production output, material availability and site productivity, supporting proactive interventions to mitigate emerging delivery bottlenecks.

Model-to-machine fabrication and automation

CNC integration

- Converts approved steel model data into machine-readable instructions for cutting, drilling, punching and marking, reducing manual interpretation between detailing and fabrication
- Maintains dimensional consistency between digitally designed and factory-produced members, supporting faster assembly and reducing fit-up issues during erection.

Robotic welding

- Automates repetitive and standardised welds across beams, columns, plates and modular assemblies, improving process consistency and fabrication throughput
- Digitally monitors welding parameters and production records, supporting traceable quality assurance across fabricated steel components.

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Reality capture and computer vision

LiDAR scanning

- Produces precise 3D scans of erected steelwork that can be compared with the design model to identify deviations in alignment, level and geometry
- Verifies existing conditions before connecting new steelwork to completed structures, reducing the risk of dimensional mismatches during extensions or redevelopment.

Computer vision

- Analyses site imagery to recognise installed steel members and compare physical progress with model-based quantities and planned erection sequences
- Supports automated quality checks by identifying missing components, incorrect positioning and visible installation deviations, enabling targeted site inspections.

BIM, digital twins, AI, automated fabrication and reality-capture technologies create a continuous flow of information across steel design, fabrication, erection and operation. Beyond improving project certainty and execution efficiency, this digital thread connects design and delivery decisions with material consumption, embodied carbon and lifecycle performance, providing the evidence base for more informed sustainability and resource-efficiency decisions throughout the steel construction lifecycle.



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04

Enabling greener outcomes: Advancing sustainability and lifecycle performance



Sustainability considerations are expanding across the building lifecycle

India's expanding building stock is increasing the importance of addressing both operational and embodied carbon emissions. With ~73 per cent of the building stock anticipated to be built by 2050, material efficiency, energy performance and whole-life carbon considerations are becoming increasingly relevant across the building lifecycle[1].

Decarbonisation priorities across the evolving built environment

- India's continued urban development is expected to add significant volumes of new built space over the coming decades, making new construction an increasingly important determinant of the sector's long-term carbon footprint

- Continued expansion of built-up area is likely to increase demand for construction materials such as steel and cement, increasing the need to decarbonise material production and construction activities
- Future buildings may need to address both operational and embodied emissions through a whole-life carbon approach.

Embodied carbon as an emerging sustainability priority

- The country's building sector is estimated to account for ~ 935 $MtCO_2e$ in CY25, highlighting the importance of addressing emissions across the building lifecycle[1]

$MtCO_2e$: Million tonnes of carbon dioxide equivalent

- In CY25, embodied emissions from major building materials were estimated at 453 $MtCO_2e$, broadly comparable to 482 $MtCO_2e$ of operational emissions, reflecting the significant contribution of construction materials to the sector's emissions footprint[1]
- Steel accounted for an estimated 143 $MtCO_2e$ of building-related embodied emissions, reinforcing the importance of material efficiency, circularity and lower-emission steel production pathways[1].

Circular design and energy efficiency across the building lifecycle

- The building sector presently represents over 30 per cent of electricity consumed in India, reinforcing the importance of efficient building envelopes, HVAC systems and operations[1]

HVAC: Heating, ventilation and air conditioning

- BEE's commercial building energy codes indicate potential energy savings of ~25 per cent, 35 per cent and ≥50 per cent at ECBC, ECBC+ and Super ECBC levels, respectively versus conventional buildings, demonstrating the potential of energy-efficient design measures[2]
- As building height increases, greater requirements for vertical transportation, water pumping and cooling may increase operational energy demand, making integrated design and systems optimisation vital for long-term building performance.

BEE: Bureau of energy efficiency, ECBC: Energy conservation building code

Key energy-efficient design interventions for skyscrapers

Steel-enabled lightweight design

Reduce structural loads and vertical transportation energy

Efficient HVAC systems

Optimise cooling efficiency and reduce energy use

Building energy management systems

Track and manage energy consumption

1. Scenarios towards Viksit Bharat and Net Zero, Sectoral insights – Buildings, Vol.5, NITI Aayog, 4 February 2026
2. ECSBC Commercial, Bureau of Energy Efficiency, 17 April 2026

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Advancing sustainable value creation from steel in the built environment

In steel-intensive skyscrapers, lifecycle performance extends beyond end-of-life recycling to include preserving the structural utility, traceability and recoverable value of steel throughout the asset's service life.

