

Assessment of prefabricated building, pre-engineered steel building, construction and expanded polystyrene markets in India

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DRAFT

Consulting

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1 Macroeconomic assessment of India

1.1 GDP outlook

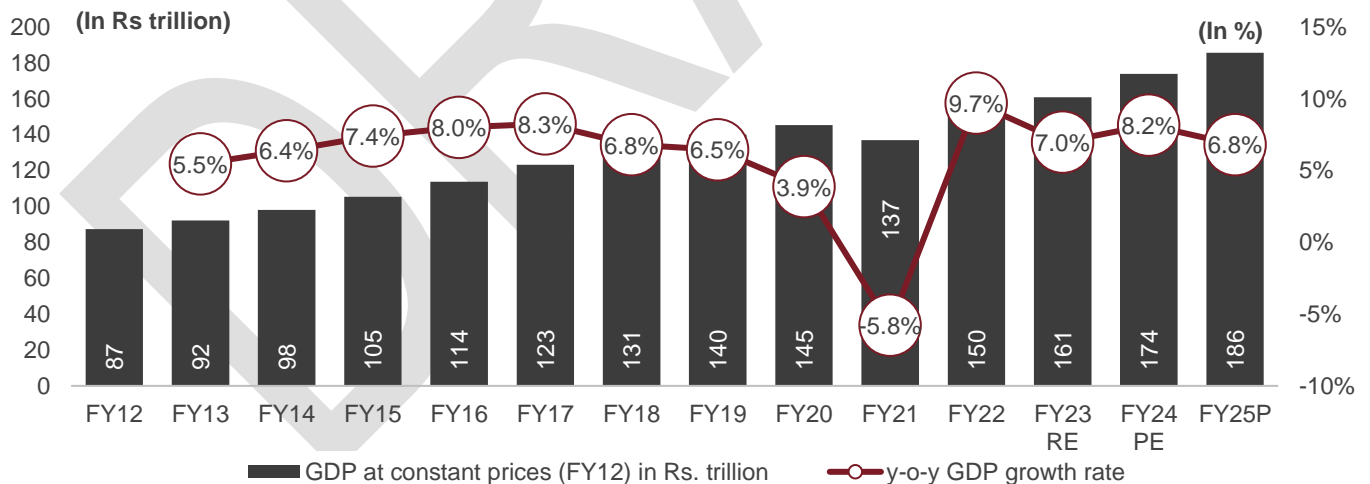
India GDP logged 5.9% CAGR between FY12 and FY24

India's annual Gross Domestic Product (GDP) grew at 5.9% compounded annual growth rate (CAGR) between FY12 and FY24 to Rs 174 trillion in FY24 from Rs 87 trillion in FY12. A large part of the lower growth rate was because of challenges heaped by the Covid-19 pandemic in FY20 and FY21. In FY22, the economy recovered with abating of the pandemic and subsequent easing of restrictions and resumption in economic activity. In FY23, GDP rose 7% on continued strong growth momentum, propelled by investments and private consumption.

The National Statistics Office (NSO) in its provisional estimates GDP for FY24, estimated India's real GDP growth to be 8.2% which is higher than its Second Advanced Estimate of 7.6%. Even as the agricultural economy slowed sharply following a weak monsoon, the surge in non-agricultural economy has more than made up for it. The government's investment push, along with easing input cost pressures for industry, has also played a major role in shoring up the growth. However, services have been slowing owing to waning pent-up demand (post the pandemic), with the exception of financial, real estate and professional services, which have powered ahead on the back of a robust growth in banking and real estate sectors.

An analysis of the FY24 growth reveals notable dichotomies. The growth was primarily fuelled by fixed investments, exhibiting a robust 9.0% expansion, while private consumption growth lagged behind at 4.0%, trailing overall GDP growth. On the supply side, the manufacturing sector experienced the most substantial growth at ~9.9%, while agriculture exhibited more modest growth rate of 1.4%. These trends underscore the varied performance across sectors, highlighting the nuanced dynamics shaping India's economic landscape in FY24. Overall, real GDP of India is estimated to have grown at 8.2% in FY24 compared with 7.0% in FY23.

India real GDP growth at constant prices (new series)



Notes: RE – revised estimates, PE: provisional estimates, P – projection

The values are reported by the government under various stages of estimates

Actuals, estimates and projected data of GDP are provided in the bar graph

Source: Ministry of Statistics and Programme Implementation (MoSPI), CRISIL MI&A

India's economy to grow 6.8% in FY25






Post strong GDP prints in the past three fiscals, CRISIL expects India's GDP growth to moderate to 6.8% this fiscal, owing to the government's focus on fiscal consolidation, rising borrowing costs and waning of pent-up demand for services. Also, the net tax impact on GDP is expected to normalise and exports could be affected by uneven economic growth of key trading partners and geopolitical uncertainties. But another spell of normal monsoon and cooling domestic inflation could revive rural demand. Also, the manufacturing sector, investments in infrastructure and domestic demand are expected to remain resilient.

Southern India was the highest contributor to India's GDP and construction GVA in FY23

In FY23, southern states had the highest combined Gross State Domestic Product (GSDP) of Rs 49.1 trillion (share of 30%), followed by western states, which had the combined GSDP of Rs 46.9 trillion (share of 28.7%).

In case of construction GVA also, southern India was leading with combined construction GVA of Rs 40.7 trillion (share of 31.3%), followed by Northern states at 35.6 trillion (share of 27.4%).

Regional GSDP and Construction GVA (at constant prices)

Region	States	GSDP (FY23)		Construction GVA (FY23)	
		Rs trillion	Share	Rs trillion	Share
 North	Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand	42.8	26.2%	35.6	27.4%
 South	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana, Andaman and Nicobar Islands, Puducherry	49.1	30.0%	40.7	31.3%
 East	Bihar, Orissa, Jharkhand, West Bengal	20.1	12.3%	18.0	13.8%
 West	Goa, Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh	46.9	28.7%	31.4	24.2%
 Northeast	Assam, Sikkim, Nagaland, Meghalaya, Manipur, Mizoram, Tripura and Arunachal Pradesh	4.5	2.8%	4.2	3.2%

Note: FY23 is considered to ensure consistency as GSDP and construction GVA FY24 data of few states is not available from the respective sources.

*Contribution: (Summation of GSDP of all the states/ union territories in the particular region)/ (Summation of GSDP of all the states/ union territories)

Source: NITI Aayog, CRISIL MI&A

In northern region, Uttar Pradesh and Rajasthan had the highest GSDP and construction GVA, whereas in southern states, Tamil Nadu, and Karnataka held top two positions in FY23.

Additionally, state governments are also focusing on the industrial and infrastructure development of their respective states, which is expected to positively impact the construction GVA. For instance, Tamil Nadu Small Industries Development Corporation Limited (TANSIDCO) promotes the development of Private industrial Parks providing 75% of the project cost of up to Rs.150 million as a government grant for the shifting of existing urban/city-based Industrial Units to the outskirts for basic infrastructure facilities like Road, Water Supply, Electricity etc. Furthermore, government undertakes 50% of the project cost of up to Rs.100 million for the formation of new private industrial estates in the outskirts of urban areas. Two new private industrial estate at Coimbatore and Namakkal were established and four more to come at Coimbatore, Virudhunagar and Madurai districts.

Tamil Nadu government had also launched Tamil Nadu Industrial Policy 2021, this Policy is applicable for projects establishing or expanding industrial units, industrial parks, R&D projects, warehousing and logistics except those specified in the negative list. Investments made from January 1, 2021, will be considered eligible for availing incentives. This Policy supersedes the Tamil Nadu Industrial Policy 2014 and will be valid till 31.03.2025. The Policy may be periodically revised from time to time.

Similarly, Government of Karnataka comes out with industrial policies at regular intervals of five years to ensure a well-balanced, sustainable and inclusive industrial development throughout the State. The focus of the New Industrial Policy 2020-25 is to build on the strengths of Karnataka's industry and to enable it to fulfil its role as the engine of growth and to shoulder responsibility of adding more hi-tech value and employment. Some of the major objectives of the scheme includes attracting investments worth Rs 5 trillion and to provide an ecosystem for technology adoption and innovation.

State/ UT wise GSDP (Rs trillion)- at constant prices

Region	States/ UT	State GSDP (Rs trillion)- at constant prices		Construction GVA (Rs trillion)- at constant prices	
		2022-23	CAGR (FY19-23)	2022-23	CAGR (FY19-23)
North	Uttar Pradesh	13.2	4.8%	1.5	6.6%
	Rajasthan	7.8	5.0%	0.6	5.8%
	Delhi	6.3	2.6%	0.3	6.1%
	Haryana	5.9	2.5%	0.4	4.2%
	Punjab	4.7	4.0%	0.3	6.0%
	Uttarakhand	2.0	1.6%	0.2	5.9%
	Himachal Pradesh	1.3	3.5%	0.1	3.1%
	Jammu and Kashmir	1.3	2.9%	0.1	2.4%
	Chandigarh	0.3	3.2%	0.0	5.4%
South	Tamil Nadu	14.5	4.8%	1.5	5.6%
	Karnataka	13.4	5.3%	0.7	4.1%
	Andhra Pradesh	7.6	5.1%	0.6	6.4%
	Telangana	7.3	4.5%	0.4	7.3%
	Kerala	6.0	1.8%	0.8	3.4%

Region	States/ UT	State GSDP (Rs trillion)- at constant prices		Construction GVA (Rs trillion)- at constant prices	
		2022-23	CAGR (FY19-23)	2022-23	CAGR (FY19-23)
	Puducherry	0.3	-0.4%	0.0	6.5%
	Andaman and Nicobar Islands	0.1	2.6%	0.0	3.0%
West	Maharashtra	22.4	3.4%	1.4	8.4%
	Gujarat	14.7	5.5%	0.9	10.5%
	Madhya Pradesh	6.2	3.5%	0.5	3.5%
	Chhattisgarh	3.0	5.4%	0.3	8.3%
	Goa	0.5	0.6%	0.0	6.3%
East	West Bengal	8.4	3.3%	0.8	4.4%
	Odisha	4.8	5.6%	0.4	8.1%
	Bihar	4.3	2.8%	0.5	7.8%
	Jharkhand	2.7	3.7%	0.2	5.4%
Northeast	Assam	2.8	5.0%	0.3	13.7%
	Tripura	0.4	3.9%	0.0	-1.2%
	Meghalaya	0.3	3.1%	0.0	2.9%
	Sikkim	0.2	5.4%	0.0	9.8%
	Manipur	0.2	5.1%	0.0	8.2%
	Mizoram	0.2	5.8%	0.0	2.1%
	Nagaland	0.2	4.6%	0.0	2.1%
Arunachal Pradesh	0.2	3.0%	0.0	4.8%	

Note: FY23 is considered to ensure consistency as GSDP and construction GVA FY24 data of few states is not available from the respective sources.

Source: NITI Aayog, CRISIL MI&A

India among fastest-growing major economies

Following the recovery from the Covid-19 pandemic, India saw a faster growth of 7.0% in FY23 (CY2022), surpassing advanced economies, which grew 2.9%, and emerging and developing economies, which grew 4.0%. The trend is expected to continue, with the country leading the growth among its key counterparts.

United States: The projected growth of the United States for 2024 has been revised upward to 2.8%, which is 0.2% higher than the July forecast. This upward revision is on account of stronger outturns in consumption and non-residential investment. The resilience of consumption is largely the result of robust increases in real wages (especially among lower-income households) and wealth effects. Growth is anticipated to slow to 2.2% in 2025 as fiscal policy is gradually tightened and a cooling labour market slows consumption.

United Kingdom: The growth in the United Kingdom is projected to have accelerated to 1.1% in 2024 and is expected to continue doing so to 1.5% in 2025 as falling inflation and interest rates stimulate domestic demand.

Euro area: In the euro area, growth seems to have reached its lowest point in 2023. A touch weaker than projected in April and July 2024, GDP growth is expected to pick up to a modest 0.8% in 2024 because of better export performance, particularly goods. In 2025, growth is projected to rise further to 1.2%, owing to stronger domestic demand. Additionally, rising real wages are expected to boost consumption, and a gradual loosening of monetary policy is expected to support investment.

For **emerging and developing economies**, the growth is projected to be relatively stable at 4.2% in 2024 and 2025, respectively. Compared with that in April, growth in emerging market and developing economies is revised upward by 0.1% for 2024.

Real GDP growth comparison between India and advanced and emerging economies

Real GDP growth	2019	2020	2021	2022	2023	2024P	2025P	2026P	2027P	2028P	2029P
Canada	1.9	-5.0	5.3	3.8	1.2	1.3	2.4	2.0	1.8	1.8	1.6
China	6.0	2.2	8.4	3.0	5.2	4.8	4.5	4.1	3.6	3.4	3.3
Euro area	1.6	-6.1	6.2	3.3	0.4	0.8	1.2	1.5	1.4	1.3	1.2
India*	3.9	-5.8	9.7*	7.0*	8.2*	6.8*	6.5	6.5	6.5	6.5	6.5
Japan	-0.4	-4.2	2.7	1.2	1.7	0.3	1.1	0.8	0.6	0.6	0.5
United Kingdom	1.6	-10.3	8.6	4.8	0.3	1.1	1.5	1.5	1.5	1.4	1.3
United States	2.6	-2.2	6.1	2.5	2.9	2.8	2.2	2.0	2.1	2.1	2.1
Advanced economies	1.9	-4.0	6.0	2.9	1.7	1.8	1.8	1.8	1.7	1.7	1.7
Emerging market and developing economies	3.7	-1.8	7.0	4.0	4.4	4.2	4.2	4.2	4.0	3.9	3.9
World	2.9	-2.7	6.6	3.6	3.3	3.2	3.2	3.3	3.2	3.1	3.1

Notes: P- projected

* Numbers for India are for financial year from April to March (2020 is FY21 and so on) and as per the IMF's forecast.

^India GDP for the FY24 is 8.2% according to provisional estimates of the Ministry for Statistics and Programme Implementation (MoSPI).

Projection is as per the IMF update

Source: IMF economic database, World Bank national accounts data, OECD national accounts data, CRISIL MI&A

Per capita net national income of India further improved in FY24

India's per capita income, a broad indicator of living standards, rose from Rs 63,462 in FY12 to Rs 106,744 (provisional estimates) in FY24, logging 4.4% CAGR. Growth was led by better job opportunities, propped up by overall GDP growth. Moreover, population growth remained stable at ~1% CAGR.

Per capita net national income at constant prices

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21RE	FY22	FY23	FY24PE
Per-capita NNI (INR)	63,462	65,538	68,572	72,805	77,659	83,003	87,586	92,133	94,420	86,034	94,054	99,404	106,744
Y-o-Y growth (%)		3.3%	4.6%	6.2%	6.7%	6.9%	5.5%	5.2%	2.5%	-8.9%	9.3%	5.7%	7.4%

RE – revised estimates, PE- provisional estimates

Source: Provisional Estimates of Annual National Income, 2022-23, CSO, MoSPI, CRISIL MI&A

1.2 Demographic factors support India’s growth

Growing population, increasing urbanisation and a young demographic profile to strengthen India’s economic growth

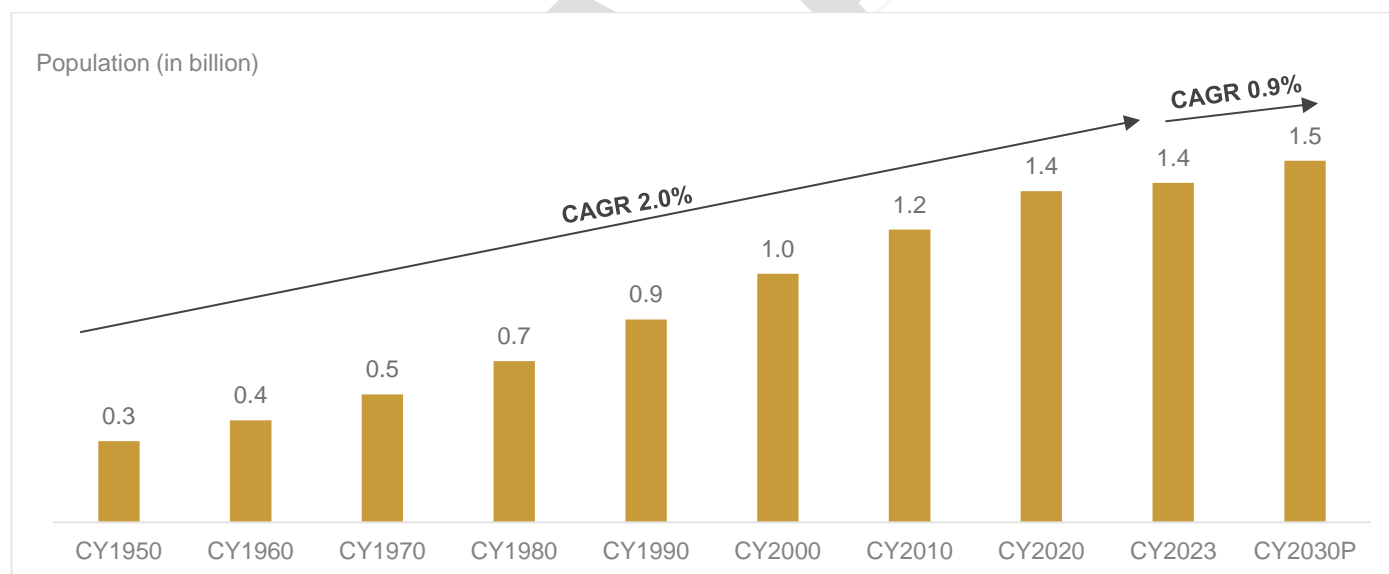
India’s population grew to ~1.4 billion in 2023 as per World Population Prospects 2024, compared to just 0.3 billion in 1950, thereby registering a CAGR of ~2.0%.

Additionally, as per World Population Prospects 2024, the population of India is expected to remain the world’s largest throughout the century and will likely reach its peak in the early 2060s at about 1.7 billion.

Furthermore, according to the UN, the global median age rose to ~30 years in 2020 from ~20 years in 1970. This is lower than the median age in developed countries such as the US (37.5 years) and the UK (39.5 years).

For the year 2020, India’s median age is 27.3 years, reflecting a favorable demographic dividend. Further, it is the lowest among BRIC peers: Brazil (32.4 years), Russia (38.6 years) and China (37.4 years). This trend is expected to continue up to 2030, indicating strong potential for an increase in income and basic and discretionary spending,

India’s population growth



Note: P: Projected

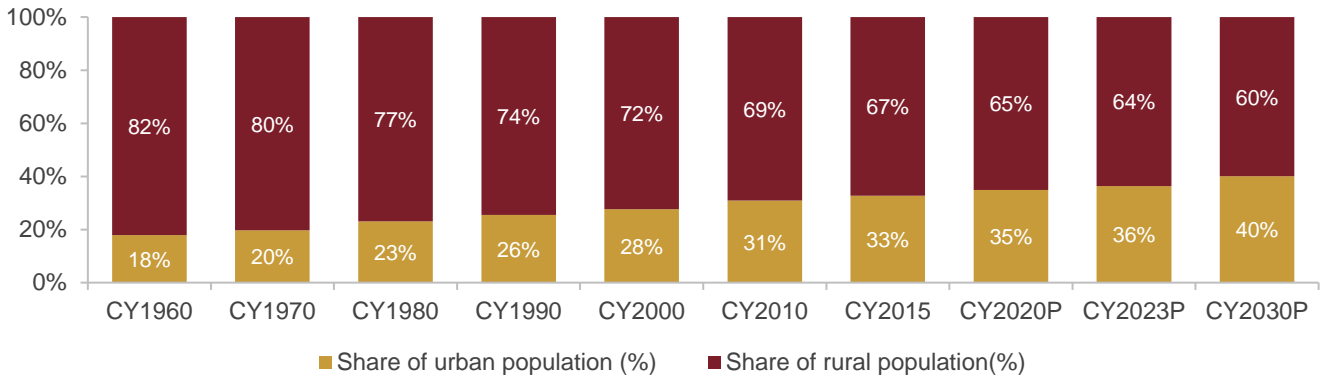
Population is the above chart as of 1st January

Source: UN Department of Economic and Social Affairs, World Population Prospects 2024, CRISIL MI&A

Additionally, urbanisation has also seen an uptrend growing from 18% in 1960 to an estimated 36% in 2023. This growth in urbanisation necessitates enhancements in facilities such as housing, transportation and utilities to support the increased population density. This in turn has aided in increased spends toward urban infrastructure.

Going ahead, India’s urban population is expected to continue to rise on the back of economic growth. The share of urban population is projected to increase to nearly 40% by 2030, according to a UN report on urbanisation.

India's urban vs. rural population (in million)



P: projected

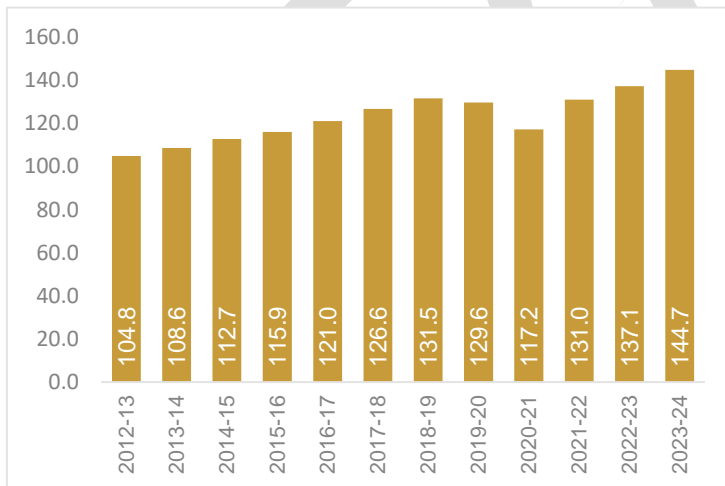
Source: World Urbanization Prospects: The 2018 Revision, UN, CRISIL MI&A

Manufacturing IIP increased to 144.7 in FY24

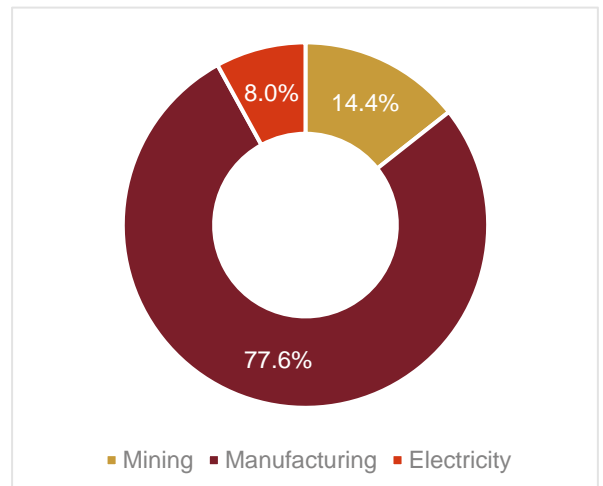
The Index of Industrial Production (IIP) for manufacturing rose to 144.7 in FY24 from 104.8 in FY13. The manufacturing sector is a significant contributor to the country's overall industrial growth, with 78% weightage in the overall IIP as of FY24.

Even though manufacturing IIP declined in FY20 to 129.6 and to 117.2 in FY21 owing to the pandemic, it recovered to 131.0 in FY22 on the back of easing of Covid-19 related restrictions, government stimulus measures, rising consumer demand and efforts to revitalise the manufacturing sector. Consequently, in FY24, manufacturing IIP stood at 144.7.

Manufacturing IIP (FY13-24)



Weight of manufacturing in IIP (FY24)



Source: MoSPI, CRISIL MI&A

Healthy growth of gross value added in FY24 in line with GDP growth

As of FY24PE, GVA has reached to Rs 158.7 trillion, up from Rs 148.0 trillion, registering a y-o-y growth of ~7.2%. Financial, Real Estate & Professional Services had the highest contribution to GVA at ~23.3%, whereas construction and manufacturing GVA had the registered the highest annual growth at ~9.9%.