Lifecycle value offered by steel as a construction material

Extending structural life and adaptability

- Durable steel frames support strengthening, repair and evolving performance requirements without major structural replacement
- Long spans and adaptable structural grids enable reconfiguration and repurposing, extending the building's service life.

Recovering and reusing finished components

- Reversible connections allow beams, columns and modular assemblies to be dismantled while preserving the structural integrity
- Material traceability and condition assessments enable recovered components to be verified and reused in future projects, reducing the need for new components.

Recycling steel through quality-assured loops

- Segregated recovery limits contamination and directs end-of-life steel into controlled, quality-assured recycling streams
- High-quality recycling retains steel's material value, supports closed-loop production and reduces demand for virgin resources.

Advancing sustainable skyscraper construction through steel

Circularity retains material value across the lifecycle

- Digital material passports link finished-steel certificates with the building's structural model, creating an auditable record of the steel's emissions profile and supporting component-level adaptation, reuse and recycling
- In skyscrapers, circularity may be supported through efficient structural design, adaptable floor configurations and recovery of structural steel during refurbishment or deconstruction.

Recycling reduces demand for primary resources

- Greater use of steel scrap could reduce demand for newly extracted resources, improving resource efficiency across the construction value chain
- Government estimates indicate that using 1 tonne of steel scrap can potentially save approximately[3]

1.1 tonnes of iron ore | **630 kg of coking coal** | **55 kg of limestone**

- The Steel Scrap Recycling Policy also estimates that scrap-based EAF/IF steel production could potentially reduce energy consumption by 16-17 per cent compared with the BF/BOF route. It could also lower water consumption by 40 per cent and greenhouse gas emissions by 58 per cent[3].
- During April - February FY26, scrap imports declined by 20 per cent y-o-y, signalling stronger domestic scrap recovery and reduced reliance on imported scrap[4].

EAF/IF: Electric arc furnace/Induction furnace, BF/BOF: Blast furnace/Basic oxygen furnace

Lifecycle performance requires resilience by design

- High-rise buildings require structural systems designed for wind, seismic forces, fire safety, durability and serviceability requirements, helping maintain structural performance and safety throughout the building lifecycle
- Steel and composite systems enhance resilience and adaptability through ductility, structural redundancy and replaceable components, supporting future refurbishment.

3. Steel Scrap Recycling Policy, Ministry of Steel, 7 November 2019
4. Scrap processing centres and their capacity, Government of India ministry of steel

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Green steel: A measurable lever for reducing embodied emissions

Alongside circularity and lifecycle performance, decarbonising steel production remains an integral component of whole-life carbon reduction. Green steel, produced through lower-emission pathways, has the potential to reduce the embodied carbon associated with structural material inputs. India's Green Steel Taxonomy provides a structured approach to classifying steel based on verified production emissions, enabling more informed material procurement decisions.

India's green steel taxonomy[5]

- Steel produced with an emissions intensity of less than 2.2 tCO_2e per tonne of finished steel qualifies as green steel
- Based on its emissions performance, eligible steel is classified into 3-star, 4-star or 5-star categories, providing a standardised framework for assessing greenness of steel products.

Rating	Emission intensity (in tCO_2e/tfs)
★★★★★ (5-star)	<1.6
★★★★ (4-star)	1.6–2.0
★★★ (3-star)	2.0–2.2

Role in steel procurement and evaluation



Transparency: Enables buyers to differentiate steel product-based on verified emissions performance

Material selection: Supports developers in considering emissions alongside grade, quality, cost and delivery requirements

Decision-making: Facilitates credible procurement, supplier evaluation and investment decisions using emissions-based criteria.

During FY26, 90 steel units secured green-steel certification covering ~12.4 million tonnes of production across HR/CR coils, TMT bars, wire rods and pipes. Among certified products, a majority achieved a 5-star rating, signalling an emerging domestic supply base for verified lower-emission steel[6,7].

tCO_2e/tfs: Tonnes of carbon dioxide equivalent per tonne of finished steel, TMT: Thermo-mechanically treated ,HR/CR: Hot rolled/cold rolled

Towards lower-carbon and circular steel construction

As sustainability considerations expand from operational efficiency to whole-life carbon performance, greater attention may be required on material efficiency, embodied carbon and circularity. Extending asset life through adaptable steel structures, retaining material value through the recovery, reuse and recycling of steel components and advancing lower-emission steel pathways may strengthen lifecycle performance while supporting broader decarbonisation objectives.