GVA at constant prices

Sectors (Rs trillion)	FY12	FY19	FY20	FY21	FY22	FY23 RE	FY24 PE	Share in GVA FY24	Annual growth in FY24
Construction	7.8	10.3	10.4	10.0	11.9	13.1	14.4	9.0%	9.9%
Manufacturing	14.1	23.3	22.6	23.3	25.6	25.0	27.5	17.3%	9.9%
Financial, Real Estate & Professional Services	15.3	27.1	29.0	29.5	31.2	34.1	36.9	23.3%	8.4%
Public Administration, Defence & Other Services	10.3	16.3	17.3	16.0	17.2	18.8	20.2	12.7%	7.8%
Electricity, gas, water supply & other utility services	1.9	2.9	3.0	2.9	3.2	3.5	3.7	2.4%	7.5%
Mining and quarrying	2.6	3.3	3.2	2.9	3.1	3.2	3.4	2.1%	7.1%
Trade, Hotels, Transport, Communication & Services related to Broadcasting	14.1	25.4	26.9	21.5	24.8	27.8	29.6	18.6%	6.4%
Agriculture, forestry and fishing	15.0	18.8	19.9	20.7	21.7	22.7	23.0	14.5%	1.4%
Total GVA at constant prices	81.1	127.3	132.4	126.9	138.8	148.0	158.7	100.0%	7.2%

Note: The above table has been arranged in the descending order of annual growth in FY24

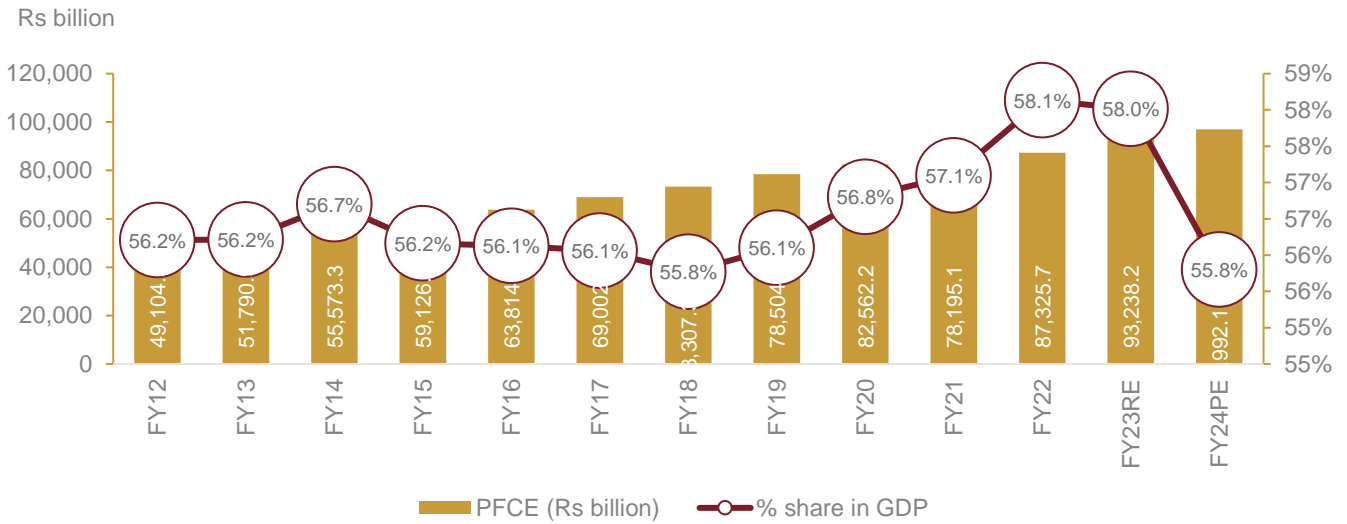
RE – revised estimate, PE- provisional estimates

Source: MoSPI, CRISIL MI&A

Private final consumption expenditure to maintain dominant share in India's GDP

Private final consumption expenditure (PFCE) at constant prices clocked 6% CAGR between FY12-23, maintaining its dominant share of ~58.0% in FY23 (~Rs 93,238 billion in absolute terms, up 6.8% year-on-year). Growth was led by healthy monsoon, wage revisions due to the implementation of the Seventh Central Pay Commission's (CPC) recommendations, benign interest rates, growing middle age population and low inflation. As of FY24PE, PFCE is estimated to have further increased to Rs 96,992 billion, registering a y-o-y growth of ~4% and forming ~56% of India's GDP.

PFCE at constant prices



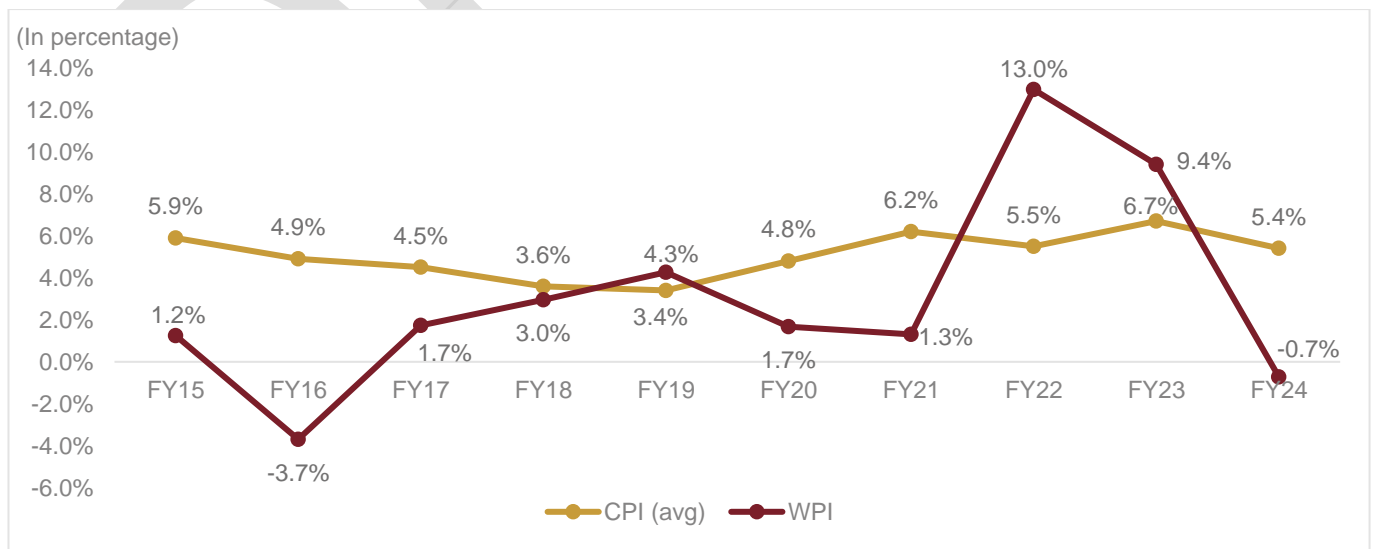
RE – revised estimates; PE- provisional estimates
Source: MoSPI, CRISIL MI&A

WPI and CPI inflation eased in FY24

India's wholesale price index (WPI), which has a higher weight for items linked to global prices, has seen wild swings in the aftermath of the pandemic and geopolitical tensions. From 1.7%, on average, in FY20, WPI inflation, averaged around ~1.3% in FY21, before touching a high of 13.0% FY22. In FY23, WPI inflation moderated to 9.4% from a high of 13.0% in FY22. In FY24, WPI inflation fell to -0.7%, on account of deflation in non-food items like manufacturing goods and fuel and power, which cumulatively have a high weightage in overall index.

Consumer price index (CPI) based inflation was 6.7% in FY23, which was above the Reserve Bank of India's (RBI) upper tolerance limit of 6%, moderated to 5.4% in FY24. This was majorly due to moderation in non-food categories. However, key food categories including cereals, pulses and vegetables have remained at elevated levels.

Inflation (year-on-year %)



Note: WPI data is as per the 2011-12 base
Source: Ministry of Commerce and Industry, CRISIL MI&A

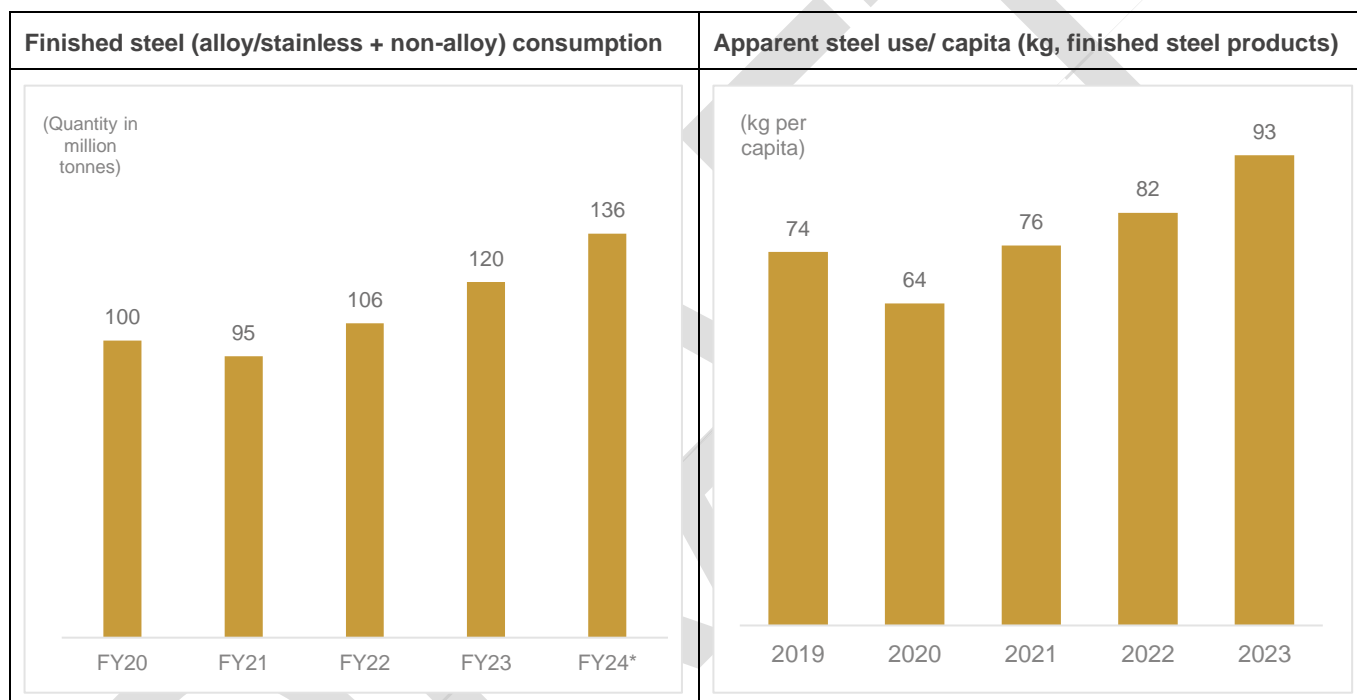
1.3 Steel consumption in India

India steel consumption is expected to rise on investments in infrastructure

Finished steel consumption grew from 100 million tonnes in FY20 to 136 MT in FY24 owing to strong demand from allied sectors and the government's capital spending drive. However, demand had declined in FY21 to 95 MT from 100 MT in FY20 following the onset of the pandemic.

The government's initiatives, such as Make in India, Smart Cities Mission, Production Linked Incentive (PLI) and Pradhan Mantri Awas Yojana, have supported steel demand during the period, which increased to 136 MT in FY24 as per the provisional estimates. Additionally, apparent steel use/ capita of India also improved between CY2019-2023 to 93 kg per capita in 2023 compared to 74 kg per capita in 2019.

Steel consumption- India

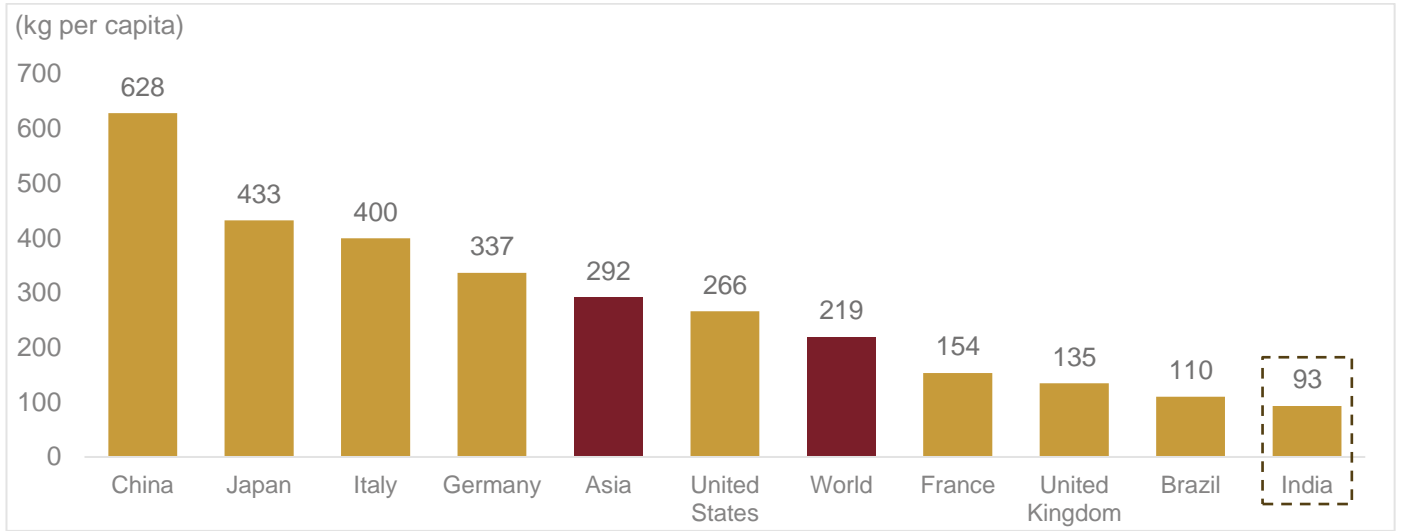


Note: FY24 numbers are provisional

Source: Ministry of Steel annual report, Joint Plant Committee (JPC), World Steel Association CRISIL MI&A

However, India has considerable scope to enhance steel usage across various sectors. As of CY2023, the country's annual per capita apparent steel consumption was 93 kg per annum vs. the world's average of 219 kg.

Apparent steel use (kg) per capita in CY2023

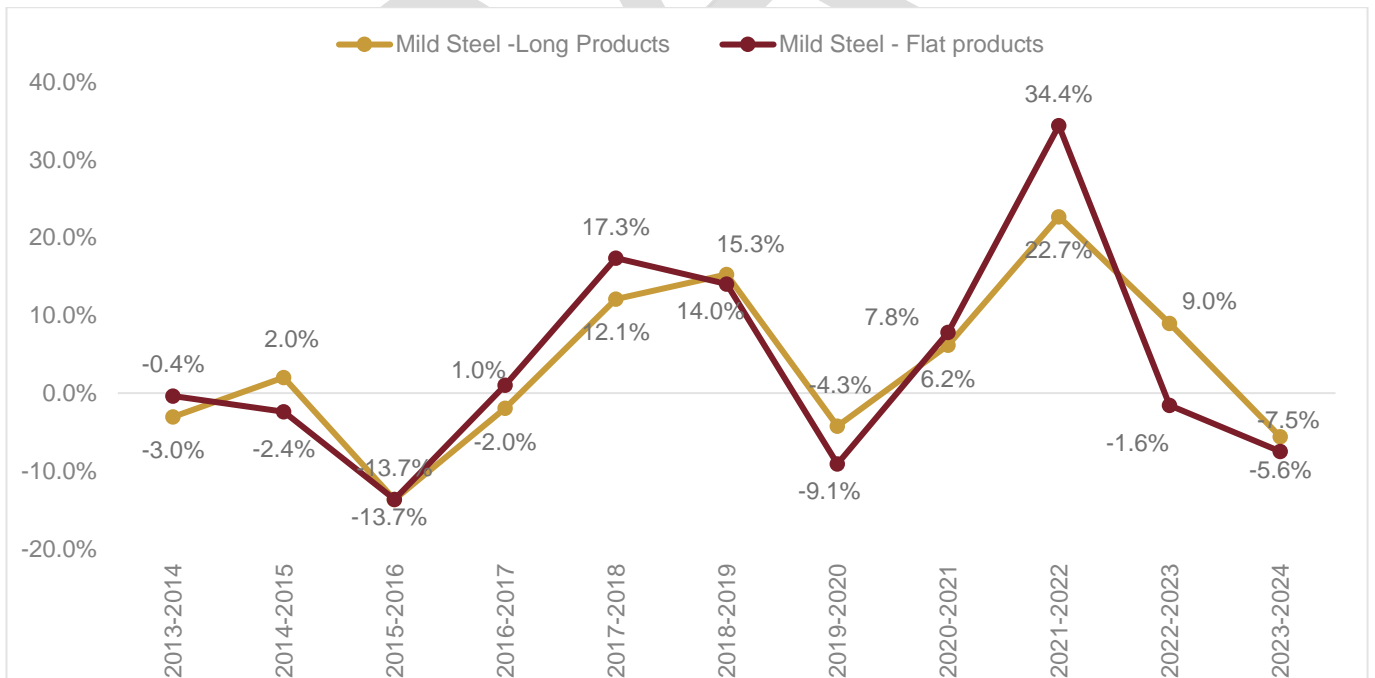


Source: World Steel Association, CRISIL MI&A

Steel inflation cooled down in FY24

Factors like muted global demand, geopolitical issues, cheaper imports and better realisations in the domestic market helped in price correction in FY23 and FY24, after a steep increase in prices in FY22 due to pandemic and global geopolitical issues. This price correction in steel had been a favourable development for suppliers in the pre-engineered steel building (PEB) sector, given that steel constitutes a significant input cost for PEB construction.

Trend in mild steel prices –long and flat products



Note: Data is as per the 2011-12 base

Source: Office of Economic Advisor, CRISIL MI&A

2 Assessment of construction capex in India

2.1 Construction sector in India

Construction sector share in overall GVA estimated to have risen further in FY24

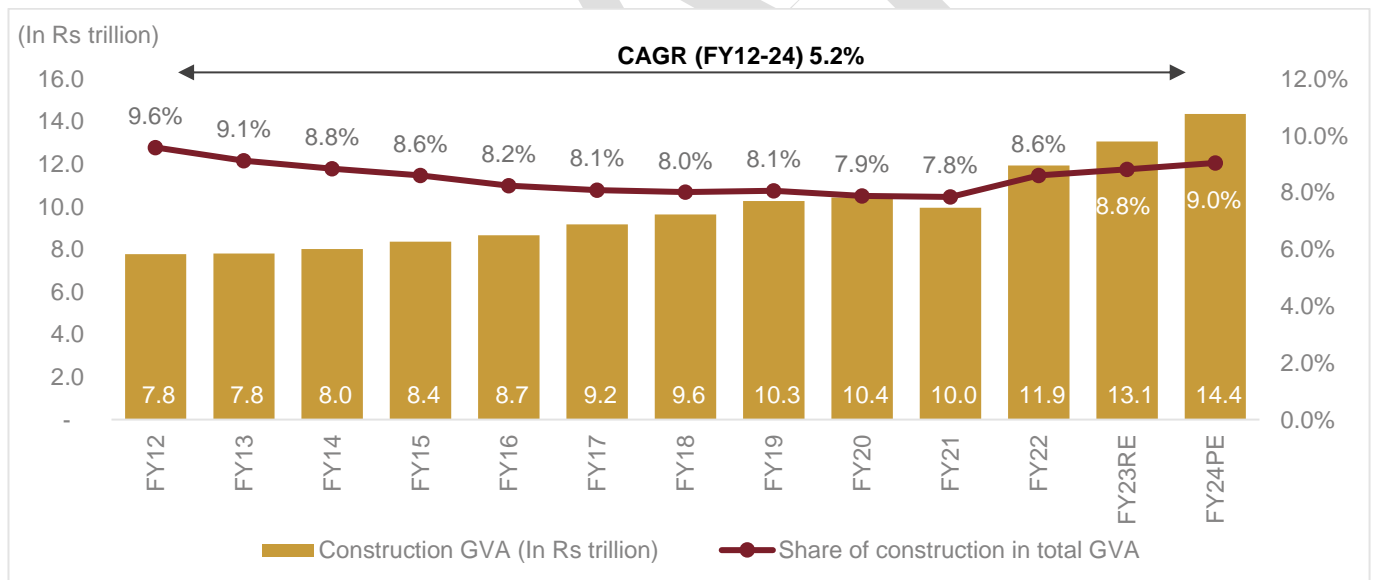
Construction GVA is a critical indicator of economic activity as it represents the value generated by the construction sector, which includes activities related to building infrastructure, real estate and other construction projects.

In India, the construction GVA increased to Rs 14.4 trillion in FY24PE from Rs 7.8 trillion in FY12, which was a CAGR of 5.2%. Several factors contributed to the growth were economic expansion, the government's commitment to infrastructure development, particularly roads, railways and energy projects, and increase in FDI, which boosted private sector investments. Furthermore, increasing demand for affordable housing, driven by rising urbanisation and an expanding middle-class population, has also played a significant role in elevating construction GVA.

However, in FY21, the country's GVA was under pressure amid challenges heaped by the Covid-19 pandemic. In FY22, though, the share of construction GVA in the overall GVA rebounded to 8.6%, which further increased to 8.8% in FY23.

As per the provisional estimates for FY24, the construction GVA was Rs 14.4 trillion, thereby contributing to 9.0% in overall GVA.

Construction GVA



RE – revised estimate, PE – provisional estimates

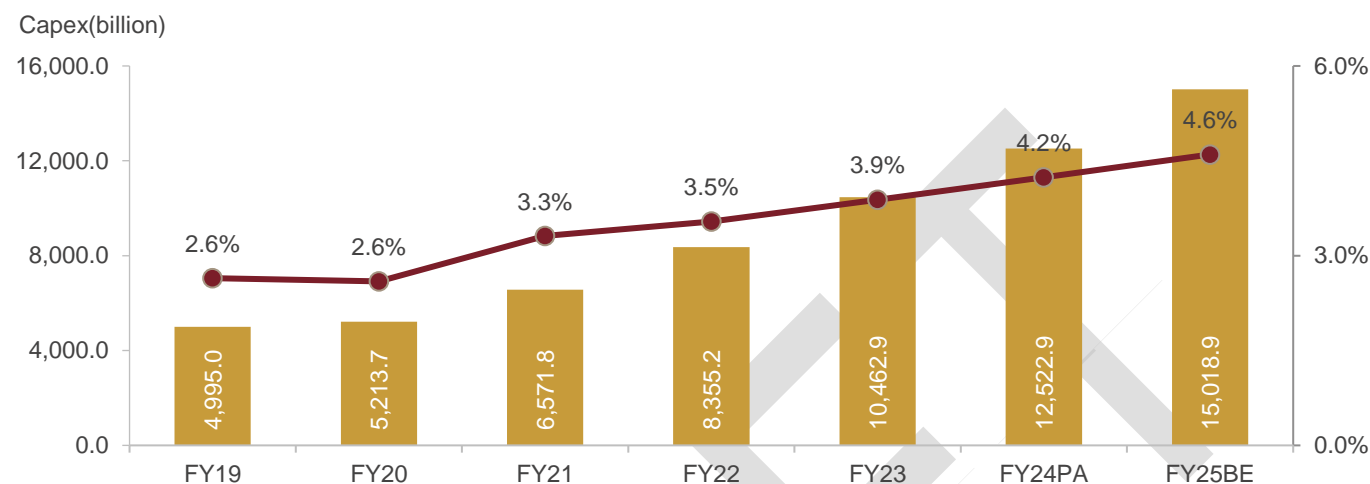
Source: MoSPI, CRISIL MI&A

Effective government capex to GDP ratio improved to 4.2% in FY24

The central government has continued to maintain its focus on capital expenditure, whose share in the total expenditure mix is budgeted to rise further this fiscal. Capital expenditure for FY25 is budgeted at Rs 11.1 trillion, up 17.1% from Rs 9.5 trillion in FY24. At the same time, grants-in-aid for creation of capital assets are also budgeted to increase substantially to Rs 3.9 trillion, from Rs 3.0 trillion in FY24. Together, this means effective capital expenditure through the budget rises to Rs 15.0 trillion, from Rs 12.5 trillion (up 19.9%).

It is worth noting that during April-May FY25, central government capex was down 14.4% on-year, largely since the nation was in election mode. Hence, the capex run rate must be increased substantially in the remaining months of the fiscal to achieve the full-year target

Effective construction capex as a percentage to GDP



Note:

RE: Revised estimates, PA: Provisional estimates, BE: Budgeted estimates

For FY21 Grants for creations of capital assets also includes allocations under Demand driven/entitlement-based scheme MGNREGS, which would vary based on demand.

Provisional Actuals for FY 2023-24 are unaudited and subject to change.

Source: Budget documents, MoSPI, CRISIL MI&A

India’s gross fixed capital formation as % of GDP to have further improved in FY24

Gross fixed capital formation (GFCF) the indicator for fixed investments done by both government and private sector, has seen a rise from Rs 30 trillion in FY12 to Rs 58.3 trillion in FY24 (as per provisional estimates) growing at a CAGR of 5.7%.

In FY24, GFCF as % of India’s GDP increased to 33.5% compared to 33.3% of GDP in FY23 due to factors such as the government's focus on infrastructure development, private investments, etc.