As green-steel certification frameworks mature and whole-life carbon considerations gain greater prominence across the built environment, sustainability performance may increasingly influence material selection and project delivery decisions. These developments may further strengthen the case for steel-intensive construction in high-rise developments, supported by advances in structural steel solutions and the potential to reduce cement-related embodied emissions through material optimisation.

5. Green steel initiative, Ministry of steel, Government of India, accessed on 22 October 2026
6. Challenges faced by the steel sector, Lok Sabha unstarred no. 1382, Ministry of Steel, For answer on 28 July 2026
7. Indian Steel Sector Maintains Growth Momentum in April 2026; Prices Recover Across Categories, PIB, 6 May 2026

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05

Bridging potential and adoption: Key considerations for scaling steel construction

The benefits of steel-intensive construction are becoming increasingly evident across high-rise development. However, wider adoption may depend on stakeholders' ability to address technical, commercial and execution-related considerations that influence project feasibility, delivery and long-term value. As projects continue to increase in scale and complexity, addressing these considerations may support broader market acceptance and the long-term growth of steel construction across the built environment.

Dominance of conventional construction practices

- RCC has traditionally been the preferred structural material for residential and mixed-use high-rise developments due to its perceived economy, durability and fire resistance
- The widespread adoption of RCC continues to shape project delivery approaches and material selection decisions, highlighting the need to build familiarity in alternative structural systems.

Commercial viability and cost considerations

- Higher upfront costs associated with materials, fabrication and specialised systems may influence the adoption of steel-intensive construction, particularly in cost-sensitive projects
- The commercial case for steel-intensive construction is often shaped by how stakeholders balance lifecycle value and accelerated delivery against upfront investment requirements.

Structural complexity in high-rise developments

- As buildings increase in height, structural design is increasingly governed by lateral forces, drift control and vibration performance, requiring more sophisticated structural systems
- Project delivery and structural performance depend on accurate system selection, connection detailing, fabrication precision and durability measures, including corrosion protection.

Execution and delivery considerations

- Steel-intensive construction relies on seamless integration across design, fabrication and erection activities, supported by capable fabrication partners, robust quality controls and effective erection planning
- Dense urban sites may present execution challenges related to space constraints, logistical complexities and movement of large prefabricated components.

Fire strategy embedded by design

- High-rise developments present unique fire safety challenges related to complex evacuation requirements, emergency response and high occupant densities
- Addressing these challenges may require the integration of structural fire engineering and fire protection measures, with potential implications for project design, costs and delivery timelines.

RCC: Reinforced cement concrete

Realising steel's potential within India's urban built environment may depend not only on technical performance, but also on commercial viability and effective implementation at scale. As projects continue to evolve in scale and complexity, addressing considerations related to project economics, structural performance and execution readiness may help reduce adoption risks, support broader market acceptance and translate steel's speed and precision into long-term value for developers.

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06

Advancing steel construction for the next skyline: Strategic imperatives for India



The potential for steel-intensive construction lies in its ability to enhance structural efficiency, accelerate project delivery and support more sustainable development outcomes, helping address the needs of denser cities and increasingly complex high-rise developments. Realising these benefits at scale may require broader adoption of industrialised construction approaches, wider use of connected digital delivery, greater recognition of lifecycle value and enhanced execution certainty.

Prefabrication and off-site manufacturing

- Expanding the use of prefabricated and modular steel systems across building segments could improve productivity, accelerate project delivery and enhance execution efficiency
- Scaling off-site manufacturing and fabrication capabilities may enhance execution certainty and reduce reliance on site-intensive construction activities.