Overview of GFCF and share in GDP – at constant prices

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23 RE	FY24 PE	CAGR FY12-FY24
GFCF (Rs trillion)	30.0	31.5	31.9	32.8	34.9	37.9	40.8	45.4	45.9	42.7	50.1	53.5	58.3	5.7%
Share of GFCF in GDP	34.3%	34.1%	32.6%	31.1%	30.7%	30.8%	31.1%	32.4%	31.6%	31.2%	33.4%	33.3%	33.5%	-

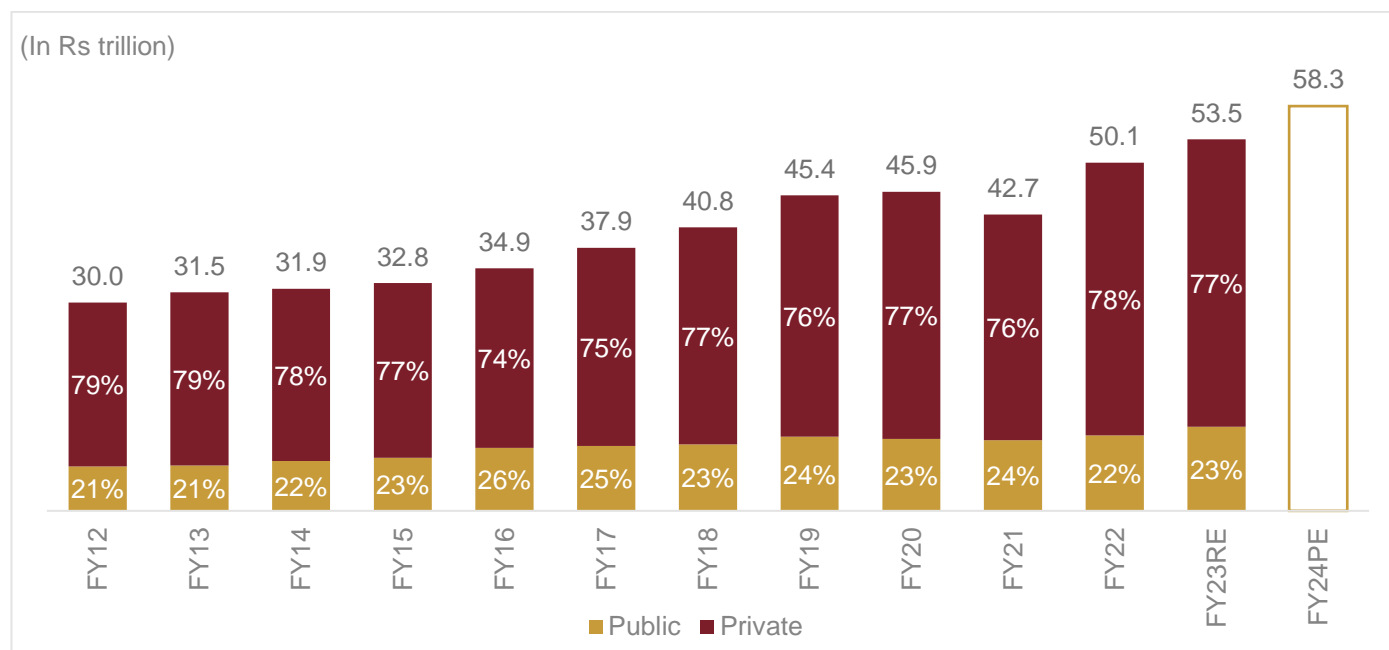
RE: Revised estimates, PE: Provisional estimates

Source: MoSPI, CRISIL MI&A

Private sector is a major contributor to GFCF, share of government contribution improved in FY23

The distribution of GFCF between the private and public sectors has been relatively constant in India, with the private sector consistently the predominant contributor. In FY23, the private sector accounted for 77% of total GFCF.

Share of public and private sectors in GFCF



RE – revised estimate, PE – provisional estimate

Note: Private fixed capital formation includes household sector

Source: MoSPI, CRISIL MI&A

Inflation of key construction materials cooled down in FY24 in line with overall WPI inflation

In FY24, inflation of key construction materials including manufacturing of cements, lime and plasters, refractory products, etc moderated in alignment with the overall WPI inflation which stood at -0.7%.

WPI inflation of mild steels (long and flat products, porcelain sanitary ware, and varnishes registered a negative WPI inflation of -6.6%, -8.4% and -2.8% respectively, whereas manufacture of cement, lime and plaster, articles of concrete, cement and plaster, and refractory products saw a modest WPI inflation of 0.1%, 2.5% and 0.6% respectively.

Overall, WPI inflation of key construction raw material rose moderated in FY24, compared to FY22 and FY23, where some of the key construction raw materials saw double digit WPI inflation, and overall WPI inflation reached at 13.0% and 9.4% respectively.

WPI index of key construction raw materials

Key construction raw materials	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
Manufacture of cement, lime and plaster	-1.3%	4.2%	-0.9%	0.6%	2.9%	0.4%	4.5%	1.2%	4.5%	8.5%	0.1%
Manufacture of articles of concrete, cement and plaster	3.4%	3.6%	-0.3%	-0.7%	3.1%	2.2%	0.1%	3.0%	3.1%	4.0%	2.5%
Manufacture of refractory products	3.1%	2.9%	3.8%	-2.8%	-2.6%	-1.9%	-2.2%	0.7%	5.6%	2.9%	0.6%
Manufacture of paints	3.6%	2.2%	-1.7%	-1.1%	-0.3%	3.5%	1.3%	0.3%	14.1%	11.9%	0.0%
Manufacture of varnishes (all types)	5.8%	5.0%	5.6%	1.1%	-0.6%	5.8%	1.7%	-2.6%	7.5%	10.2%	-2.8%
Porcelain sanitary ware	4.3%	6.5%	-14.9%	-8.0%	-0.3%	4.3%	4.9%	6.3%	9.1%	13.4%	-8.4%
Electric insulating material	-1.9%	4.9%	1.8%	1.0%	0.4%	-0.1%	1.1%	-4.8%	1.6%	3.4%	2.0%
Mild steel- long and flat products	-1.7%	-0.2%	-13.7%	-0.5%	14.8%	14.6%	-6.8%	7.0%	28.7%	3.3%	-6.6%
Overall WPI inflation	5.2%	1.2%	-3.7%	1.7%	3.0%	4.3%	1.7%	1.3%	13.0%	9.4%	-0.7%

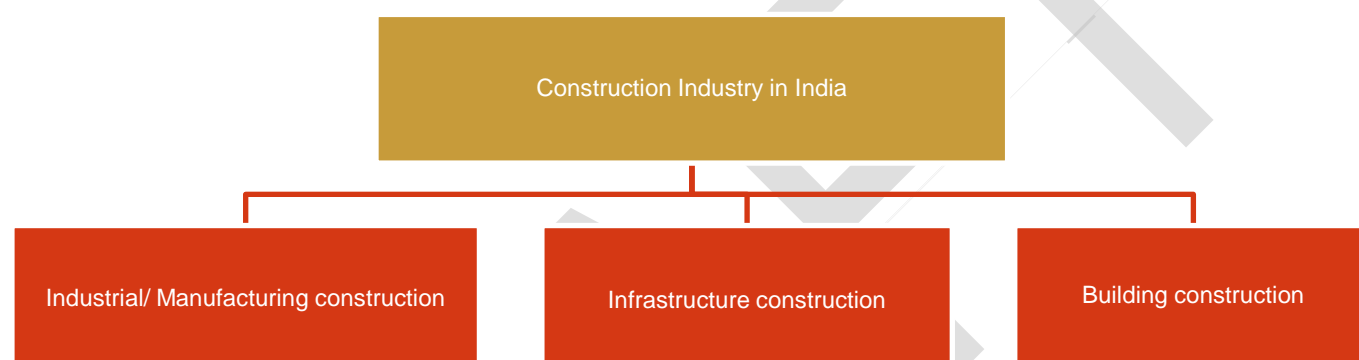
Note: Inflation below zero is highlighted in green
Source: Office of Economic Advisor, CRISIL MI&A

2.2 Overview of investments in construction sector

The construction sector in India can be broadly classified into Building Construction, Industrial/ Manufacturing construction, and Infrastructure construction.

Industrial/manufacturing construction includes manufacturing plants, factories, power plants, and other highly specialised facilities. Infrastructure construction includes warehouses, bridges, dams, roads, airports, canals, etc. and building construction includes constructing buildings for residential uses such as houses, residential towers, etc. as well as non-commercial buildings like hospitals, educational institutions as well as buildings for commercial use such as offices, retail malls, etc.

The further classification of these verticals into conventional and unconventional construction methods has been discussed in the latter section of the report.



Source: CRISIL MI&A

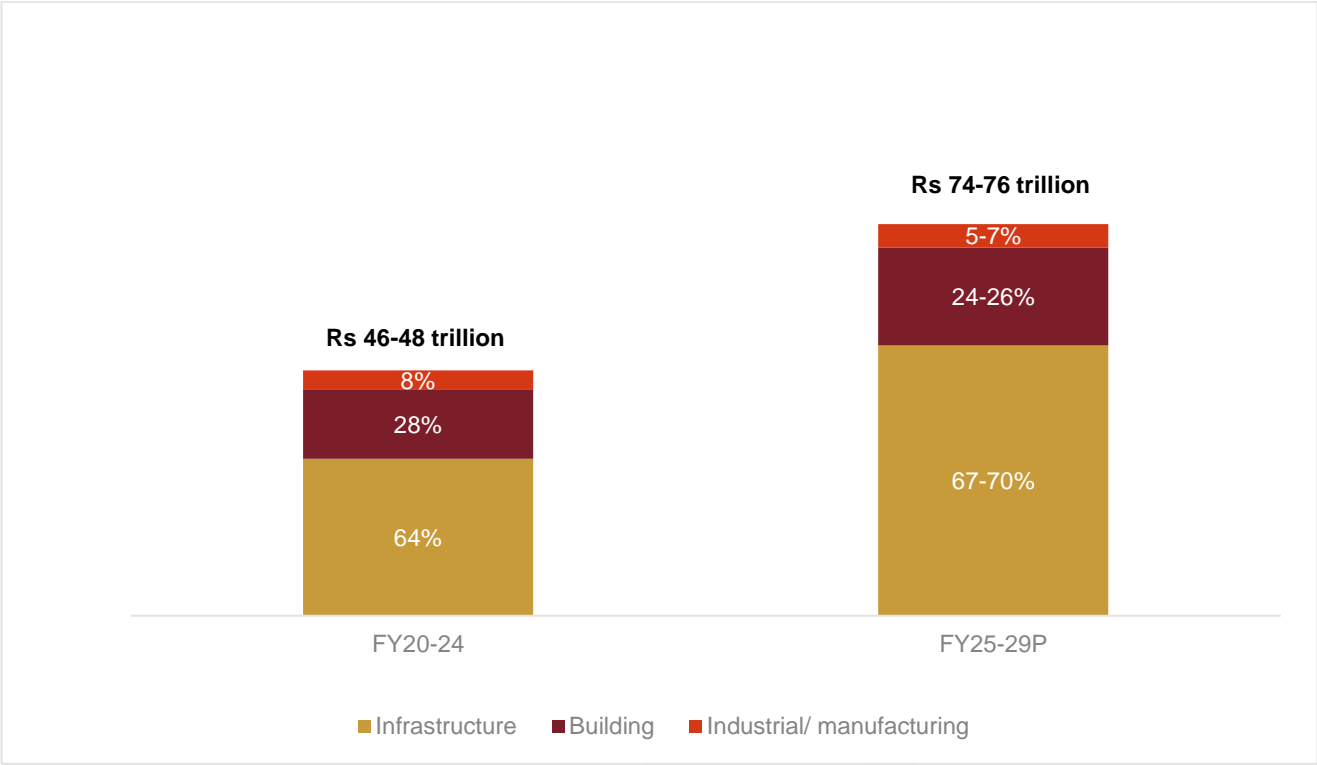
Investments in construction sector

Construction capex recorded to have risen by 13% on year FY24 led by infrastructure segment to Rs 12 trillion. The rise is in keeping with the Govt's focus on infrastructure as visible in rising central and state budget allocations to capex to meet the infra build out outlined in the NIP.

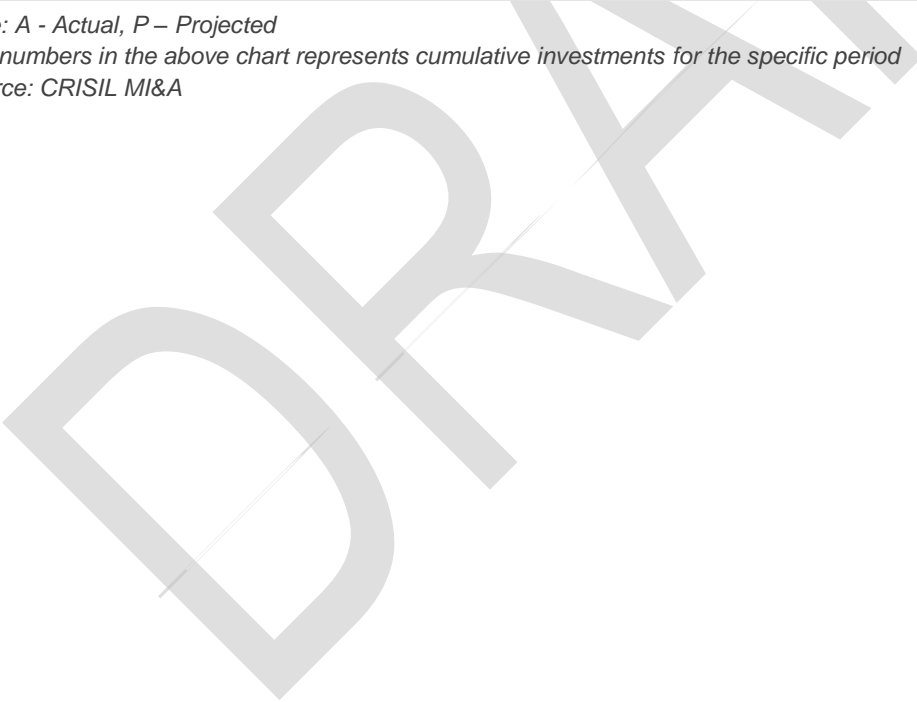
Moving forward, construction sector is projected to grow at 7-9% in FY25 with major contribution by infrastructure segment given the rising investments and focus by central and state government capex coupled with schemes such as NIP, NMP and Gati Shakti initiatives on a rising pace. Growth in Construction sector to be supplemented by the infrastructure segment over the medium to long term as the building construction and industrial sector record sedate growth rates.

Overall, CRISIL estimates cumulative construction investments of Rs 46-48 trillion between FY20-24 and the same is expected to increase to Rs ~74-76 trillion between FY25-29P.

Break-up of the domestic construction sector



Note: A - Actual, P – Projected
 The numbers in the above chart represents cumulative investments for the specific period
 Source: CRISIL MI&A



Share of infrastructure segment is estimated to increase further

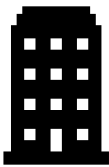


Infrastructure

FY 20-24: 29-31 trillion
Projected growth: 1.6x-1.8x
FY25-29P: 51-53 trillion

Infrastructure investments are seen growing faster than the other two sectors due to the government's focus under the National Infrastructure Pipeline (NIP), National Monetization Pipeline (NMP) and the Gati Shakti initiatives. Total construction investments in this sector is expected to attract investments of ~Rs 51-53 trillion between FY25-29P, up from Rs 29-31 trillion between FY20-24.

Moving forward, the share of infrastructure projects is expected to stabilise in the ~67-70% range in the next five years (FY25-29). The Central government's focus on roads, urban infrastructure and railways will boost infrastructure investments. Roads, railways, irrigation & Power sectors will continue to drive the bulk of these investments.



Building

FY 20-24: 12.5-13.5 trillion
Projected growth: 1.3x-1.5x
FY25-29P: 18-19 trillion

Crisil MI&A estimates Building & Construction sector to grow at 4-6% in FY25 with real estate segment showing a slowdown in demand along with rising inventory levels in key cities. The increase in execution of deferred projects and government schemes such as PMAY is expected to provide the required boost to the sector.

Between FY25-29P, the sector is expected to rise to Rs 18-19 trillion from an investment of Rs 12.5-13.5 trillion between FY20-24.



Industrial

FY 20-24: 3-4 trillion
Projected growth: 1.3x-1.5x
FY25-29P: 4.5-5.5 trillion

Construction spends across Industrial investments in FY25 are seen rising 5-7% driven by expansion in oil and gas and metals segment. To be sure, the growth is on a high base of FY24 where the sector grew due to deferred investments from FY21 and FY22 and capex investments from PLI scheme picking up.

Based on an analysis of eight key sectors, CRISIL MI&A estimates construction investment in the industrial sector at Rs 4.5-5.5 trillion between FY25-29P, compared to Rs 3-4 trillion spends seen in FY20-24. The rise in investment is projected due to inclusion of the PLI scheme in the capex investments of the industrial sector. CRISIL have only considered 3 capex-intensive sectors in case of PLI scheme, viz., auto and auto components, textiles and specialty steel for inclusion in our estimates.

Note: A - Actual, P – Projected

Infrastructure vertical includes warehouse

Building construction includes residential, commercial and non-commercial verticals

Source: CRISIL MI&A

Warehouses

Warehouses refer to storage facilities where the goods are stored until they are dispatched to the customers/end-user. The time lag between production and consumption of goods necessitates to have warehouses for temporary storage of goods. For instance, certain goods are produced only during a particular season but consumed throughout the year. Similarly, certain goods are produced throughout the year but demanded only during a particular season. Thus, warehouses play an important role in maintaining the quality of the product and minimize wide fluctuations in the price of goods.

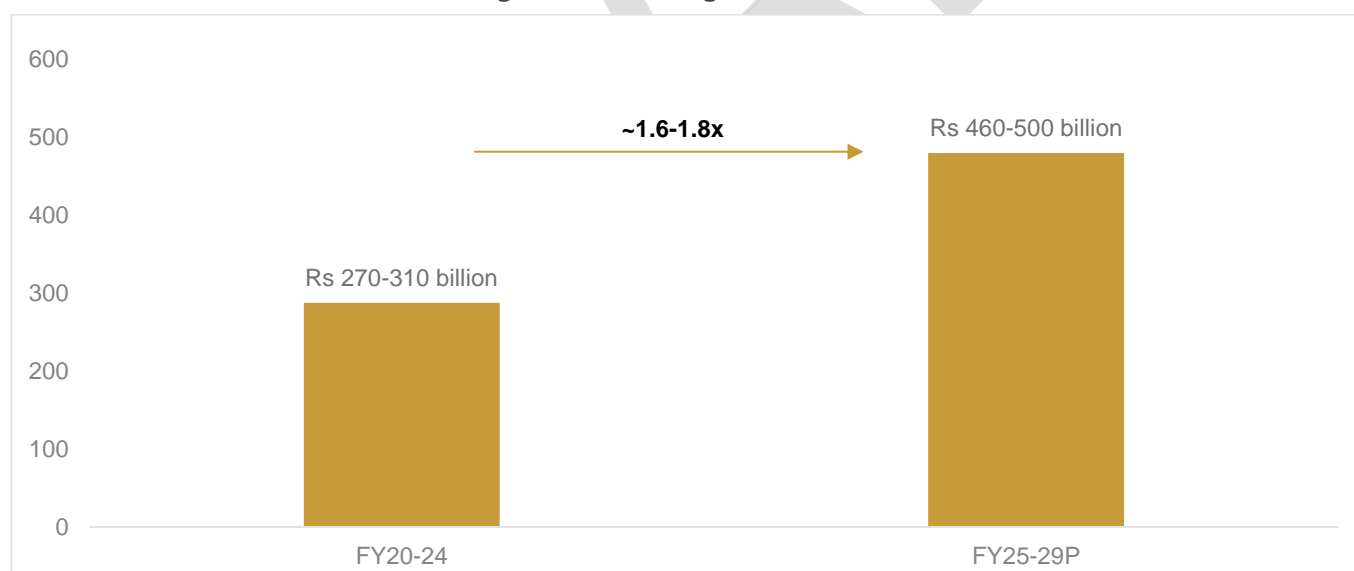
Additionally, value-added activities such as packaging, sorting, grading, kitting, bar coding, reverse logistics etc. can be carried out at the warehouse. Modern warehouses equipped with latest IT systems can also track inventory, order management, product data management, storage management etc.

Construction spends in warehouse segment to increase between FY25-29

CRISIL projects construction investments in the warehousing (agricultural and industrial) and cold-storage (single- and multi-commodity) sectors to rise to Rs 460-500 billion over the FY25-29 on expectations of increased demand. Industrial warehousing is likely to account for 85-90% of total investments. Investments in the sector of multipurpose cold storages are expected to rise due to their faster return on investment compared to single-commodity storages. The multipurpose facilities offer the advantage of accommodating various types of perishable goods simultaneously, ensuring a better capacity utilization, thereby making it a more economically viable option.

Over the long term, the annual demand for Grade A and B warehouses in top eight Indian cities is expected to log 11-16% CAGR between FY25-29. The annual supply is also expected to rise at the same rate.

Construction investments warehousing and cold storage



Note: The numbers in the above chart represents cumulative investments for the specific period

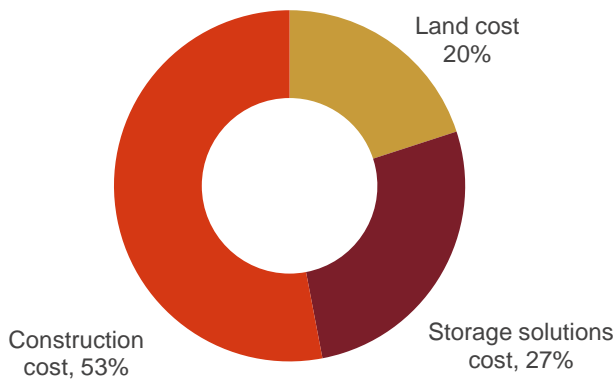
Source: CRISIL MI&A

Overall, pursuant to the change of the indirect tax regime, there is a huge demand for warehouses. Additionally, the entry of several retail giants in India and increased penetration of e-commerce players is expected to lead the demand for Grade A warehousing infrastructure and upgradation of old-style warehousing into Grade A modern warehousing in India, which would contribute to the demand of pre-engineered steel structures.

Furthermore, CRISIL MI&A also expects the warehousing industry to evolve structurally over the long term – led by automation and investment in technology and reduced dependence on labour. Most end-user industries are also expected to automate their supply chains and warehouse management services.

Warehousing project cost

Warehouse cost breakup



The warehousing project cost comprises of land, construction, and storage solution costs. Land cost, which comprises the share of 27% in the overall cost, differs significantly from one location to another on account of the demand-supply scenario, infrastructure quality and connectivity via different modes of transport in a particular location.

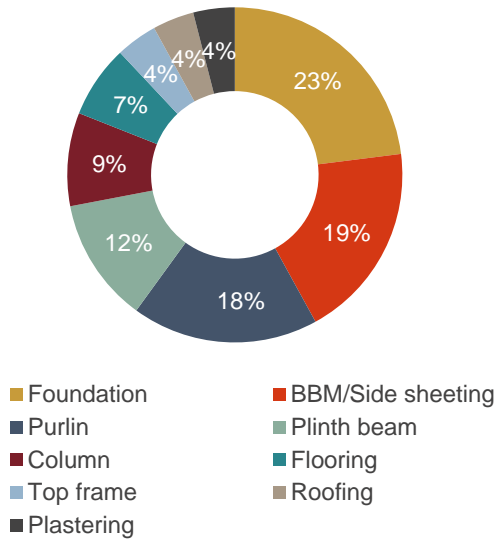
Whereas, construction cost, which accounts for the highest share of more than 50%, is relatively similar across locations.

Source: Industry interaction, CRISIL MI&A

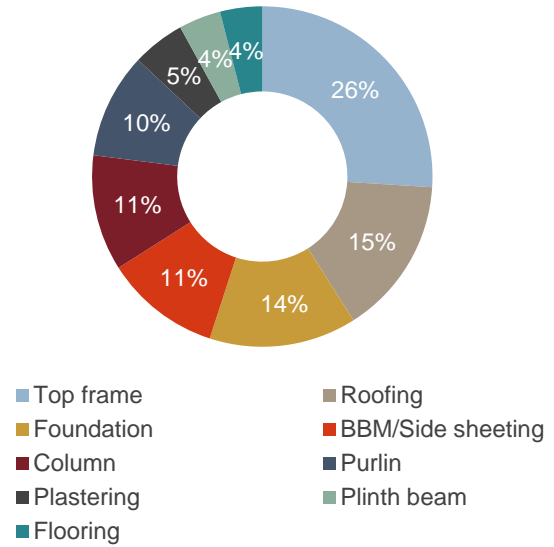
Within construction costs, the cost of setting up a warehouse depends largely on the type of warehouse, i.e., pre-engineered building (PEB) or reinforced cement concrete (RCC) structure. The primary difference is the construction of roof which includes roofing and top frame cost. In RCC, cement as well as steel rods are used in conventional buildings, whereas steel structures are used in PEB, which gives them higher clear height, larger clear span and faster construction timelines. Considering the complete life cycle of a warehouse, PEB is more economical than an RCC building largely on account of extensive usage of steel which requires less maintenance and has scrap value. Also, the longevity of steel roofs is high, and they are not prone to leakages, while RCC roofs require significant labour and time for execution.

Construction cost components breakup

PEB cost breakup



RCC cost breakup



Source: Industry interaction, CRISIL MI&A

3PL segment to be the largest driver of industrial warehousing demand in FY25

Robust demand is anticipated from third-party logistics (3PL) providers, particularly in sectors such as electronics, white goods, retail, and fast-moving consumer goods (FMCG). These sectors are leveraging 3PL services to optimise inventory management and reduce costs. Overall, the annual demand in warehousing, driven by e-commerce, Q-commerce and 3PL end-use sectors, is expected to contribute significantly, accounting for 55-60% of the overall demand.

PEB warehouses along with hub and spoke model gained prominence post GST implementation

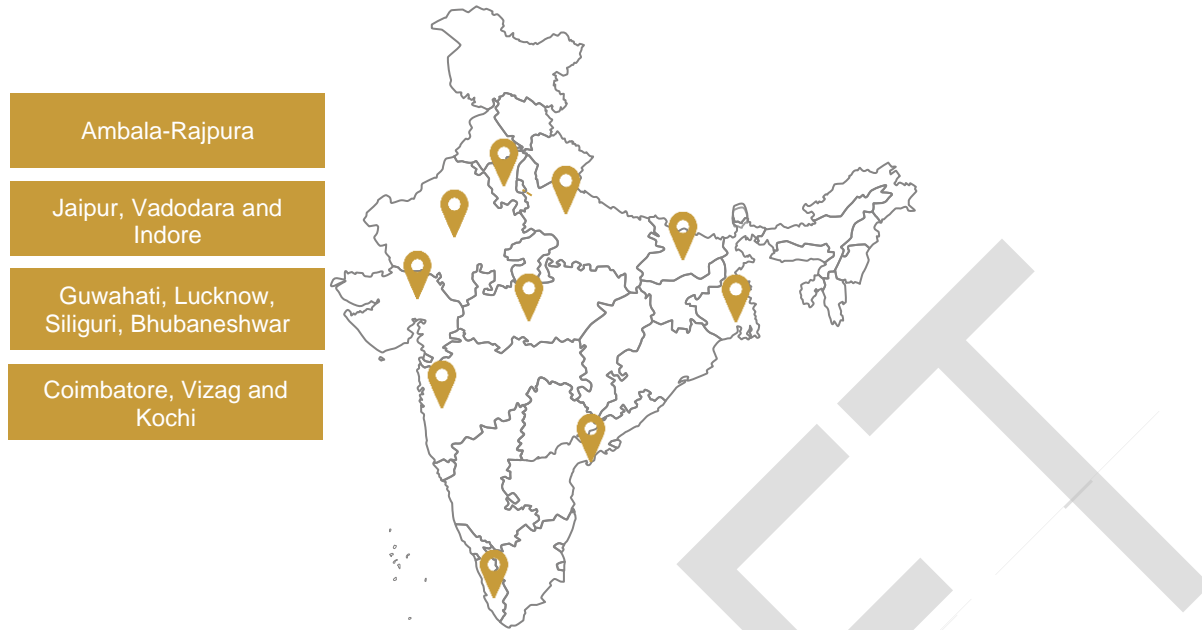
The warehousing industry in India is fragmented with unorganised players occupying a majority share in volume terms. They have smaller reinforced cement concrete (RCC) warehouses with small shelves, build small warehouses and have an asset heavy strategy. Typically, they do not provide value-added services such as packaging, labelling, inventory management, etc.

In the pre-GST scenario, players used to prefer setting up warehouses in every state to save on inter-state taxes.

But in the past 4-5 years, the industry has started gaining traction due to implementation of GST; many large players have started investing in huge, modernised warehouses which are PEB structures. This was on account of end-user industries moving towards a hub-and-spoke model as the need to establish warehouses in each states diminished. Larger PEB warehouses of 1,00,000-2,00,000 sq. ft are being set up as hub warehouses and smaller warehouses of 20,000-30,000 sq. ft. which would serve as the key 'spoke' warehouses.

Realignment towards the hub-and-spoke model is expected to result in major business opportunities for organised 3PL players operating large-sized warehouses in key geographies. These players not only provide huge modernised PEB storage but also warehouses equipped with racking and storage solutions, forklifts and reach trucks, and value-added services. The 3PL players also have an asset light model. They take warehouses on lease from warehousing developers which, in turn, acquire the land and construct.

Other smaller hubs are emerging largely due to e-commerce led demand



Source: CRISIL MI&A

Multiple smaller hubs are emerging largely due to increased demand from end use segments like ecommerce. Additionally, increased consumption from non-metro cities, demand for same day delivery, as well as lower land and operational costs in non-metro cities are serving as major growth drivers for the smaller hubs.

2.3 Major government initiatives to boost the construction industry

Key Government of India’s initiatives, such as, ‘AatmaNirbhar Bharat’, PLI scheme, Bharatmala Pariyojana, Sagarmala, Make in India, PMAY-G and PMAY-U are expected to drive growth of the construction industry in India.

PLI scheme

The PLI scheme was introduced by the Indian government to boost domestic manufacturing, attract investments, and enhance exports by offering incentives. With an outlay of Rs 1.97 trillion (over US\$24 billion), the PLI Schemes focus on 14 critical sectors to enhance the country’s manufacturing prowess, foster technological advancements, and elevate India’s position in global markets. These sectors are aligned with the government’s goal of strengthening domestic production and expanding exports, contributing to the broader vision of Atmanirbhar Bharat.

The purpose of the PLI Schemes is to attract investments in key sectors and cutting-edge technology; ensure efficiency and bring economies of size and scale in the manufacturing sector and make Indian companies and manufacturers globally competitive. These schemes have the potential of significantly boosting production, increase manufacturing activities and contribute to economic growth over the next five years or so. As of August 2024, actual investments totalling Rs 1.5 trillion have been realized. These investments have already led to a boost in production and sales, amounting to Rs 12.5 trillion, while directly and indirectly generating approximately 9.5 lakh jobs.

NMP

Union Minister for Finance and Corporate Affairs launched the asset monetisation pipeline of Central ministries and public sector entities: 'National Monetisation Pipeline (NMP Volumes 1 & 2)'. NITI Aayog has developed the pipeline, in consultation with infrastructure line ministries, based on the mandate for 'Asset Monetisation' under Union Budget

2021-22. NMP estimates aggregate monetisation potential of Rs 6.0 trillion through core assets of the Central Government, over a four-year period, from FY22-25. The estimated value corresponds to ~14% of the proposed outlay for Centre under NIP (Rs 43 trillion). The top 5 sectors (by estimated value) capture ~83% of the aggregate pipeline value. These top 5 sectors include: Roads (27%) followed by Railways (25%), Power (15%), oil & gas pipelines (8%) and Telecom (6%).

NIP

The National Infrastructure pipeline (NIP) aims to improve project preparation and attract investments in infrastructure. It is expected to positively impact the construction industry through a projected infrastructure investment of around Rs 111 trillion over FY20-25, to build robust infrastructure and boost the economy by increasing employment opportunities and enhancing living standards. The sectors like energy, roads, urban infrastructure, railways have a major share in the NIP.

NIP was launched with 6,835 projects and has expanded to capture over 9,288 projects in calendar year 2023 with a total project outlay of Rs 108.9 trillion between 2020-2025. Transport (42%), energy (25%), water & sanitation (15%) and social infrastructure (3%) sectors amount to around 85% of the projected infrastructure investments under NIP.

Bharatmala Pariyojana

Bharatmala Pariyojana is an umbrella project of the central government since 2015, that aims to improve efficiency in the roads sector. It is expected to supersede the National Highways Development Project (NHDP) and envisages the construction of 65,000 km of highways under the following categories: national corridor (north-south, east-west, and golden quadrilateral), economic corridor, inter-corridor roads, and feeder roads. As per the ministry, Bharatmala, along with the schemes currently undertaken, could require a total outlay of Rs 6.9 trillion.

Phase-I of the scheme envisages development of about 24,800 km length of national highways/roads, plus residual 10,000 km of NHDP between FY18-22. Awarding under Bharatmala has begun from FY18 and CRISIL expects it will stretch till FY25 for Phase 1.

Atmanirbhar Bharat Abhiyan

Prime Minister Narendra Modi launched the Atmanirbhar Bharat Abhiyan on May 12, 2020, to make the country self-reliant through five pillars: economy, infrastructure, system, vibrant demography, and demand.

As Atmanirbhar Bharat places a strong emphasis on infrastructure development, including roads, highways, bridges, airports, urban projects as well as local manufacturing and production, it is not only expected to drive demand for infrastructure construction through construction of roads and highways but also facilitate growth of allied industries such as cement and metals.

Urban infra projects: WSS and Metro projects

Government schemes focused on urban infra such as AMRUT, Smart Cities Mission and the implementation of Metro projects are set to drive significant growth in the construction sector.

In May 2015, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was succeeded by the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) to prioritise essential infrastructure services, including water supply, sewerage (sewage system), stormwater drains, transportation, and the development of green spaces and parks in urban areas.

Under AMRUT, the Centre is assisting states based on project cost and population of the cities and towns. The financial aid is released in three instalments in the 20:40:40 ratio, based on achievement of milestones indicated in the State Annual Action Plan.

The scheme also covers JNNURM projects sanctioned between 2005 and 2012 and those that have achieved 50% physical progress (102 projects) or have availed of 50% central government funding up to the initiation of project (296 projects). The budgetary outlay for AMRUT in FY24 is Rs 80 billion while revised estimates for FY23 is Rs. 73 billion.

Additionally, the government's emphasis on urban infrastructure projects, including the Smart Cities Mission and Metro projects should fuel substantial growth in the construction sector. According to CRISIL estimates, Metro projects are the second-highest contributors to urban infrastructure investments at approximately Rs 1.6 trillion in upcoming fiscals. Furthermore, Smart Cities Mission will also boost the construction sector as construction-intensive verticals such as housing, roads, non-residential development, and sewage systems will constitute a considerable portion of total investments.

Sagarmala

Sagarmala is the Central Sector Scheme of the Ministry of Ports, Shipping and Waterways to promote port-led development in the country through harnessing India's 7,500 km long coastline, and 14,500 km of potentially navigable waterways. Under the Sagarmala Scheme, the Ministry provides financial assistance to State/UT Governments for Port infrastructure projects, Coastal berth projects, Road & Rail projects, fish harbours, skill development projects, Coastal community development, cruise terminal and projects such as Ro-Pax ferry services etc

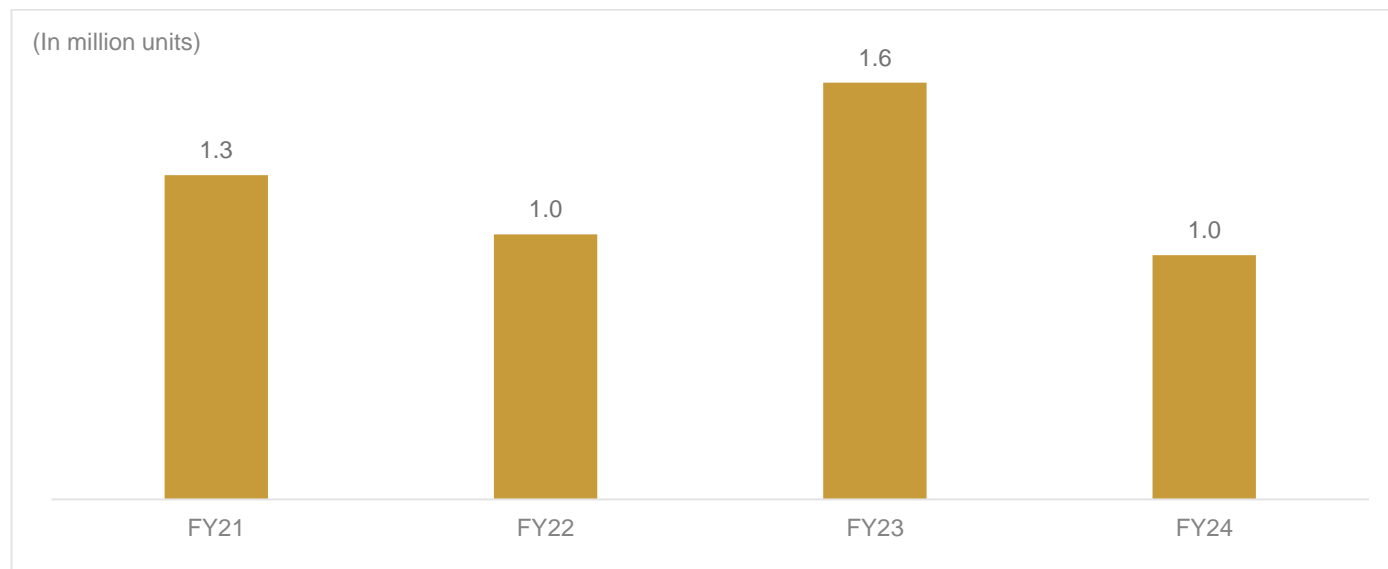
As per Ministry of Ports, Shipping and Waterways website accessed in December 2024, there are 839 projects worth investment of ~Rs. 5.8 trillion for implementation under the Sagarmala Programme by 2035. These include projects being implemented through various funding arrangements including Equity, Internal Resources, Grant in Aid, PPP mode etc. Out of which, 262 projects worth ~Rs. 1.4 trillion have been completed and remaining projects are under various stages of implementation and development.

Pradhan Mantri Awas Yojana - Urban (PMAY-U)

The Pradhan Mantri Awas Yojana-Urban (PMAY-U) is an affordable housing scheme being implemented from 2015 to 2022. It seeks to achieve the 'Housing for All' target by 2022. In FY24, construction pace moderated with ~1.0 million units built after witnessing the fast-paced execution of ~1.6 million units in FY23.

The Union Cabinet has approved the Pradhan Mantri Awas Yojana-Urban (PMAY-U) 2.0. This ambitious scheme aims to construct 10 million houses for urban poor and middle-class families over the next five years, with an investment of Rs 10 trillion and a government subsidy of Rs 2.3 trillion.

Progress in urban housing (number of housing units)



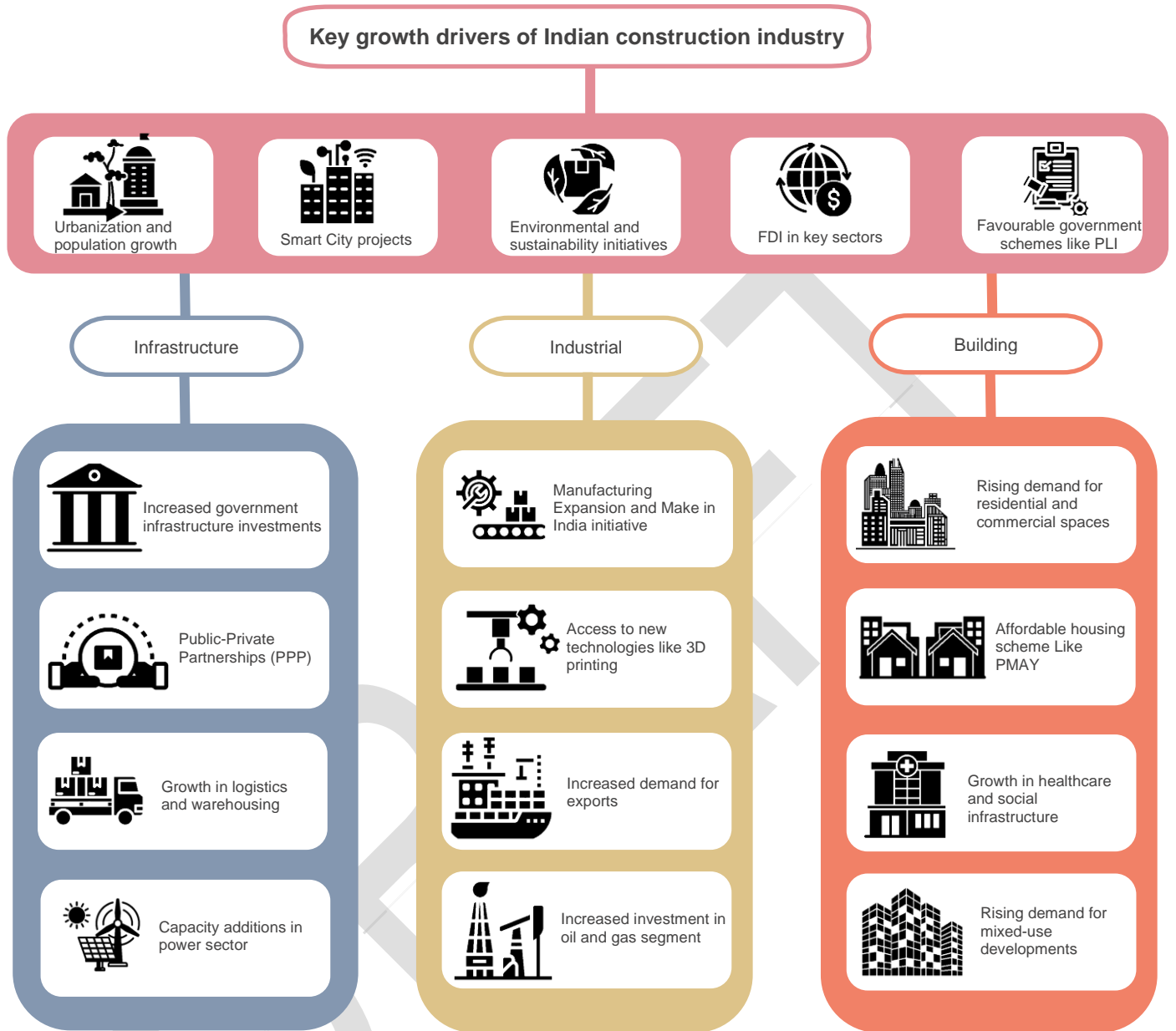
Source: MoHUA, CRISIL MI&A

Pradhan Mantri Awas Yojana – Gramin (PMAY-G)

In order to achieve the 'Housing for All by 2022' mission, the government launched a restructured rural housing scheme, namely Pradhan Mantri Awas Yojana-Gramin (PMAY-G), in November 2016, with the target of constructing 29.5 million houses with basic amenities, which has been extended up to 2024. As of Sep'2024, a total of ~29.1 million units have been sanctioned, of which, 26.6 million have been completed (~91% completion rate). As many as ~2.5 million units are under construction. Construction pace slowed down during FY24 as uneven and delayed monsoon impacted agriculture activities regionally. Execution pace under PMAY-G is further moderated in the first half of fiscal 2025, due to fund diversion during elections, however, it is expected to ramp up in the second half of FY25.

The Union Cabinet approved the proposal of the Department of Rural Development for “Implementation of the Pradhan Mantri Awaas Yojana – Gramin (PMAY-G) during FY 2024-25 to 2028-29” wherein financial assistance is to be provided for the construction of twenty million more houses at existing unit assistance.


2.4 Key growth drivers in Indian construction industry



Source: CRISIL MI&A

2.5 Key challenges in Indian construction industry

Key Challenges	Description
 Time contingency	<p>Cost saving and time performance are usually essential to all parties - owner, contractor, and subcontractor, etc- involved in a construction project. The project may get stalled on account of numerous reasons such as unavailability of land, lack of funds, and proper clearances not in place. Depending on the risk allotment, the burden of increased costs could fall on either the owner or the contractor</p>
 Price risk	<p>Capital investments, especially in the industrial segment, depend on the successful offtake of the planned product in the increased capacity. However, that depends largely on the owner's product-pricing ability. Investments in commodity segments depend on the international commodity prices. For past two years, the prices of oil in the international market have remained subdued. Thus, investments in oil exploration, which used to form a major chunk of investments in the oil and gas sector, have fallen.</p>
 Risks involved in dealing with government agencies	<p>Many of the segments in construction, especially in the infrastructure side, have various government authorities as the counterparty. These could be central, or state government authorities or special purpose vehicles floated by the governments to cater to some needs. Thus, for sectors such as irrigation, where most of the payments come from the state governments, the players must face elongated working capital cycles on account of delays in payments. Additionally, a difference of opinion between the central and state governments, may hold up required clearances, thus stalling the project.</p>
 Regulatory risk	<p>This risk relates to matters such as increased taxes and royalties, revocations or changes to the concession, exchange controls on proceeds, forced government participation in shares, and refusal of import licenses for essential equipment. For example, on account of political instability surrounding the separation of Andhra Pradesh and Telangana, contractors were affected as there were delays in payments and the investments from the state governments floundered.</p>
 Input related risk	<p>Construction industry have exposure to multiple input related risks. For example, the cost of input materials such as bitumen depends upon the international oil market. As bitumen is a major raw material, any change in oil prices affects the overall project cost. The international scenario for other commodities such as steel and cement also affect the industry. Additionally, land is one of the most important inputs for the infrastructure segment. There are various stages involved in land acquisition and the overall process is time consuming. Thus, the status of land acquisition during awarding of the project and within a time period after the project has been awarded is crucial.</p>
 Fragmented industry	<p>The construction industry is highly fragmented as low fixed capital requirement for construction contracts remove entry barriers. Capital expenditure is only required for procuring necessary equipment, unlike a manufacturing business, which requires heavy capex requirements such plants and machinery for production. These low entry barriers lead to a competitive environment where numerous players bid for same projects.</p>

Key Challenges	Description
 <p data-bbox="143 470 406 537">Possibility of payment delays</p>	<p data-bbox="438 369 1481 537">Construction projects are mainly funded and managed by the owner. Apart from the initial advance, contractors receive payments after each project milestone is completed. However, timely payments also depend on the owner's credit profile and the nature of the project. Most projects, especially infrastructure, have a gestation period of 2-3 years. Any delay in payment can push up receivables. Such a scenario makes the construction industry working capital intensive.</p>

Source: CRISIL MI&A

DRAFT

3 Assessment of the pre-engineered steel construction industry

3.1 Prefabricated buildings

Overview of prefabricated buildings

Prefabricated structures, commonly referred to as prefab buildings, involves the use of pre-manufactured elements in the overall construction. These elements are designed in a controlled factory environment, ensuring high quality and precision, before being transported to the construction site where they are assembled to form a complete and functional structure. This unconventional method of building is gaining acceptance due to its numerous benefits and versatility across various sectors.

The process of prefabrication begins with the design and engineering of individual components, which can include walls, floors, roofs, and even entire modules. These components are produced in a factory setting, where conditions can be optimized for efficiency and quality control, which in turn minimizes the chance of delays due to external reasons. Once all the components/module/ structure are ready, it is shipped to the designated site, where skilled workers assemble it into the final structure.

Prefab buildings are getting utilized across a wide range of sectors, including residential, commercial, and industrial segments. These homes can be customized to meet individual preferences and are often built in lesser time frame than traditional homes. Prefab buildings are being used for offices, retail spaces, hospitals and educational facilities, providing businesses with flexible and cost-effective solutions that can be rapidly deployed. The industrial sector also benefits from prefabrication, with structures such as warehouses and manufacturing facilities being constructed more efficiently.

Key offerings under prefabricated construction

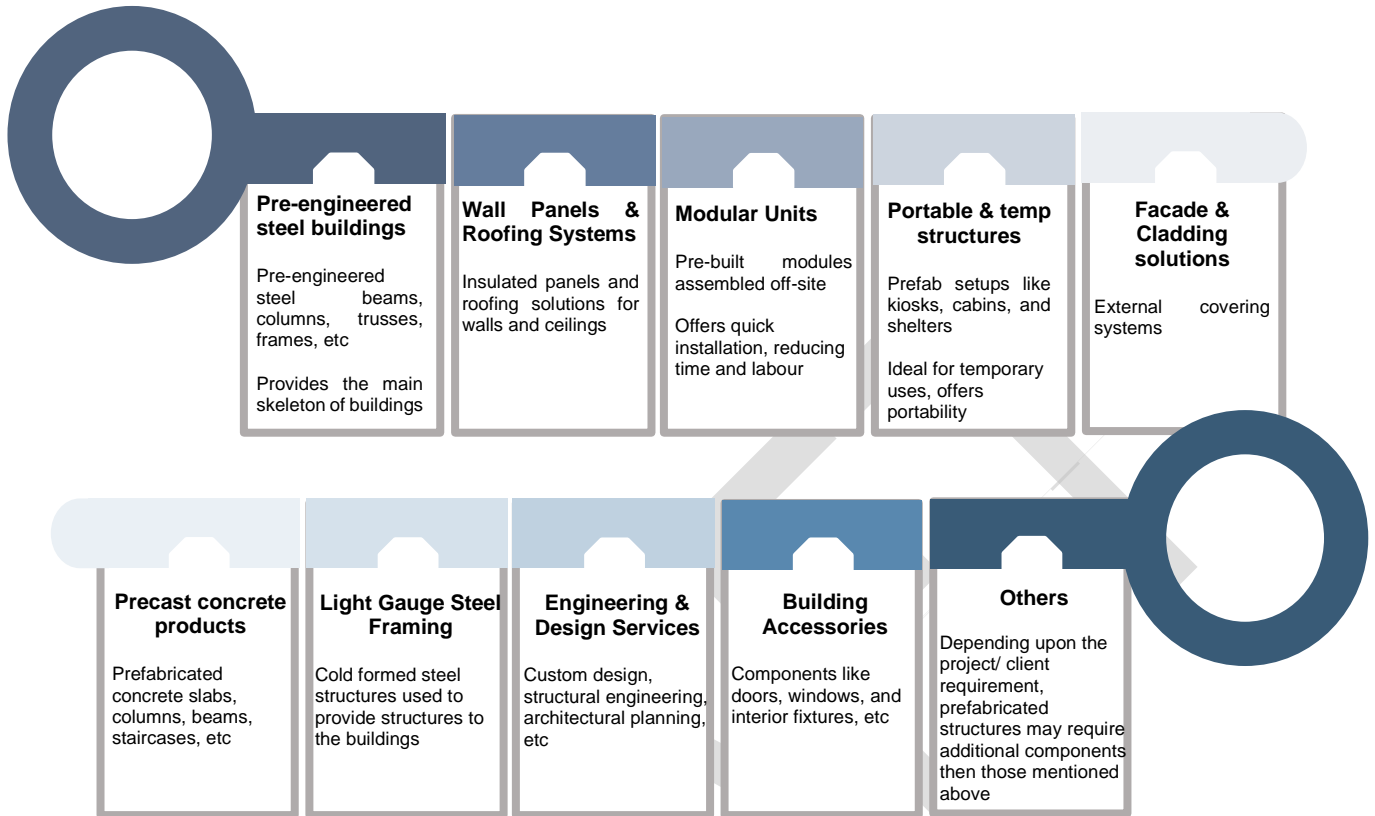
The prefabricated building sector has witnessed expansion in recent years, driven by a confluence of factors that underscore the growing demand for swift, economical, and environmentally friendly construction methods. Prefabricated building industry encompasses a diverse range of products and techniques, including modular constructions, steel frameworks, and pre-assembled elements, all of which contribute to a transformative approach to building.

Additionally, various type of raw materials are utilized for these prefabricated constructions including metals, concrete, glass, wood, etc. depending on the overall structural requirements and the aesthetics considerations of the project.

For example, prefabricated modular constructions are usually made of metal, concrete, etc and involve the off-site fabrication of building sections. These structures are gaining popularity for their ability to streamline the construction process. These structures can be designed to meet various architectural styles and functional requirements, allowing for customization while still benefiting from the efficiencies of prefabrication. The use of modular units not only reduces the time required for construction but also minimizes disruptions to the surrounding environment, making it an attractive option for urban development. Similarly, in the realm of infrastructure and industrial constructions, metals like steel are gaining acceptance due to their structural properties and recycle nature.