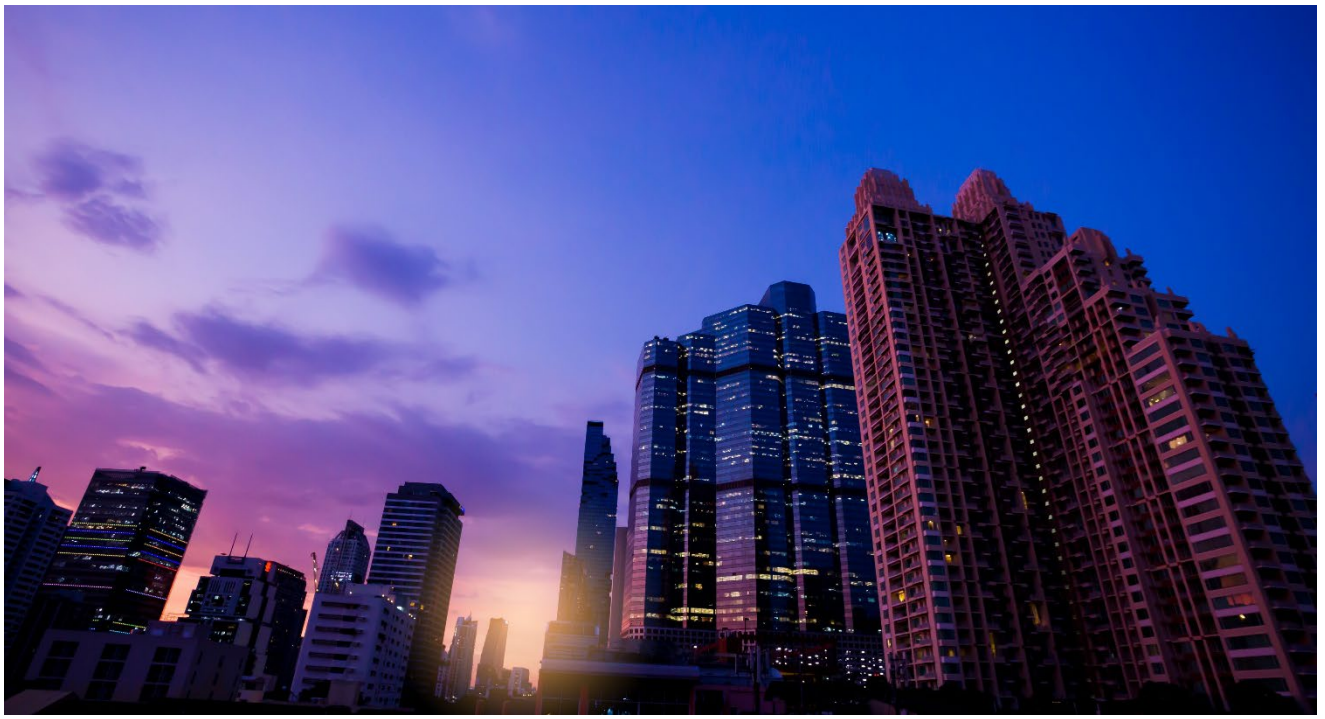
Connected digital delivery

- Mandating fabrication-grade BIM, common data environments and model-based approvals on large steel projects could eliminate interface gaps across structural design, detailing, procurement and erection
- Leveraging digital twins, AI-enabled analytics and data-driven controls has the potential to improve project visibility, evaluate design scenarios and support more proactive decision-making.

Integrate design, fabrication and assembly

- Aligning project planning, design development and fabrication schedules could improve delivery readiness and minimise downstream execution challenges.
- Strengthening adoption of established standards such as IS 800 and IS 11384, alongside qualified fabrication practices, could improve implementation readiness, support regulatory compliance and enhance execution certainty.

IS: Indian Standard



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Lifecycle value-based decision-making

- Moving beyond upfront cost comparisons to evaluate total project economics, including accelerated delivery, lower interest during construction, earlier occupancy, additional usable area and faster revenue realisation, which may help offset higher structural, fabrication and fire-protection costs.
- Incorporating lifecycle value considerations into project evaluation, including long-term performance, maintenance requirements, operational flexibility and potential carbon reduction benefits.

Advance low-carbon and circular steel construction

- Embedding circular design principles could enable component reuse, material recovery and reduced material waste throughout the building lifecycle
- Enabling the use of low-carbon steel solutions through product-level emissions disclosure and green steel taxonomy frameworks may support informed material selection and embodied carbon reduction.

Leverage global experience and leading practices

- Drawing lessons from markets with higher adoption of steel and steel-composite construction could provide insights into structural systems, standardisation, fabrication practices and delivery models relevant to India's urban development ambitions
- Learning from International experience in fire engineering, approval processes, supply chain coordination and DfMA could help identify practices that may be adapted to local regulatory and project delivery contexts.

DfMA: Design for manufacture and assembly

As India constructs its next skyline, steel-intensive construction is gaining traction across a growing range of high-rise developments and could increasingly evolve from a selective structural solution into a more mainstream delivery model. The opportunity ahead may lie in creating more predictable, efficient and industrialised approaches to project delivery. The next phase of growth may therefore be shaped less by the potential of steel and more by the industry's ability to deploy it repeatedly, competitively and sustainably at scale.



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