Additionally, the environmental benefits of prefabricated construction are also driving their adoption. The reduction in waste generated during the construction process, coupled with the potential for using sustainable materials like steel, aligns with the growing emphasis on green building practices.

Key offerings under prefabricated structures



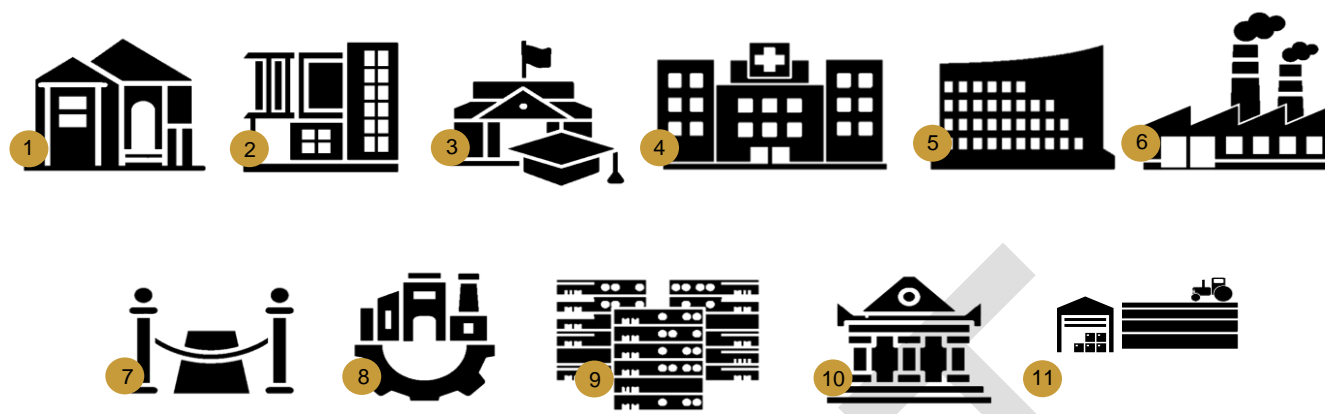
Source: CRISIL MI&A

Key applications of prefabricated buildings

Prefabricated industry offers multiple offerings for residential, infrastructure and industrial segments. Some of the structural key products include modular homes, portable cabins, pre-engineered steel buildings, precast, light gauge steel framing (LGSF), insulation materials (sandwich insulated panels), and modular buildings.

Whereas products like modular homes and portable cabins finds use cases in residential and commercial building, products like PEBs, LGSF and sandwich insulated panels are generally used in industrial and infrastructure settings. Besides these primary offerings, prefabricated industry also offers multiple offerings in accessories front, like modular walls doors, windows, Façade & Cladding solutions, etc. More details about key application areas of prefabricated buildings are provided in the below table.

Overview of key application areas



Key application area	Key benefits	Prominent areas of usability
1) Residential Buildings	<ul style="list-style-type: none"> Faster construction timeline Sustainable materials 	Affordable housing, urban development, disaster relief
2) Commercial buildings	<ul style="list-style-type: none"> Scalability Reduced on-site labour Customization options 	Office spaces, retail stores, showrooms
3) Educational Institutions	<ul style="list-style-type: none"> Speedy setup More control on quality 	Modular school buildings, student hostels, libraries
4) Healthcare Facilities	<ul style="list-style-type: none"> Faster construction timelines Reduced onsite labour More control over quality and safety Mobile structures allow reusability Reduced operational interference 	Modular clinics, rural health centres, temporary testing labs
5) Hospitality and Tourism	<ul style="list-style-type: none"> Accelerated speed to market Scalability More eco-friendly options Adaptability (easier expansion in case of increased demand) 	Resorts, modular hotels, eco-friendly cabins
6) Factories and warehouses	<ul style="list-style-type: none"> High strength Durability Large open spaces (wide spans) Faster commencement of operations 	Manufacturing plants, logistics hubs, distribution centres
7) Event and Exhibition Spaces	<ul style="list-style-type: none"> Quick setup Portability Mobility/ reusability 	Exhibition halls, concert stages, trade show pavilions
8) Infrastructure Projects	<ul style="list-style-type: none"> Reduced lead times Standardized quality More durable 	Airports, railway stations, and metro stations.

Key application area	Key benefits	Prominent areas of usability
9) Data Centres and Technical Hubs	<ul style="list-style-type: none"> Faster construction times Quicker berthing Easier expansion/ upgradation More convenient for remote setup 	Data storage hubs
10) Public Sector Buildings	<ul style="list-style-type: none"> Faster construction timelines Minimize disruption to daily operations/ traffic Reduced onsite labour More control over quality and safety 	Rural post offices, government office annexes, municipal buildings
11) Others (like rural infrastructure, agriculture, etc)	<ul style="list-style-type: none"> Faster construction timelines Reduced risks/ disturbance related to onsite construction, etc 	Grain storage facilities, animal barns, cold storage for produce, etc

Note: The above table represents an indication list of key application areas and prominent areas of usability and not an exhaustive list

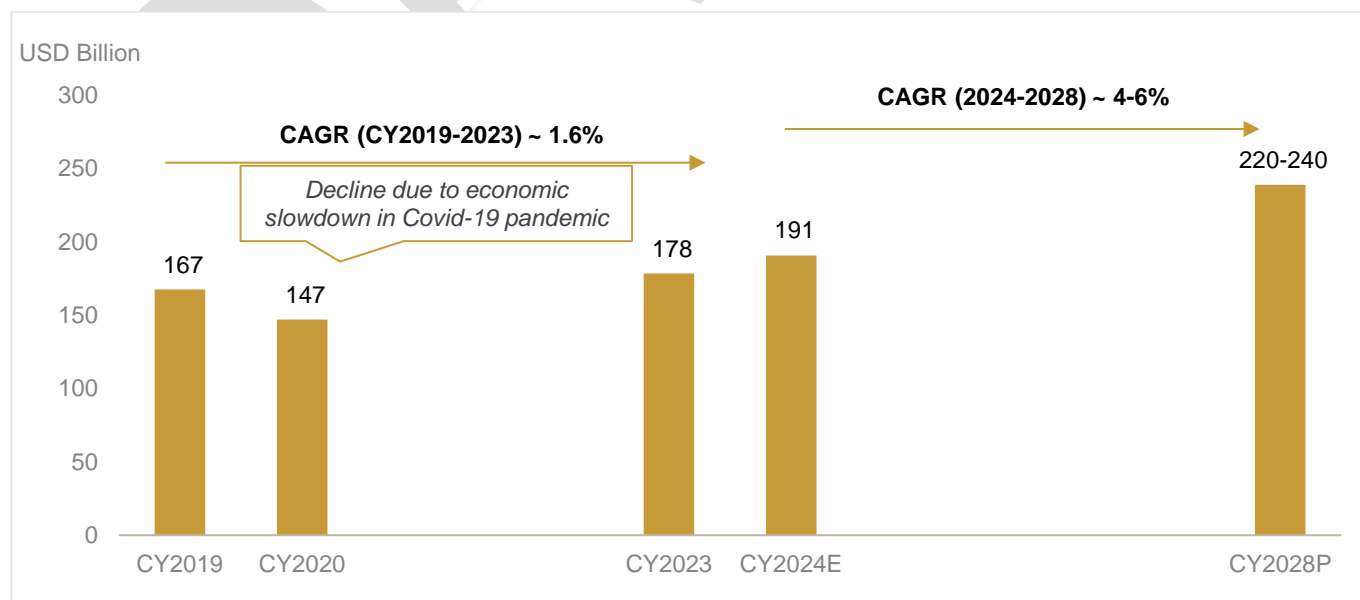
Source: CRISIL MI&A

Global prefabricated building market expected to grow at a CAGR of ~5-6% between CY2024-2028

The global prefabricated construction industry experienced moderate growth between CY2019-2023, increasing from \$167 billion in CY2019 to \$178 billion in CY2023, thereby registering a CAGR of ~1.6%. This modest performance was primarily attributable to Covid 19 pandemic and its consequent disruptions on the overall economic activities and capex cycle. These factors collectively impacted the overall construction industry, including prefabricated industry.

However, moving forward, global prefabricated industry is estimated to reach \$178 billion in CY2024 and register a CAGR of 5-6% between CY2024-2028 to reach \$230-240 billion by CY2028. This surge is expected to be driven by the growing awareness of prefabricated buildings and rising demand for sustainable, and cost-effective building solutions. Additionally, increasing global population coupled with improving urbanisation is also estimated to positively boost the demand for prefabricated construction technologies.

Global prefabrication market by value



Source: Allied Market Research, CRISIL MI&A

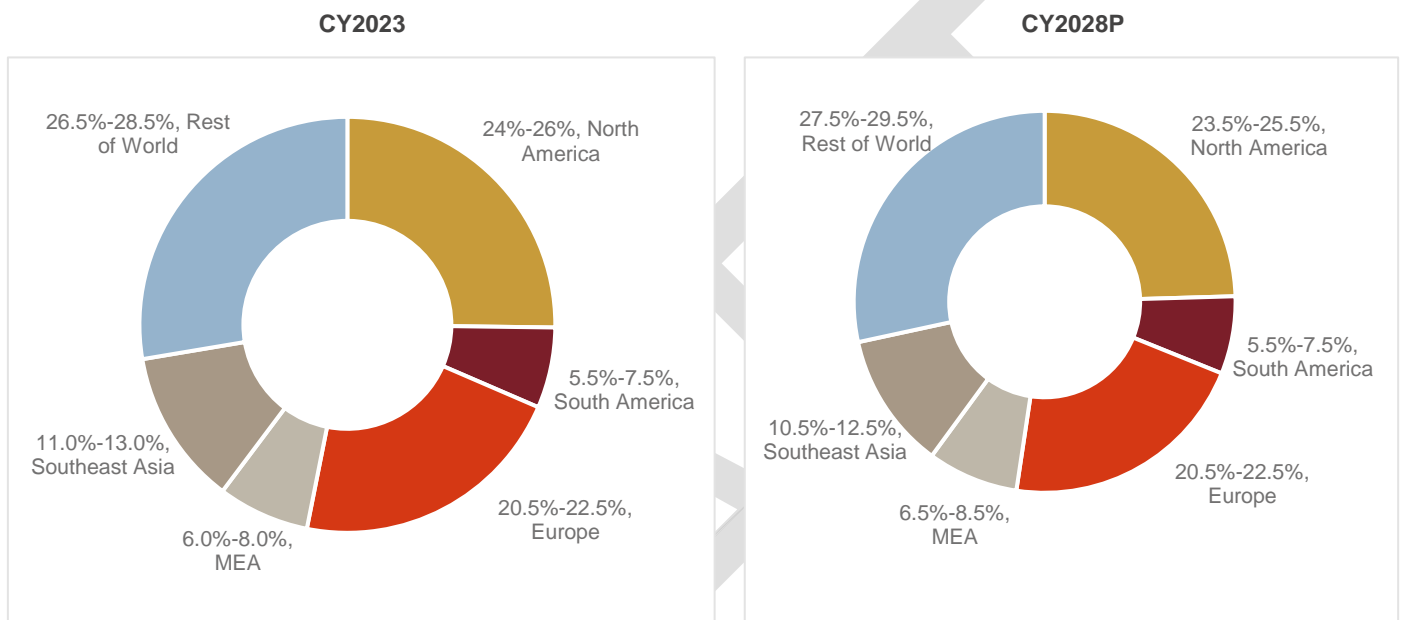
North America and Europe hold dominant positions in the global prefabricated market

The global market share was distributed across major markets like North America and Europe, which is estimated to hold 24-26% and 20.5-22.5% respectively of the global prefabricated market in CY2023.

Additionally, in rest of world markets, countries like China, India, etc are major contributors to the regional prefabricated markets.

The regional market shares in the overall prefabricated markets is estimated to remain largely constant in CY2028, whereas the overall market will be driven by government infrastructure initiatives and swift urbanization. Additionally, as these economies grow, the demand for scalable, sustainable, and cost-efficient construction solutions is expected to increase. This, coupled with growing awareness of prefabricated structures is expected to provide impetus to the overall prefabricated industry.

Global market share by Geography

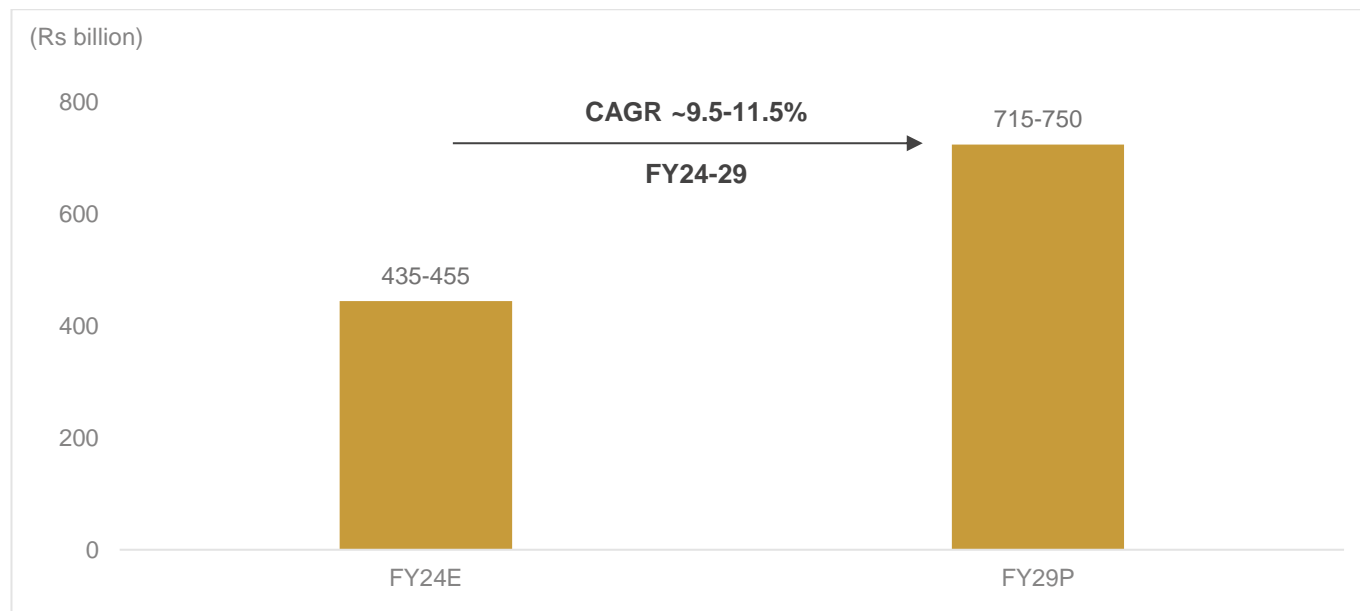


Source: Allied Market Research, CRISIL MI&A

Indian prefabricated market is estimated to register a CAGR of 9.5%-11.5% between FY24-29

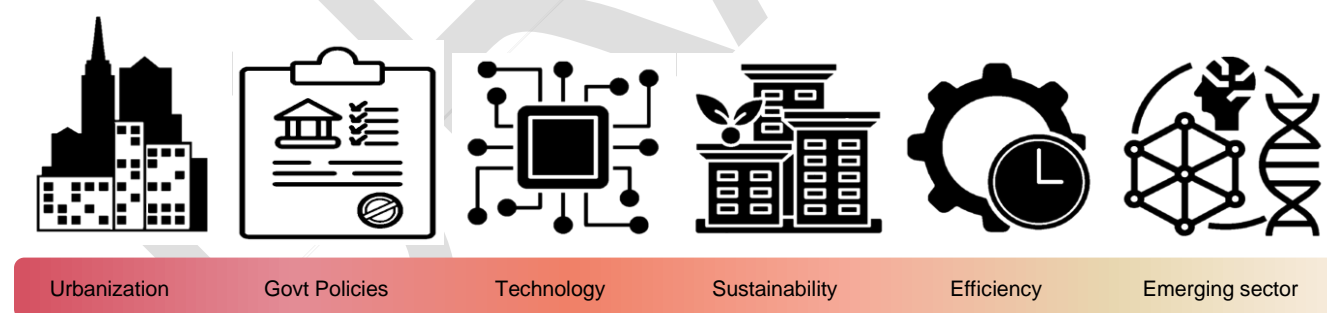
As of FY24, the Indian prefabricated market was estimated around Rs 435-455 billion. Key growth drivers of the industry include increase investments in the overall construction, favorable government policies, growing urbanisation and increasing population. Moving forward, the industry is projected to register a CAGR of 9.5%-11.5% between FY24-29 and value around Rs 715-750 billion by FY29. This growth will be driven by continued construction investments, favourable government policies like Lighthouse project, growing acceptance of prefabricated construction, and expanding end use segments like pharmaceuticals, etc.

Indian prefabricated market in value terms



E: Estimated, P: Projected
Source: CRISIL MI&A

Key growth drivers for prefabricated buildings industry in India



Source: CRISIL MI&A

Rapid Urbanization and Infrastructure Development

The rapid pace of urbanization phase in India serves as a significant catalyst for the prefabricated building sector as the need for quick and affordable housing becomes prominent. Share of urban population in India is estimated to increase to 40% by 2030, compared to just 18% in 1960s.

This increasing urban population in India necessitate enhanced infrastructure in areas such as housing, healthcare, education and overall infrastructure development. Hence, prefabricated structures provide a swift and effective

means to address the increasing demand for both residential and commercial properties in densely populated urban areas given the constraints on construction timelines.

Government Initiatives and Policies

The Indian government's initiatives in housing, urban development, and infrastructure is expected to benefit the prefabricated construction industry. Initiatives like Light House Projects, PMAY-G etc are designed to deliver affordable housing options throughout both urban and rural areas of India, thereby creating a substantial demand for economical and swiftly deployable housing solutions. Additionally, the government's focus on infrastructure projects, which include hospitals, educational institutions, and other public facilities, further drives the demand for prefabricated buildings, owing to their speed, cost efficiency, and adaptability in design.

Key government initiatives

Scheme/Initiatives	Budgeted Outlay	Description
Global Housing Technology Challenge (Light House Projects)	N.A.	Ministry of Housing and Urban Affairs initiated a Global Housing Technology Challenge to identify and mainstream the best available construction technologies from across the globe. Out of the identified 54 technologies, six Light House Projects using six distinct technologies were finalised to showcase use of these technologies for further mainstreaming in the country.
Pradhan Mantri Awas Yojana-Urban 2.0	Investment- Rs 10 trillion Government subsidy- Rs 2.30 trillion	PMAY-U 2.0 is designed to extend financial assistance to urban poor and middle-class families for constructing, purchasing, or renting houses at affordable costs in urban areas. This scheme aims to construct 10 million houses for urban poor and middle-class families over the next five years.
Pradhan Mantri Awaas Yojana – Gramin (PMAY-G)	Total outlay- ~Rs.3 trillion for FY 2024-25 to 2028-29 <i>(Including Central Share of ~Rs 2 trillion and State matching Share of~ Rs.1 trillion)</i>	The Union Cabinet approved the proposal of the Department of Rural Development for “Implementation of the Pradhan Mantri Awaas Yojana – Gramin (PMAY-G) during FY25-29” wherein financial assistance is to be provided for the construction of 20 million more houses at existing unit assistance.
Smart Cities Mission	Total outlay of Central assistance- Rs 480 billion	Smart Cities Mission (SCM) was launched by the Hon’ Prime Minister on 25 June 2015. The main objective of the Mission is to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of ‘smart solutions’. On the financial front, the total outlay of Central assistance for the SCM was Rs 480 billion. As per PIB article dated September 2024, the Central Government has already released Rs 467.9 billion to 100 Smart Cities under the SCM, of which over 90% has been utilized.

Source: PIB, Government ministry websites, CRISIL MI&A

Technological advancements

Advancements in construction technology and design, including Building Information Modeling (BIM), automation, 3D Printing and cutting-edge materials, are transforming the prefabricated building sector. For example, BIM facilitates accurate design, minimizes errors, and streamlines project management, while automation in prefabrication enhances both the speed and uniformity of production. As smart technologies and data-driven construction methodologies become increasingly accessible, the prefabricated industry is expected to benefit from it.

Sustainability and green building demand

The growing emphasis on environmental sustainability and the advocacy for eco-friendly construction methods are pivotal factors influencing the prefabricated building sector. Prefabricated construction techniques minimize waste generated on-site, utilize recyclable materials like steel and specific types of panel insulation, and result in lower emissions. These characteristics are in harmony with green building standards and align with India's environmental initiatives aimed at decreasing the carbon footprint.




Cost and time efficiency

In contrast to traditional construction methods, prefabrication lowers on site labour costs and facilitates quicker assembly on-site, which is essential in an environment where labour shortages and construction delays frequently occur. Additionally, the factory-controlled manufacturing process of prefabrication diminishes dependence on on-site labour and lessens delays attributed to weather and other site-related issues. Consequently, this leads to a more efficient construction process that enables companies/contractors to adhere to stringent timelines. These improvements in efficiency are especially appealing for large-scale commercial initiatives and infrastructure projects which have long construction timelines and have high associated overrun costs.

Rising demand in emerging sectors

The prefabricated building sector is witnessing increased demand from emerging industries such as logistics, cold storage, and healthcare. The surge in e-commerce in India has created a need for the swift construction of warehouses and distribution centres, where prefabricated structures are particularly advantageous due to their scalability, and rapid installation. Additionally, the expansion of healthcare infrastructure, particularly in the wake of the COVID-19 pandemic, has heightened the demand for both temporary and permanent medical facilities. Prefabricated solutions facilitate quick establishment of essential facilities that adhere to regulatory requirements. Furthermore, the cold storage sector, which necessitates high levels of insulation, also reaps the benefits of prefabricated structures, as they efficiently maintain temperature-controlled environments, which is crucial for India's agricultural and food processing sectors.

Key challenges in prefabricated buildings industry in India

Key Challenges	Description
 Market awareness	<p>There is a limited understanding of the advantages among both customers and contractors regarding prefabrication buildings. Additionally, there are apprehensions regarding the durability and safety of alternative methods, leading to a preference for traditional construction practices.</p> <p>Additionally, cultural inclination towards conventional building methods is influencing the rates of adoption due to perceptions regarding restricted options of customization in prefabricated structures</p>
 Logistics issues	<p>Prefabricated buildings are required to be transported on the construction site for final assembly/delivery. Complex nature of prefabricated buildings due to their large and heavy size increases the complexity of transferring the components/ structure to the final site.</p> <p>Hence, manufacturers of prefabricated buildings have to rely on competent third-party logistics providers for the final delivery to ensure timely delivery without any damage to the products.</p>
 Skill Gaps and Labor Issues	<p>There is a shortage of skilled labour experienced in prefabrication techniques due to novelty of the field. Unlike traditional construction methods, prefabricated construction requires knowledge and experience of more advanced technologies and precision.</p> <p>Additionally, training workers regarding prefabricated techniques requires dedicated time and cost commitments by the companies, which further increases their cost.</p>

Key Challenges	Description
 <p data-bbox="156 488 370 517">Supply chain issues</p>	<p data-bbox="421 365 1476 524">The prefabricated industry in India is faces supply chain challenges due to limited numbers of high quality and reliable raw material providers. This scarcity makes this industry susceptible to supply chain issues, as manufacturers have limited alternative sourcing options. Consequently, it also increases the bargaining power of suppliers, which in turn negatively impact the prefabricated buildings manufacturers.</p>
 <p data-bbox="124 719 402 748">Large unorganized sector</p>	<p data-bbox="421 571 1476 730">Presence of large unorganized sector presents significant challenges to the industry. Unorganized players generally compete on price, which in turn creates pricing pressures for the players in the organized industry. Furthermore, small players in the unorganized segment may also procure substandard raw materials/ products, which can lead to structural issues during final assembly of the product and pose safety risks.</p>

Source: CRISIL MI&A

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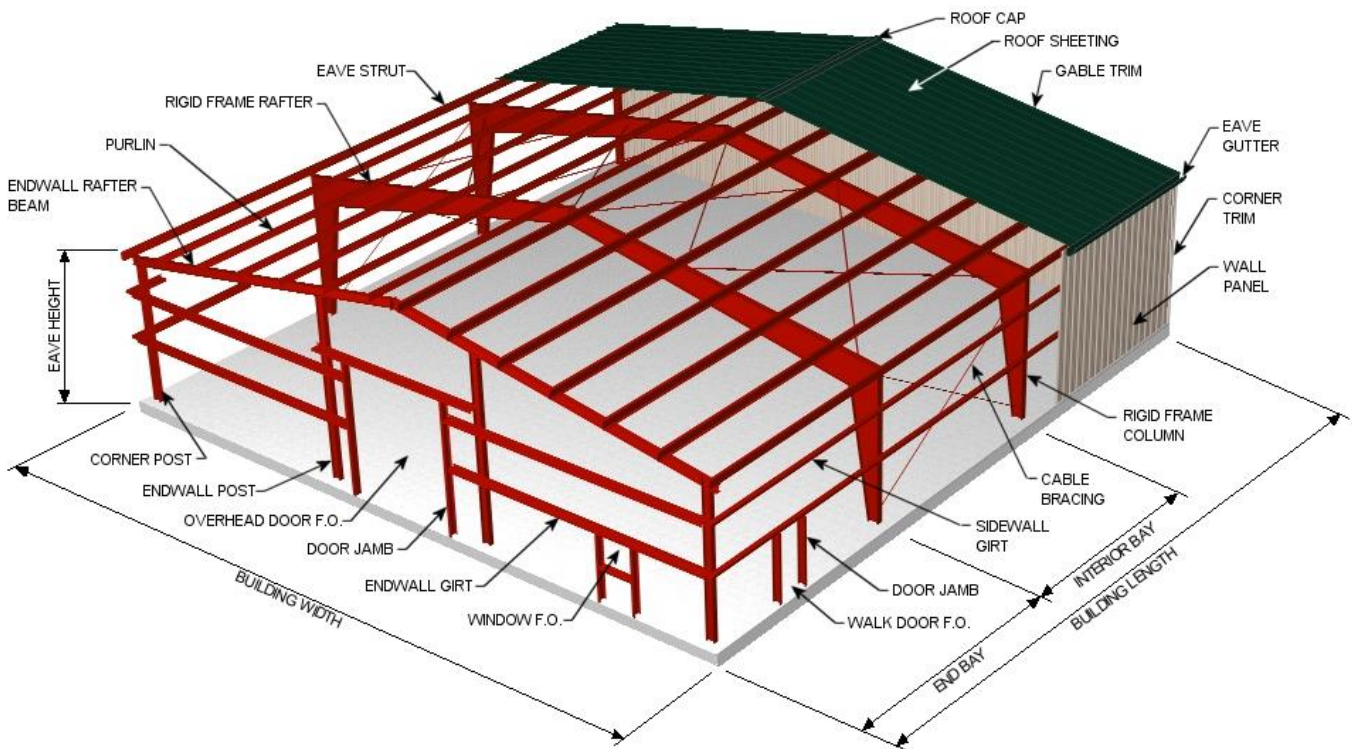
3.2 Pre-engineered steel construction

Pre-engineered steel construction is a sub segment of the overall prefabricated building and has emerged as an innovative building method due to rapid growth of automation in the construction industry. However, whereas prefabricated construction can be built through different raw materials like concrete, metal, etc, steel pre-engineered buildings have steel as its major raw material component. Furthermore, these PEB structures are fabricated in the factories in a controlled environment and then transported to the construction site where the final assembly takes place, whereas prefabricated buildings can in knockdown, semi- knockdown or as completely built in units.

Pre-engineered steel structures/units are more eco-friendly than traditionally constructed ones and provide benefits such as reduced material wastage, enhanced quality control, and improved onsite safety. The controlled manufacturing process minimises material wastage, promoting sustainable building practices, while rigorous quality control ensures consistent and durable structures.

Furthermore, within conventional construction, RCC and steel buildings are prominent methods of construction. Steel players like Tata Steel, Nippon Steel, ArcelorMittal Nippon Steel India, Steel Authority of India Limited, Jindal Steel & Power Ltd., Jindal Steel, etc. provide structural steel long products for construction of steel buildings, which is further used by EPC players, PEB players as well as directly by steel players themselves to provide steel buildings.

Overview of pre-engineered steel building

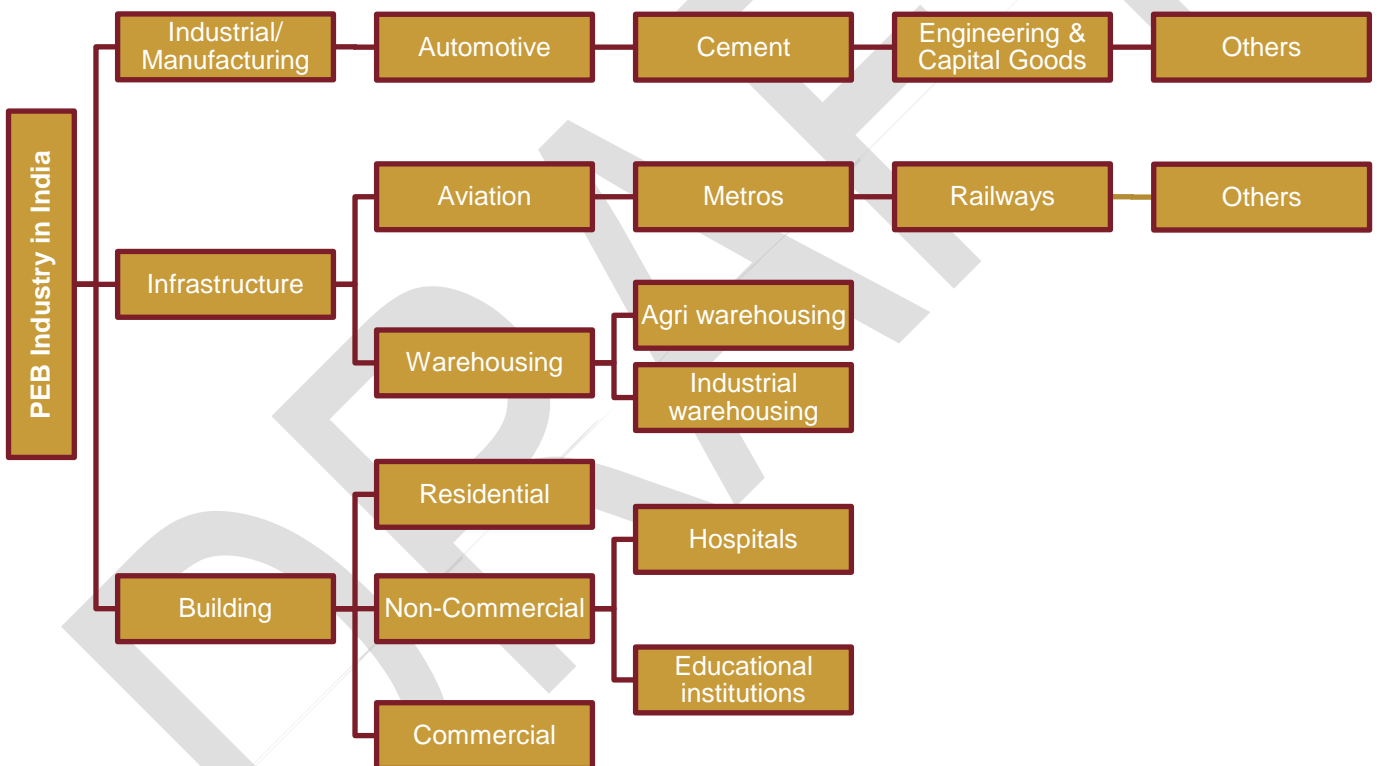


Source: CRISIL MI&A

Key components/sub-structures of pre-engineered steel buildings:

- 1. Main frame or primary structure:** This frame is the main load-carrying and support structure of a pre-engineered steel building made of rigid steel frames. The primary structure consists of columns, rafters, and other supporting structures. The shape and size of these structures differ based on their application and requirements. The frame is constructed by bolting the end plates of connecting sections together
- 2. Secondary structure:** It consists of purlins, girts, and eave struts used to support the wall and roof panels. Purlins are employed on the roof, girts on walls, and eave struts at the intersection of the sidewall and roof
- 3. Roof, wall panels, and insulation:** These components are used for sheeting and generally made of ribbed steel sheets. They are used as roof and wall sheeting, roof and wall liners, partition, and soft sheeting. Colour coated steel sheets are generally produced from steel coils. The metal roofing generally comprises roofing made of aluminium, galvalume steel and copper, among others. Usage of high-quality material, such as pre-painted galvalume (PPGL) aids in avoiding corrosion and leaks, increasing the longevity of the roofing system.

Pre-engineered steel construction industry segmentation by end user



Source: CRISIL MI&A

Pre-engineered steel construction is gaining popularity in the commercial, infrastructure, and industrial landscape, such as in the automobile industry, cement industry, paper industry, offices, aircraft hangers, warehouses and logistics, and data centres. Use of pre-engineered steel constructed units enable companies to accelerate the construction process in a cost-effective manner without compromising on quality. In fact, the absence of external uncontrollable factors such as adverse weather in pre-engineered steel construction ensures better quality control through standardised operations and streamlined processes.

Steel pre-engineering is reshaping the realm of building construction by decreasing the overall construction duration for commercial complexes, hospitals, office buildings, high-rise buildings, and so on, without compromising

on construction quality. Pre-engineered steel structures are also used extensively in the institutional and recreational field to construct schools, exhibition halls, hospitals, theatres, auditoriums, gymnasiums, and indoor sports facilities.

Difference between RCC and pre-engineered steel construction

Parameter	Traditional RCC construction	Pre-engineered steel construction
Major component	Concrete and reinforced steel bars	Steel and metal accessories
Raw materials used	Cement, steel, sand, bricks, etc	Steel, anchors, channels, etc The primary structure of PEBs consists of columns, rafters, and other supporting structures, whereas the secondary structure consists of purlins, grits, eave struts, etc. Additionally, wall panels, roofs, etc are also used for sheeting and insulation purpose.
Construction location	Completely onsite	The entire structure is manufactured in controlled environments such as factories, only assembling of structures happens onsite. The foundation in pre-engineered steel buildings is similar to RCC construction but its requirements may vary depending on the weight of pre-engineered steel structures
Construction time	It depends largely on the type (industrial, residential, etc), height and area of construction. However, RCC construction usually takes a longer time than pre-engineered steel building construction	In pre-engineered steel building construction, a majority of components are manufactured in a controlled environment and only assembling of parts takes place onsite. According to industry sources, construction of pre-engineered steel buildings takes 40-50% less time than RCC construction
Manpower	Demands a substantial workforce since the entire construction process, including moulding and shaping concrete, occurs onsite	Requires less manpower as only assembling of the final structure happens onsite. According to industry sources, manpower required for construction of pre-engineered steel buildings is approximately 25% lower than the conventional method
Applications	Residential as well as industrial; even infrastructural	Largely industrial and warehouse or shed requirements at infrastructure setup
Effect on environment	RCC construction has a more adverse environmental impact owing to the generation of significant waste and landfill mass during onsite construction activities	Owing to the streamlined nature of construction in a controlled environment, the environmental footprint is reduced by minimising wastage. Additionally, pre-engineered steel building components can be recycled, which optimises the use of raw materials and minimises construction waste. This optimized use of raw materials combined with faster construction timelines also helps in decreasing the carbon footprint while construction.
Modifications and relocations	Once concrete hardens, making alterations becomes complex and costly in RCC structures	Pre-engineered steel construction offers superior flexibility as modifications involve changing the assembly of prefabricated components, adjusting to make it more manageable and cost-effective

Parameter	Traditional RCC construction	Pre-engineered steel construction
Cost efficiency	<p>Construction of RCC structures is highly labour-intensive in an uncontrolled environment.</p> <p>Overall, cost depends on the size and type of the structure, the span, etc, and varies from project to project</p>	<p>Pre-engineered steel structures are lighter and require less material, a shorter construction time, and comparatively less labour onsite, leading to lower costs compared with RCC structures.</p> <p>But the cost depends on the size and type of the structure, the span, etc, and varies from project to project</p>

Source: CRISIL MI&A

Overview of construction costs of pre-engineered steel structures

As per primary research, the cost of a pre-engineered steel building is estimated to be at times 15-35% lower than conventional structures for sheds, warehouses, and depots or at times 20-25% more expensive than a traditionally constructed building depending on the building’s design and usage requirements. However, the higher upfront cost of pre-engineered steel buildings is offset by faster construction time, flexibility to expand these buildings, lower maintenance costs, better durability and higher salvage value, among others, which ultimately result in cost savings over the entire lifespan of the building. Further, pre-engineered steel buildings not only accelerate the overall construction process, but also save labour costs and enable quicker occupancy/commencement of operations, leading to potential revenue generation at an earlier stage.

Additionally, due to the flexibility to shift these structures to other locations, pre-engineered steel structures help to reduce potential capex costs, enabling organisations to adapt to changing operational needs without the financial burden of constructing new buildings.

Pre-engineered steel buildings more cost-effective for smaller structures

According to research published in the International Research Journal of Engineering and Technology (Comparative Study of Pre-Engineered Building And Conventional Steel Structures), cost-saving advantages of PEB increases as the span of the structure increases till an inflection point, after which cost savings diminish.

For instance, in the case of 10m clear span structures (span denotes the distance between the two intermediate support structures), PEB provides a commendable ~40% cost savings compared to conventional steel structures (CSB). PEB provides similar cost savings in case of clear span of 20m and 30m structures, where use of PEB helps in cost savings of approximately ~50% and ~42%, respectively. However, this trend experiences a significant inflection point at 50m span, where the cost-saving benefit of PEB diminishes considerably, offering only marginal savings of approximately 2.8% compared to CSB.

The accompanying table delineates the cost per square metre for both pre-engineered and conventional steel structures.

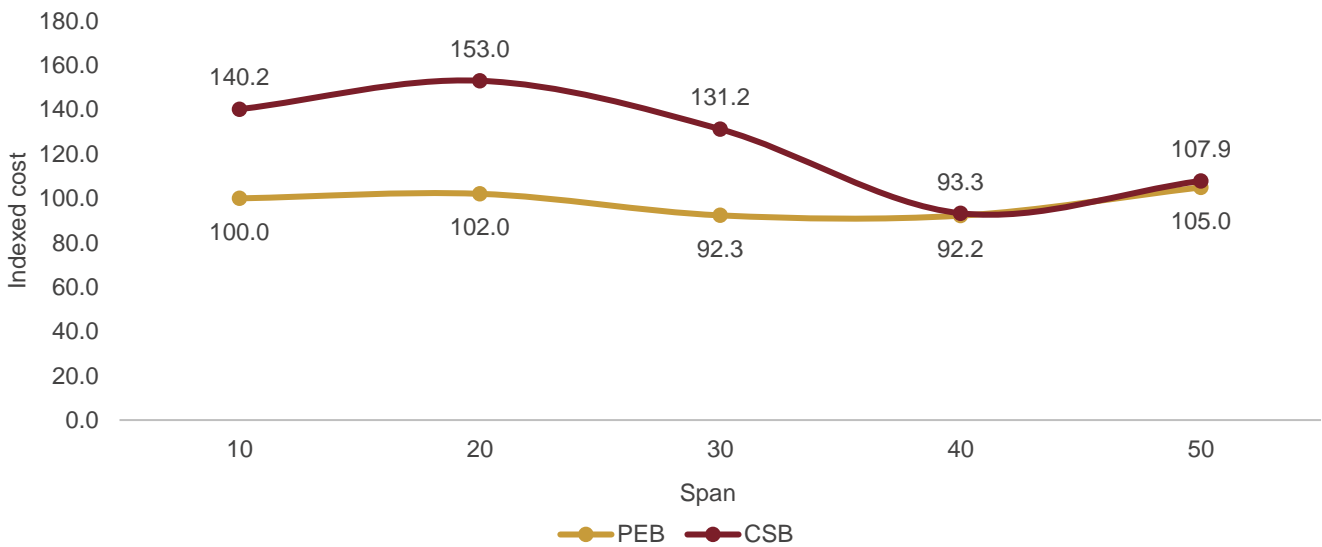
Cost of per square metre of pre-engineered building and conventional steel structure

Clear span (m)	PEB	CSB	Cost saving (%)
10	100.0	140.2	40.2%
20	102.0	153.0	50.0%
30	92.3	131.2	42.1%
40	92.2	93.3	1.2%
50	105.0	107.9	2.8%

Note: Cost is indexed with cost per square foot for PEB (Span 10) as base

Source: Comparative Study Of Pre-Engineered Building And Conventional Steel Structures, International Research Journal of Engineering and Technology, CRISIL MI&A

Cost of per square metre of pre-engineered building and conventional steel structure



Note: Costs are indexed; with cost of 10 span PEB considered as base (100)

Source: Comparative Study Of Pre-Engineered Building And Conventional Steel Structures, International Research Journal of Engineering and Technology, CRISIL MI&A

Construction plan for pre-engineered steel buildings

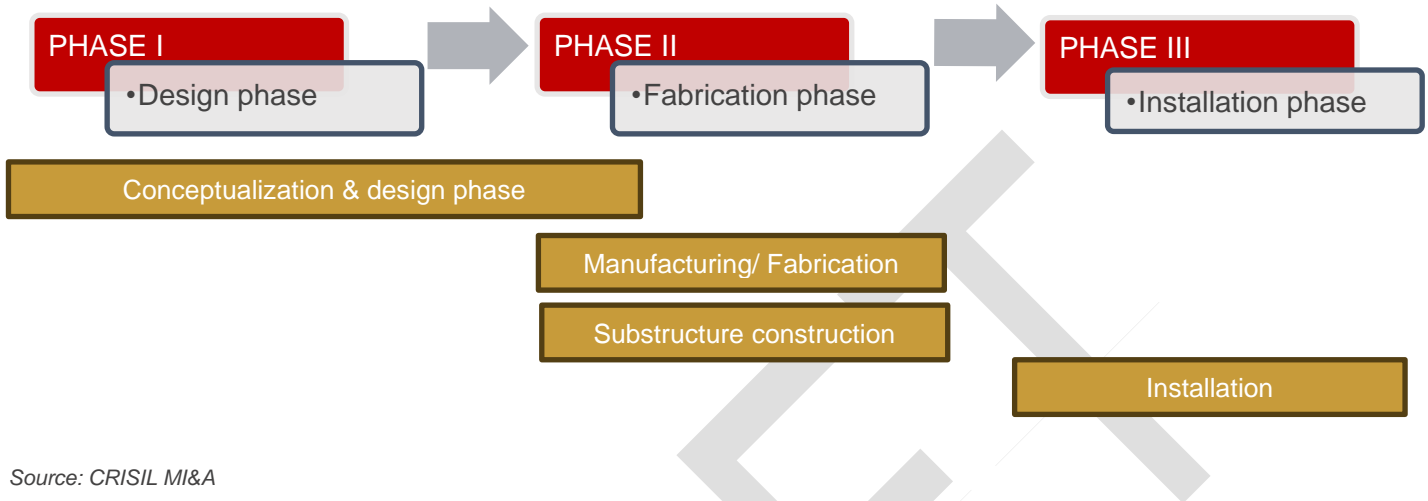
Similar to the construction plan for RCC structures, the pre-engineered steel building construction plan is also structured into three primary phases, though the activities scheduled in each of the three phases—design, fabrication, and installation—differ. The initial design phase encompasses critical tasks such as site preparation, finalising the design specifications, and obtaining the requisite approvals.

The design phase is the first phase of overall PEB construction and is extremely critical to the overall outcome of the PEB building. Companies may utilise specialised design software in addition to the experience of their design team to ensure optimal steel usage, which directly impacts the overall cost of the building.

Design phase is followed by the fabrication phase, which focuses on manufacturing of pre-engineered steel structures as well as construction of substructures that not only enhance cost efficiency but also accelerate project timelines significantly. Hence, this simultaneous approach contributes to substantial savings in terms of both time and resources. Finally, the concluding phase of pre-engineered steel building construction involves the transport of

individual building components to the designated construction site, where the final structure is installed with precision.

Design plan of pre-engineered steel construction



Source: CRISIL MI&A

Advantages of PEBs over traditional construction

Better quality control

Traditional construction methods rely heavily on skilled workers for onsite assembly and intricate tasks, the current shortage of such labour poses challenges to timely and efficient project completion.

Hence, pre-engineered steel construction offers a viable solution as a majority of the construction is done in controlled factory environments, reducing the need for onsite labour. Moreover, companies can achieve economies of scale through improved manufacturing processes, further boosting growth of the pre-engineered steel construction industry, enabling faster component production, and ensuring greater accuracy and consistency in final structures.

More sustainable

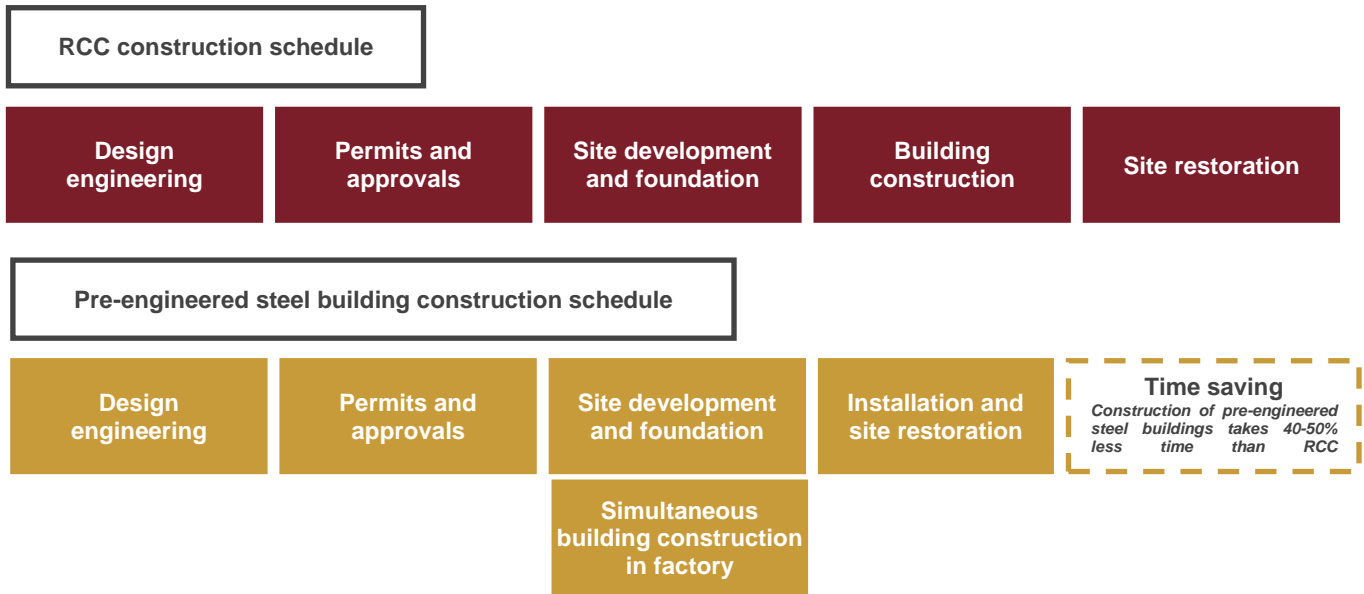
As considerable parts of the structures are built offsite in the case of pre-engineered steel construction, it causes less disturbance to the construction site’s surroundings. Furthermore, factories and manufacturing plants enable standardisation of processes and streamlining of procedures, which help reduce wastage and the carbon footprint that directly impact the environment. Additionally, pre-engineered steel building components can be recycled, as steel is the major raw material of PEB. This allows optimized use of raw materials and minimises construction waste.

This optimized use of raw materials helps in decreasing the overall carbon footprint compared to traditional conventional construction methods.

Faster construction timelines

Pre-engineered steel construction accelerates project timelines without compromising on deliverable quality. As it involves components being first manufactured in factories/manufacturing plants, this method enables simultaneous preparation of the foundation at the construction site, which helps in accelerating project timelines. According to industry sources, construction of pre-engineered steel buildings takes 40-50% less time than RCC construction.

Construction schedule: RCC vs pre-engineered steel buildings










Source: CRISIL MI&A

Cost optimisation

Use of PEBs in construction enables cost optimisation by decreasing overhead site costs, including labour costs. Furthermore, as pre-engineered steel structures are manufactured within factories/manufacturing plants, they enable standardisation of processes, which ensures good quality of structures. Additionally, they also prevent project delays stemming from external factors such as adverse weather.

As per primary research, the cost of a pre-engineered steel building is estimated to be at times 15-35% lower than conventional structures for sheds, warehouses, and depots or at times 20-25% more expensive than a traditionally constructed building depending on the building's design and usage requirements.

Key selection criteria for pre-engineered steel building suppliers

Brand	Design capability	Prior experience	Pricing	Manufacturing capacity	Project management expertise	Pan India presence
						

Source: CRISIL MI&A

Brand

Having a reputed brand name is a success factor for pre-engineered steel building suppliers as companies prefer brands for ensuring reliability and quality of raw materials. Furthermore, established brands are also known to adhere to industry standards and codes, ensuring that product quality remains consistent.

Additionally, choosing a reputed brand instils confidence in the project's key stakeholders and reduces the risks associated with dealing with lesser-known suppliers in the unorganised sector. Furthermore, established players invest in research and development and modern technology, resulting in better product quality due to more efficient processes. This, in turn, guarantees that clients receive a high level of quality in their pre-engineered steel projects. Therefore, opting for a well-known brand name is not just a preference but a practical necessity to ensure the success and quality of pre-engineered steel projects.

Design capability

Companies prefer pre-engineered steel building suppliers who have established structural design capabilities as these factors influence optimal use of structural steel, the functionality and the aesthetics of the building.

Suppliers with expertise in structural design can optimise the building's steel quantity estimation, ensuring efficient building cost and seamless integration of various components.

Additionally, the importance of an experienced design team becomes more pronounced in pre-engineered steel building projects compared to traditional construction projects such as RCC as these projects demand greater coordination among various stakeholders and precise planning and execution from the start to ensure seamless integration of pre-engineered steel components. Hence, the emphasis on design capability remains a crucial factor in the decision-making process for companies engaged in pre-engineered steel projects.

Prior experience

Even though adoption of pre-engineered steel buildings is increasing due to inherent benefits such as cost savings and a lower environmental impact, the market is still in a nascent stage in India. Hence, companies prefer pre-engineered steel building suppliers with a proven track record to ensure their projects are completed on time. Furthermore, having prior experience also helps in gaining confidence of key project stakeholders as more experience translates into better knowledge of building codes, industry regulations and terrain requirements. Additionally, experienced suppliers often have well-established networks with other stakeholders such as erectors to ensure smooth coordination during the project lifecycle.

Pricing

The fragmented structure of the pre-engineered steel building industry grants customers significant bargaining power. Hence, competitive pricing is imperative for success. However, pre-engineered steel building suppliers must ensure a balance between affordability and quality, along with a transparent cost structure.

Manufacturing capacity

A robust manufacturing capability ensures timely production and delivery of building components, as the construction industry is frequently dogged by missed project deadlines and cost overruns.

Furthermore, it also enables pre-engineered steel building suppliers to streamline their processes, optimise their operations and handle multiple projects simultaneously. Additionally, the ability to handle larger volumes of pre-steel buildings provide them more bargaining power with suppliers of raw materials, thereby optimising costs.




Project management expertise


It is a pivotal factor in the evaluation of pre-engineered steel building suppliers as the construction industry is usually riddled by long project timelines. Hence, project management expertise becomes extremely important to ensure timely completion and avoid costs overrun as it helps in the adherence to timelines, managing budget constraints, and maintaining high-quality standards.

Pan India presence

A pan India presence helps in enhancing credibility for PEB suppliers. PEB suppliers with pan India presence usually have extensive logistics network which contributes to efficiently reducing transport costs and time. Moreover, the presence of regional offices allows for prompt, on-site support, ensuring the swift resolution of any issues or bottlenecks. Thereby, facilitating successful completion of projects

Critical factors in the pre-engineered steel building industry

Success factor	Description
 Quality material	<ul style="list-style-type: none"> The use of quality raw materials ensures structural integrity, compliance with relevant codes and standards, proper safety of pre-engineered steel buildings and a higher life span of buildings Furthermore, it positively influences reputation and helps gain the confidence of potential clients
 Research and development	<ul style="list-style-type: none"> Specialised design expertise plays a pivotal role in ensuring both functionality and aesthetics of pre-engineered steel buildings. Investing in research and development enables pre-engineered steel building suppliers to provide better quality products to their clients and gain competitive advantage.
 Standardisation	<ul style="list-style-type: none"> Establishing standardised processes and specifications is a critical factor for the industry as it ensures consistency and quality across pre-engineered steel building structures. Having standardised products also decreases the chances of structural failures and collapse of these structures during erection Overall, standardisation streamlines the manufacturing process, reduces the chances of mishaps during the erection process, thereby enabling suppliers to deliver reliable, cost-effective and high-quality solutions consistently

Success factor	Description
 <p>Technology</p>	<ul style="list-style-type: none"> Pre-engineered steel building suppliers can leverage technology through use of proper design software and new construction technologies such as 3D printing to optimise their design process as well as accelerate their manufacturing process. Utilising the latest technological innovations related to construction not only helps pre-engineered steel building players in saving costs and time, but also helps them gain competitive advantage As technology continues to advance, access and knowledge of the latest technologies/software will emerge as a key differentiator in the PEB industry, companies equipped with cutting-edge technologies such as advanced robotics, artificial intelligence, and digital fabrication techniques will gain a competitive edge in terms of efficiency, quality, and time For example, integration of technologies such as CNC machines, robotic welding, and 3D modelling software could increase the precision and pace of the fabrication process without compromising on quality. Consequently, investment in training and development to enhance technological capabilities will be crucial for firms seeking to maintain their market leadership and meet the growing demands for sophisticated PEB solutions
 <p>Location of Manufacturing plants</p>	<ul style="list-style-type: none"> As individual components of PEBs are manufactured in factories and then transported to the construction site, location of manufacturing plants plays an important role in ensuring optimised transportation costs. Additionally, presence of manufacturing plants at diverse strategic locations also enables economic and efficient delivery of PEB components to the construction sites. Furthermore, as these components are typically heavy and large in size, the proximity of manufacturing plants to the client side minimizes the risk of damage and reduces the likelihood of delays.
 <p>Experience of handling complex projects</p>	<ul style="list-style-type: none"> Prior experience of handling complex projects is paramount for success in the pre-engineered steel building industry as it provides invaluable insights on streamlining operations and optimising resource allocation, thereby facilitating smooth project execution. Additionally, having prior experience of handling complex projects for high ticket clients also provides credibility to pre-engineered steel building players
 <p>Project management and global safety practices</p>	<ul style="list-style-type: none"> Efficient project management, along with compliance to safety measures, is a prerequisite for success of the pre-engineered steel building industry. While effective project management ensures efficient planning, budget control, and quality assurance, adherence to safety measures includes strict compliance to codes, training programmes for workers, provision of safety equipment, regular audit of work practices at sites as well as promoting awareness on security norms among all key stakeholders Hence, the synergy between efficient project management and stringent safety compliance is a critical factor for the pre-engineered steel building industry
 <p>Qualified sales and marketing team</p>	<ul style="list-style-type: none"> Qualified sales and marketing team is essential for success in the PEB industry due to the technical nature of the industry. Deep technical knowledge and industry experience of sales and marketing team ensures effective communication of PEB benefits and its alignment with the clients' overall construction requirement. Additionally, effective marketing strategies and brand positioning also helps companies in educating potential clients and capturing market share.
 <p>Peak manufacturing capacity</p>	<ul style="list-style-type: none"> A high peak production capacity enables PEB manufacturers/ suppliers to ensure timely production and delivery of building components. This becomes particularly crucial in time sensitive projects which are required to get completed in short timeline. Furthermore, having high peak capacity also facilitates in efficiently completing large projects (high value projects), which in turn positively impact business credibility and boost client confidence.

Source: CRISIL MI&A

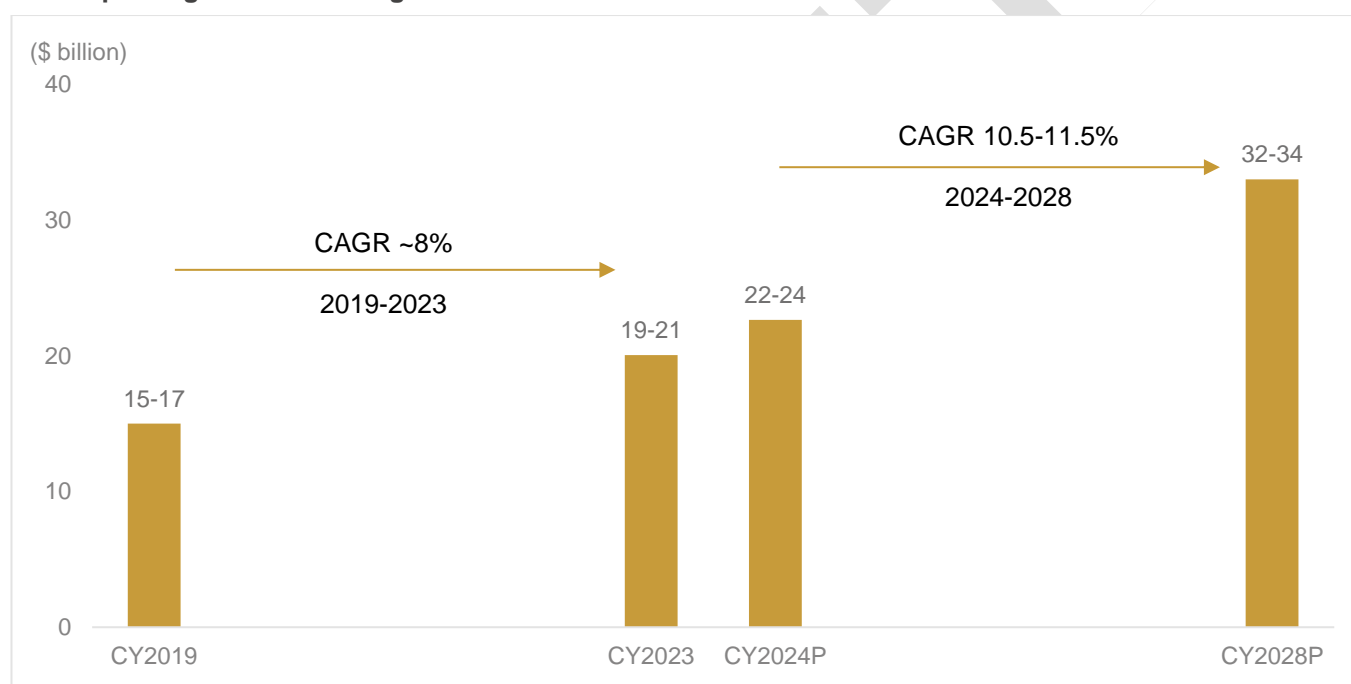
Overview of global pre-engineered buildings industry

Global PEB market to reach \$32-34 billion by CY2028

The global pre-engineered buildings market was valued at \$19-21 billion in CY2023, compared with \$15-17 billion in 2019. The market witnessed moderate growth during CY2019-2023 because of Covid-19 and its subsequent impact on the overall construction sector.

The market is expected to clock a CAGR of 10.5-11.5% over the medium term and is projected to be valued at \$32-34 billion by CY2028. This high growth could be attributed to the increasing awareness about modern off-site construction techniques, as well as rising demand for green buildings globally, which has resulted in a shift in focus to pre-engineered buildings.

Global pre-engineered buildings market



Source: CRISIL MI&A

Infrastructure segment to continue to hold prominent share in global PEB industry

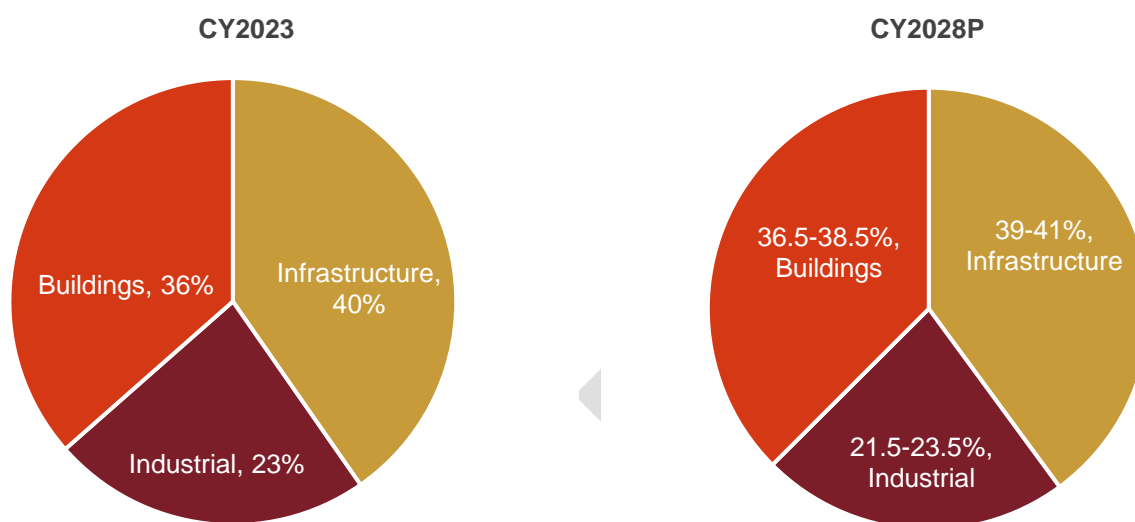
In CY2023, the infrastructure segment accounted for the largest share of the global pre-engineered buildings market (40%), followed by buildings (36%) and industrial (23%). Increasing investments in public infrastructure, growing urbanisation and rising awareness of benefits of pre-engineered construction vis-à-vis the traditional onsite model have contributed to this high share of the infrastructure segment.

The infrastructure segment — mainstay of the global pre-engineered buildings market — is expected to drive demand for pre-engineered buildings. Within the segment, railways and warehouses form a major share, whereas in the industrial segment, manufacturing plants drive the majority of spend. The growing adoption of PEBs in these sectors is driven by their advantages, such as larger clean span spaces, the durable nature of PEBs, faster construction timelines and cost optimisation.

In the buildings segment, institutional buildings such as hospitals, schools and college campuses drive the major demand. PEB penetration in this sector is driven by faster construction timelines, the durable nature of PEBs and optimised cost savings.

Going forward, the infrastructure segment is expected to continue holding the major share of the overall PEB industry (39-41%), followed by buildings (36.5-38.5%) and industrial (21.5-23.5%) in 2028. Overall, increasing awareness of the benefits of PEB construction, combined with the growing emphasis on infrastructure development, is expected to drive demand for PEBs going forward.

PEB market by end-use industry



Source: CRISIL MI&A

Southeast Asia held largest market share in CY2023

In CY2023, Southeast Asia accounted for the largest share of the pre-engineered buildings market (29.5-31.5%), closely followed by North America (28.5-30.5%) and Europe (15.5-17.5%). Key factors contributing to the growth of PEBs in Southeast Asia are rapid industrialisation and urbanisation and increasing adoption of advanced construction practices. Additionally, the tourism and e-commerce sectors are expected to boost demand for commercial and industrial structures such as warehouses, restaurants and hotels, which will facilitate the growth of pre-engineered buildings in the region. Major factors contributing to the growth of the pre-engineered buildings market in North America and Europe are the booming e-commerce and construction sectors and increasing awareness of non-conventional construction methods such as PEB. Furthermore, India is estimated to hold ~11% share in the global PEB industry in CY2023 and is projected to remain range bound moving forward.

Furthermore, growing demand from the infrastructure and industrial sectors, coupled with the rising adoption of construction technologies such as PEB, is expected to facilitate the growth of the pre-engineered buildings market in the Middle East and Africa (MEA) and South America. The share of MEA and South America in the overall PEB industry is estimated to increase to 4.5-6.5% and 3.5-5.5%, respectively, by CY2028.

Share of key geographies in global PEB market

Key regions	CY2023	CY2028P	CAGR (CY2023-2028)
Europe	15.5-17.5%	15.5-17.5%	9.5%-11.5%
MEA	4-6%	4.5-6.5%	11.5%-13.5%
North America	28.5-30.5%	27.5-29.5%	8.5%-10.5%
South America	3-5%	3.5-5.5%	12%-14%
Southeast Asia	29.5-31.5%	28-30%	8.5%-10.5%

Key regions	CY2023	CY2028P	CAGR (CY2023-2028)
Rest of the world	13.5-15.5%	14-16%	10%-12%
• India *	~11%		10-11%

Note: India numbers are on fiscal year basis and CAGR (CY2023-2028) represents CAGR (FY24-29)

Source: CRISIL MI&A

A few global PEB players

Company	Overview	Capacity
ATAD Steel Structure Corp.	Established in 2004, ATAD has implemented more than 3,500 steel buildings across 60 countries and territories with a network of 11 companies and representative offices in Myanmar, Indonesia, Thailand, the Philippines, Cambodia, Sri Lanka, Bangladesh and Uganda.	144,000 MT of steel structure p.a. ¹
BlueScope Steel	BlueScope Steel Ltd has global presence and provides engineered steel building solutions. In 2004, it acquired Butler Manufacturing Company and in 2008, it acquired Varco Pruden Buildings.	N.A.
Cornerstone Building Brands Inc. (Shelter Solutions)	Cornerstone Building Brands, Inc. is a holding company incorporated in Delaware. The company is the manufacturer of exterior building products and serve residential and commercial customers. Under its Shelter Solutions business, the company offers a portfolio of metal roof and wall systems and complete pre-engineered building systems.	N.A.
Kirby International	Established in 1976, Kirby has executed projects across more than 70 countries. The company is a 100% subsidiary of Kuwait-based multinational business conglomerate Alghanim Industries.	515,000+ MT p.a.
Nucor Buildings Group	Nucor Buildings Group is one of North America's manufacturers of metal building systems. Nucor Buildings Group is represented by four independent building brands: American Buildings, CBC Steel Buildings, Kirby Building Systems and Nucor Building Systems.	~500,000 tons p.a.
Rigid Global Building	Rigid Global Buildings has experience of more than 30 years in production of pre-engineered metal buildings. The company offerings include metal buildings for industries' including commercial, government, schools, self-storage, etc.	N.A.
Whirlwind Steel Buildings, Inc.	Whirlwind Steel, Buildings and Components was founded in Houston, Texas, in 1955 by the Sturdivant family. By 1961, Whirlwind had expanded into the manufacture and sale of metal building components, including panels, secondary structural framing, and trim.	150,000,000+pounds of steel products p.a.
Zamil Steel	Established in 1977 in Dammam, Saudi Arabia, Zamil Steel provides multiple offerings including design, manufacture, and supply of pre-engineered steel buildings.	500,000 MT of fabricated steel p.a.

Note: The above list of players is only indicative and not exhaustive

¹Design capacity

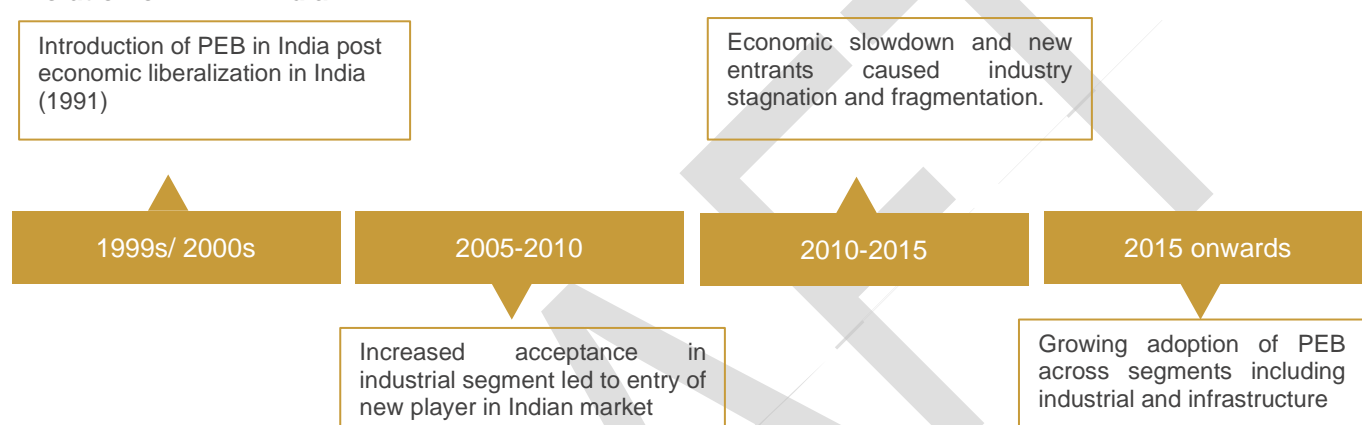
Source: CRISIL MI&A

Overview of pre-engineered steel buildings market in India

Evolution of pre-engineered steel structure market in India

Pre-engineered steel buildings were introduced in India during the late-1990s/2000s with the onset of India's economic growth post liberalisation in 1991. However, the acceptance among consumer verticals began in early-2000 with good growth during 2005-2010. Pre-engineered steel buildings started gaining prominence following a strong fixed capital formation in India and increased adoption by customers. This period of high growth saw new players enter the fray. With the slowdown of India's economic growth, the Indian pre-engineered steel buildings industry stagnated between 2010 and 2015. Post that, the industry saw good adoption but suffered some slowdown as capex declined during the pandemic, leading to a drop in revenue in FY21.

Evolution of PEB in India



Source: CRISIL MI&A

Overview of construction costs of pre-engineered steel structures

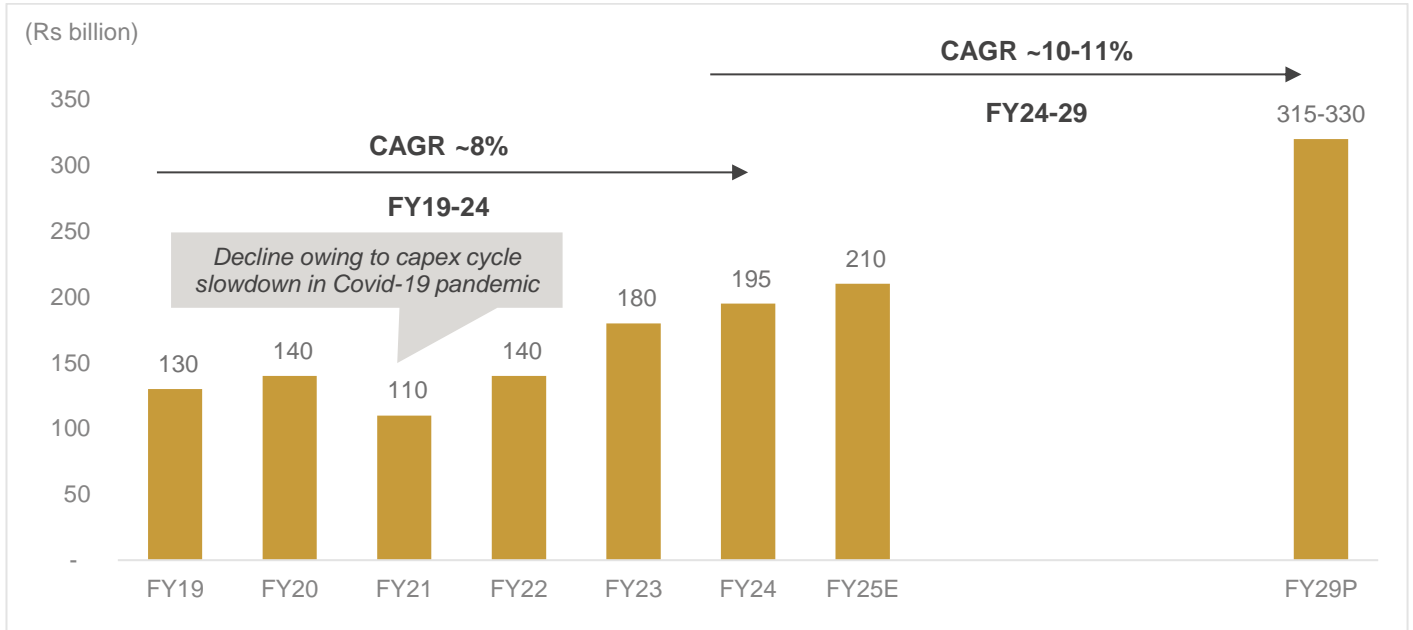
As per primary research, the cost of a pre-engineered steel building is estimated to be at times 15-35% lower than conventional structures for sheds, warehouses and depots, or at times 20-25% higher than a traditionally constructed building, depending on the building's design and usage requirements. However, the higher upfront cost of pre-engineered steel buildings is offset by faster construction times, flexibility to expand these buildings, lower maintenance costs, better durability and higher salvage value, among others, which ultimately results in cost savings over the entire lifespan of the building. Further, pre-engineered steel buildings not only accelerate the overall construction process but also save labour costs and enable quicker occupancy/commencement of operations, leading to potential revenue generation at an earlier stage.

Additionally, due to the flexibility to shift these structures to other locations, pre-engineered steel structures help reduce potential capex costs, enabling organisations to adapt to changing operational needs without the financial burden of constructing new buildings.

PEB market in India to log 10-11% CAGR between FY24-29

The industry expanded at a CAGR of ~8.0% over FY19-24, growing from Rs 130 billion in FY19 to Rs 195 billion in FY24. In FY25, the industry is estimated to grow by ~8% to Rs 210 billion. The medium-term outlook is optimistic, with the industry growing at a 10-11% CAGR between FY24-29 to Rs 315-330 billion, supported by investments in the industrial and infrastructure sectors, such as warehouses and logistics as well as expressways (wayside amenities and toll plazas).

Pre-engineered steel buildings market in India



E: Estimated; P: Projected
Source: CRISIL MI&A

Large, organised players grow at faster clip than overall pre-engineered steel building industry

Within the overall industry, key players have grown at a faster growth rate as compared to the rest of the industry. This higher growth of the top players can be attributed to higher reliability and capability, high quality raw materials used, good track record for execution and capability to provide innovative and effective solutions to customers.

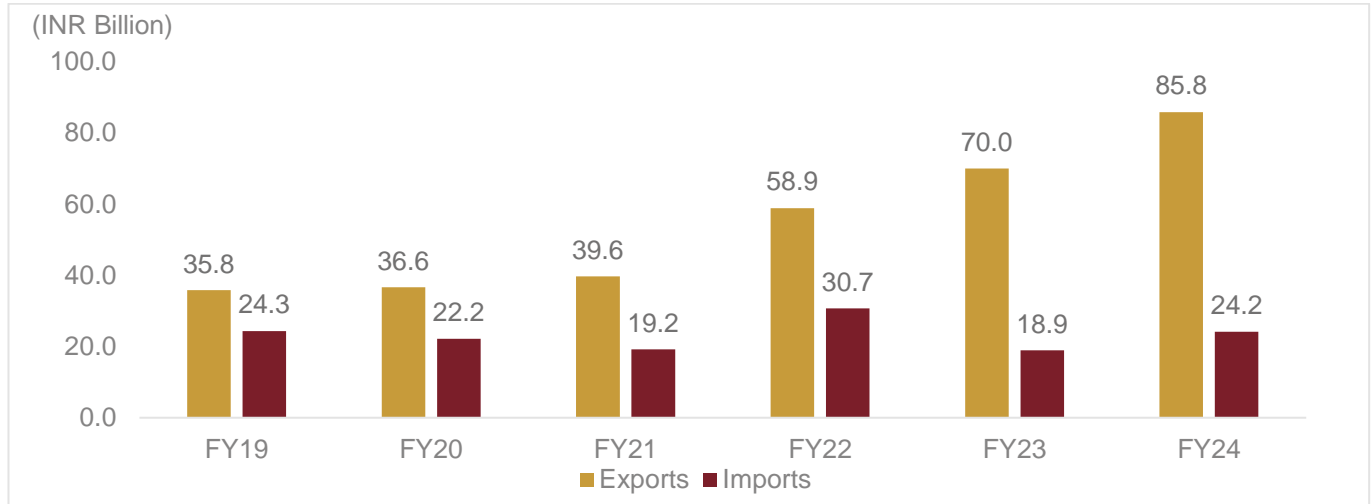
Industry players	Revenue FY20 (Rs billion)	Revenue FY24 (Rs billion)	CAGR FY20-FY24 (%)
Some of the key players	54	78	9.8%

Note: Key players considered for the above table are as follows: EPack Prefab Technologies Limited, Everest Industries Ltd, Interarch Building Products Ltd, M&B Engineering Ltd, Pennar Industries Ltd, Zamil Steel Buildings India Pvt Ltd
Kindly note that overall revenue from operations of these players which may include revenue from non-PEB segments as well
Source: Annual reports, CRISIL MI&A

PEB exports grew ~2x between fiscals 2019 and 2024

Exports of PEB increased to Rs 85.8 billion in fiscal 2024 from Rs 35.8 billion in fiscal 2019, implying a CAGR of ~19.1%. Compared with exports, imports registered a CAGR of (0.1%) during the period. This growing difference between the imports and exports of PEB from India indicates increasing domestic manufacturing/production of PEBs and global demand for PEBs from India, thereby leading to a positive trade balance.

PEB imports and exports — India



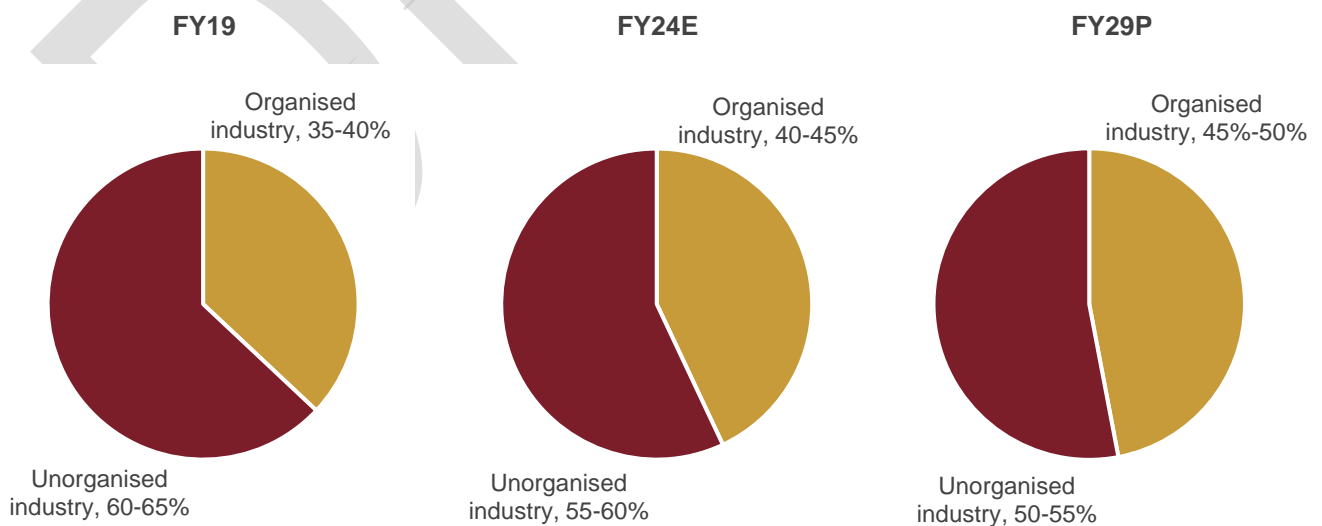
Notes: Following HSN codes are considered for the purpose of the chart above: 94069090, 73089090 and 73089010
Source: Ministry of Commerce and Industry, CRISIL MI&A

Pre-engineered steel buildings market remains competitive with large unorganised vertical; organised sector remains superior to unorganised one

As of FY24, the organised industry is estimated to hold a 40-45% revenue share in the overall industry. The remainder is the fragmented unorganised industry, which accounts for 55-60% of the overall market, as high capital investment is not required for entering the market.

However, the organised sector has an edge over the unorganised sector in terms of a reliable track record, supply-chain capabilities, and quality engineering services and products, due to which there has been a growing shift towards the organised sector. This shift is also expected to augment the revenue of players in the organised market. Hence, moving forward, share of organized industry is estimated to increase to 45-50% by FY29, whereas unorganized industry will hold the remainder 50-55%.

Share of organised and unorganised sectors in PEB



Source: CRISIL MI&A

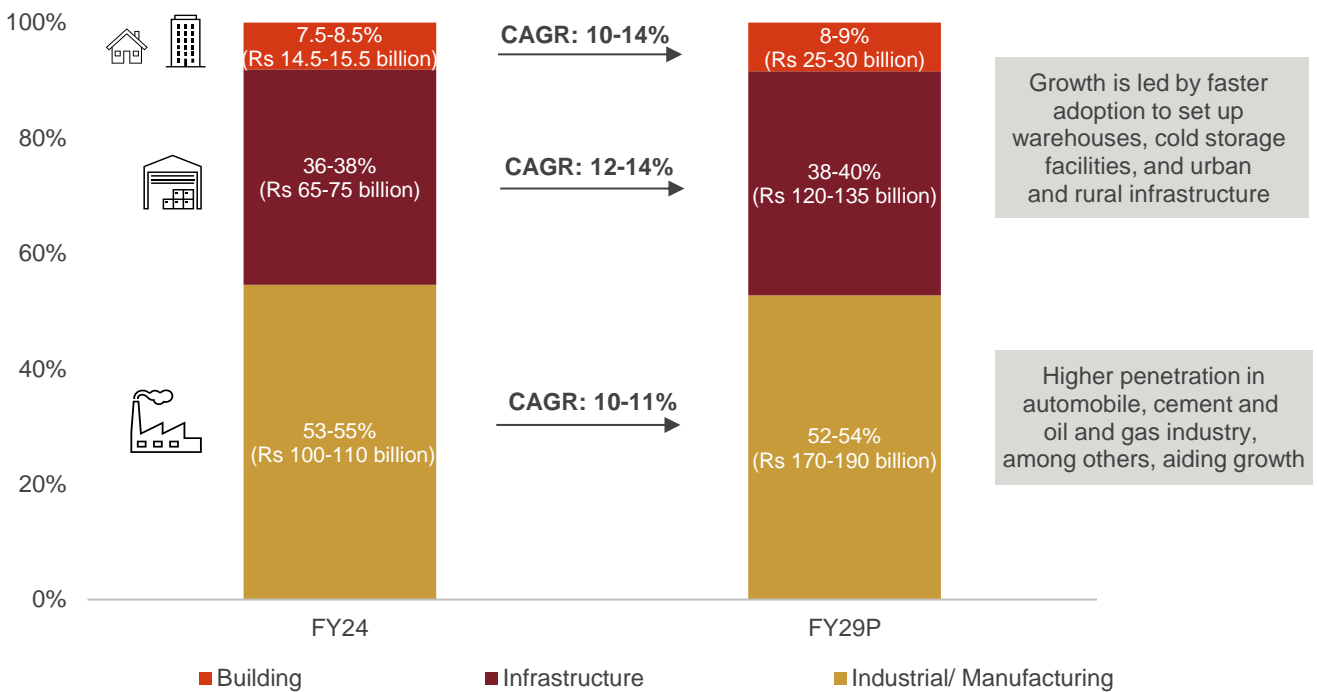
Share of infrastructure in the pre-engineered steel building market to increase

The pre-engineered steel building market in India can be divided into three broad end-use sectors: industrial/manufacturing, infrastructure, and building (residential, commercial and non-commercial). The industrial sector, which is estimated to hold the largest market share of 53-55% in FY24, is expected to account for 52-54% of the market by FY29. The high industrial sector’s share in the pre-engineered steel buildings market is led by higher penetration in the automobile, cement, and oil and gas markets, among others. Overall, the segment is estimated to register a CAGR of 10-11% between FY24-29.

The infrastructure sector is estimated to grow at a CAGR of 12-14% between FY24 to FY29, thereby increasing its share to 38-40% by FY29 from an estimated 36-38% in FY24. Pre-engineered steel buildings in the sector include warehouses, cold storage facilities, data centres, power plants, aircraft hangers and railway yards. PEB warehouses are also gaining prominence post GST implementation.

The buildings sector share in the pre-engineered steel buildings market, which was low at 7.5-8.5% in FY24, is estimated to remain range-bound at 8-9% in FY29

Market segmentation by end-use sectors





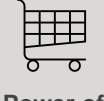


E: Estimated; P: Projected
Source: CRISIL MI&A

SWOT (Strengths, Weaknesses, Opportunities, Threats) Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Growing acceptance of PEBs in the construction sector due to faster construction times and reduced dependence on onsite labour • Availability of improved and advanced machinery and technologies • Increasing access to international markets • Rise in government-led innovative construction projects like Light house projects under the ambit of PMAY-U • Launch of policies like Domestically Manufactured Iron & Steel Products (DMI&SP) and PLI scheme for specialty steel, which is expected to positively impact the availability and quality of steel as a raw material, supporting the PEB industry 	<ul style="list-style-type: none"> • As Steel is the major raw material for PEB construction and a good conductor of heat, it reduces the thermal comfort of the building and the overall fire resistance of the building • Steel being one of the major raw materials for PEB construction, can make entire PEB structure susceptible to corrosion if not properly maintained • High presence of unorganized segment combined with lack of differentiated offering may result in price pressure. • Limited suppliers of high-grade steel, makes the industry susceptible to supply chain issues • Future expansions of PEB become difficult if such expansions are not properly thought out from the start of the project
Opportunities	Threats
<ul style="list-style-type: none"> • As of FY24, the share of PEB in the building, industrial and infrastructure sector is estimated at 0-1%, 13-15% and at 5-7% respectively. Overall share of PEB in construction was only around 3-5% as of FY24. This low share of pre-engineered steel construction in overall construction indicates high growth potential • Growing popularity of sustainable buildings may help the sector- PEB is a more sustainable alternative to conventional RCC buildings • Shift from RCC to PEB construction combined with low share of PEB in overall construction • Rising construction spends, especially in infrastructure segment, to boost the demand of PEBs • Low penetration of PEBs in building segments combined with increasing urbanisation to improve demand of PEBs in building segments • Growing demand from warehouses and cold storage due to increase in the penetration of ecommerce in India expected to help the domestic PEB industry 	<ul style="list-style-type: none"> • Traditional RCC construction holds the dominant market share (95-97%), posing strong competition • Failure to gain widespread acceptance due to limited awareness, knowledge gap, and misconceptions can limit the growth • Lack of skilled labours including fabricators and designers may result in knowledge and experience gap, which may lead to operational inefficiencies • Increasing geopolitical uncertainties may adversely affect steel prices, which is the prominent raw material of PEB • Standardisation of PEB components often results in modular sizes and shapes, limiting the freedom to create highly unique or unconventional designs • Some parts of PEB structures may require significant replacement or maintenance from time to time, especially during the later stage of the lifespan of PEB structures

Source: CRISIL MI&A

Porter's five forces analysis

Porter's five forces	Description
 Threat of new entrants: High	<ul style="list-style-type: none"> The threat of new entrants in the pre-engineered steel construction industry is high due to its moderate capital-intensive nature, as it does not require substantial investments in terms of manufacturing facilities/factories, specialised equipment and skilled labour. However, high-value clients prefer credible manufacturers of pre-engineered steel structures with a proven track record, which further makes it difficult for new entrants to capture the market. That said, lack of stringent regulatory policies make the industry more attractive to new entrants.
 Power of customers: High	<ul style="list-style-type: none"> The industry's fragmented nature, coupled with lack of undifferentiated products and services, provides high bargaining power to customers. In the case of large projects, the presence of a limited number of big-ticket suppliers, provide high bargaining power to the potential clients, which increases competition for PEB suppliers. Tier 1 service providers compete on quality and pricing. Overall, the highly fragmented nature of the pre-engineered steel structure industry, coupled with inability to provide product differentiation, provides high negotiation power to customers/ clients, thereby negatively impacting revenue of players in the pre-engineered steel buildings market.
 Power of suppliers: High	<ul style="list-style-type: none"> Supplier power is high as there are few large and credible suppliers of raw materials and components, allowing them to influence the industry. SAIL, Tata Steel and JSW hold 40-45% of the steel production market. Large pre-engineering companies that have established long-term relationships with these suppliers have an advantage in negotiations, leading to a more balanced power dynamic.
 Competitive rivalry: High	<ul style="list-style-type: none"> The industry exhibits high competitiveness, driven by fragmentation (55-60% share held by unorganised players) and a limited number of big-ticket clients. Furthermore, due to the increasing demand for standardised pre-engineered steel structures, the scope of product differentiation becomes limited, which puts additional price pressure.
 Threat of substitutes: Low	<ul style="list-style-type: none"> The threat of substitutes is low. One of its major alternatives is traditional on-site built construction. However, the advantages of pre-fabrication, such as cost savings, faster construction times and more eco-friendly nature, are positively impacting its demand. Traditional construction still holds a major share in overall construction.

Source: CRISIL MI&A

Policy and regulatory framework

There is no existing regulatory or policy framework particularly for pre-engineered steel buildings in India. However, there are various codes, which are discussed below, for the use of steel in construction. The pre-engineered construction industry in India adheres to guidelines and quality standards set by authorities such as the International Organization for Standardization (ISO), Bureau of Indian Standards (BIS), Building Materials and Technology Promotion Council (BMTPC), and Ministry of Housing and Urban Affairs (MoHUA).

The National Building Code (NBC) is designed by BIS, which is responsible for setting guidelines for construction activities, including the use of prefabricated/ pre-engineered components. Civil Engineering Division (CED) Committee number 2 to CED Committee number 59 of BIS are related to construction. Furthermore, CEDs such as CED 32, CED 51 and CED 46 are related to prefabricated/ pre-engineered construction. Other standards include IS-800 (Indian Standard - General Construction in Steel - Code of Practice), IS-875-PART- I to V (Loads and Combinations), and IS-1893 Criteria for Earthquake Resistant Design of Structure (R-5). Model Building Bye-Laws, 2016, published by Town and Country Planning Organisation, MoHUA, plays a vital role in formulating policies and regulations for the construction industry, offering guidance and support for adopting new technologies. For instance, Sections 6.1.1 and 6.4 of the provisions for structural safety provide specific details for pre-engineered

systems. Moreover, depending on the nature of the project, specialised agencies may be involved in regulating specific aspects of pre-engineered construction for infrastructure projects. For instance, during the pandemic, the Ministry of Health and Family Welfare consulted experts from institutions such as IITs of Delhi, Roorkee and Madras, as well as MIT Pune, regarding suitable options available for pre-engineered structures (panels) in the case of healthcare infrastructure.

ISO 9001:2015, ISO 14001:2015, OHSAS 18001:2017, ISO 14001:2004 and OHSAS 18001:2007 (Southeast Asia) are a few quality standards and guidelines adhered to by the PEB industry in India. These standards cover the design, fabrication and supply of pre-engineered buildings and structural steel works. Other international standards include the Metal Building Manufacturers Association (MBMA), American Institute of Steel Construction (AISC) and American Welding Society (AWS).

Some applicable codes and standards as per Indian standards for PEBs/ steel construction/ prefabricated structures

Code	Description
IS:875-I	Code of practice for design dead loads for buildings and structures
IS:875-II	Code of practice for design imposed loads for buildings and structures
IS:875-III	Code of practice for design loads (other than earthquake) for buildings and structures
IS:1893	Criteria for earthquake resistant design of structures
IS:4326	Code of practice for earthquake resistant design and construction of buildings
IS:800	Code of practice for use of structural steel in general building construction
IS:801	Code of practice for use of cold-formed light gauge steel structure members
IS:811	Specification for cold-formed light gauge structural steel sections
IS:4923-III	Hollow steel sections for structural use – specification
IS:8629	Code of practice for protection of iron and steel structures from atmospheric corrosion
IS:4000	High strength bolts in steel structures
IS:14142	Code of practice for design and construction of floors and roofs with prefabricated brick panel
IS:11447	Code of practice for construction with large panel prefabricates
IS:15917	Building design and erection using mixed / composite construction – code of practice
IS:15916	Building design and erection using prefabricated concrete
IS:14213	Code of practice for construction of walls using precast concrete stone masonry blocks

Note: The above list is an indicative and not exhaustive representation of quality standards for PEBs in India

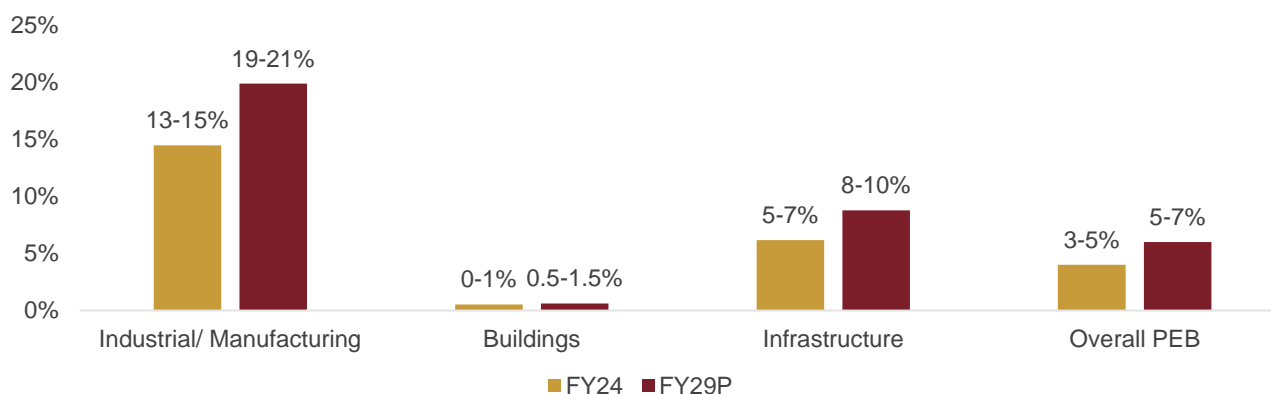
Source: CRISIL MI&A

Key growth drivers

Low penetration of PEB in the building sector

In FY24, the share of PEB in the building sector was estimated at 0-1%, considerably lower than the penetration of PEB in the industrial sector (13-15%) and infrastructure sector (5-7%). The overall PEB penetration is estimated around ~3-5% in FY24. However, growing awareness of benefits of PEB over traditional construction methods, combined with low penetration of PEB in the building sector, provides room for further growth in this sector. Furthermore, growing urbanisation coupled with space and time constraints have fuelled the shift towards vertical construction from horizontal construction. This shift is also expected to increase the demand of PEB in buildings segment, especially in high-rise buildings.

Share of pre-engineered steel construction in various sectors



P: Projected

Source: CRISIL MI&A

Shift from RCC to PEB

Growing awareness of PEB structures along with their benefits over traditional RCC construction has led to an increase in PEB projects. Use of PEB not only helps in expediting the project timelines but also is more sustainable due to less wastage. As a result, pre-engineered steel construction structures are garnering greater acceptance over traditional onsite construction practices of erecting entire structures onsite. This positioning is expected to serve as a catalyst for growth of pre-engineered steel structures in the construction industry.

Increasing popularity of green and sustainable buildings

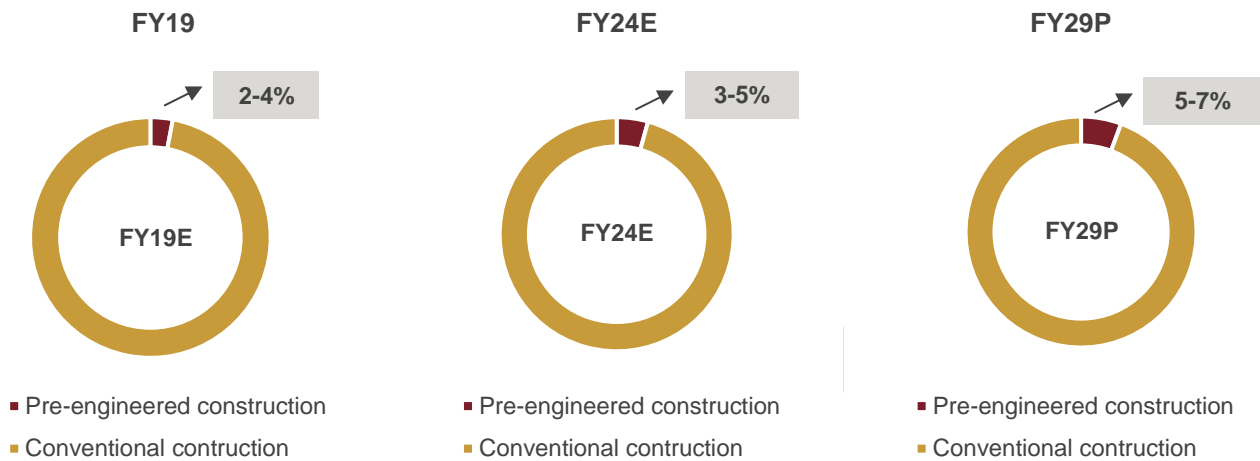
The increasing popularity of green and sustainable buildings among large corporations as well as logistics players is also driving growth of pre-engineered steel buildings, as streamlined processes minimise material waste and make these buildings more sustainable than traditional buildings. Additionally, steel, which is highly recyclable, is a major component in pre-engineered steel building construction.

Moreover, use of pre-engineered steel building structures supports deconstruction and reconstruction, enabling the building components to be reused or recycled at the end of their life cycle. This approach significantly reduces the amount of construction-related waste sent to landfills, leading to a more sustainable construction industry. Overall, the growing shift of logistics players towards green logistics is expected to support the pre-engineered steel building sector.

Low percentage share of pre-engineered steel construction in overall construction indicates high growth potential

The pre-engineered steel construction industry in India, even though gaining acceptance, is still in its infancy. As of FY24, penetration of pre-engineered steel construction in the overall construction sector is estimated to be around 3-5%. This low share of pre-engineered steel buildings in India combined with the increasing of awareness of benefits of steel pre-engineered buildings over RCC, provides a substantial growth potential of pre-engineered steel buildings in India. This will help in increasing the share of pre-engineered steel construction in overall construction to an estimated 5-7% by FY29.

Share of pre-engineered steel construction in overall construction



P: Projected; E: Estimated
Source: CRISIL MI&A

Low steel consumption in India

As of calendar year 2023, the country's annual per capita steel consumption stood at 93 kg per annum, compared with the global average of 219 kg. Favourable government policies such as the National Steel Policy aim to increase India's per capita steel consumption and create a technologically advanced and globally competitive steel industry in the country to promote self-sufficiency in steel production as well as economic growth. The National Steel Policy 2017 focuses on the following three main aspects:

- Increase consumption of steel through major sectors (segments) of infrastructure, automobile and housing
- Achieve 300 MT of steelmaking capacity by 2030
- Increase per capita steel consumption from around 60 kg in 2017 to ~160 kg by 2030

This is expected to aid the pre-engineered steel building industry by positively impacting the quality of steel available, which is the dominant raw material required for pre-engineered steel buildings. Additionally, increasing penetration of pre-engineered steel buildings in infrastructure projects, coupled with the National Steel Policy's aim to boost steel consumption in the infrastructure sector, is expected to positively impact pre-engineered steel buildings.

Furthermore, the government has implemented the Domestically Manufactured Iron & Steel Products (DMI&SP) policy for promoting 'Made in India' steel for government procurement. Additionally, in 2021, the government approved the Production Linked Incentive (PLI) scheme for specialty steel. The duration of the scheme is five years, from FY24-28. With a budgetary outlay of Rs 63.2 billion, the scheme is expected to bring in investment of approximately Rs 400.0 billion and capacity addition of 25 MT for specialty steel. These steps will positively impact the availability and quality of steel as a raw material, supporting the PEB industry.

Increased industrial capex and planned capacity expansion to boost PEB sector

Industrial capex grew ~9% on average between FY19-23. In absolute terms, industrial capex averaged around Rs 3.9 trillion per annum during the period. It is estimated to raise to Rs 6.5 trillion (on average) between FY24-28, marking an increase of 1.7x on an annual basis. Share of PLI and emerging sectors, which contributed to 5% of the capex between FY19-23, is estimated to increase to 27% between FY24-28.

Increased capex in these industries is anticipated to indirectly boost demand for pre-engineered steel structures, especially in large and complex industrial construction projects. Pre-engineered steel construction may be preferred for large and complex industrial projects, depending on the size, structure and construction span of the building, due to its shorter construction spans, engineering efficiency, sustainability and quality advantages.

Increased focus on renewable energy capacity addition

In renewable energy space, CRISIL expects strong capacity additions of 290-300 GW till FY30. Within the total capacity additions, solar and wind will see the highest capacity additions of 180-190 GW and 55-60 GW respectively. Additionally, CRISIL expects share of non-fossil in generational mix to increase to 45% by FY30, with solar accounting for 50% of incremental non fossil generation. These capacity additions will require substantial capex in development of needed infrastructure.

Additionally, the launch of National Green Hydrogen Mission on 4th January 2023 with an outlay of Rs. 197.4 billion up to FY30 will also positively impact the sector. This mission aims to accelerate the deployment of Green Hydrogen as a clean energy source, will support the development of supply chains that can efficiently transport and distribute hydrogen. This includes the use of pipelines, tankers, intermediate storage facilities, and last leg distribution networks for export as well as domestic consumption. It aims to contribute to India's goal to become self-reliant through clean energy.

Infrastructure development and investments to support demand for PEB

India's focus on infrastructure is increasing owing to government policies such as metro rail projects and the National Infrastructure Pipeline, which are expected to be major growth drivers for the pre-engineered steel construction industry in the country. Total construction investments in this sector is expected to attract investments of ~Rs 51-53 trillion between FY25-29P, up from Rs 29-31 trillion between FY20-24.

This increased government spending on infrastructure, along with growing awareness of benefits of pre-engineered steel buildings over traditional construction, is expected to boost demand for pre-engineered steel buildings in India.

Warehouse and cold storage expansion to be major contributors to PEB demand

Due to increasing e-commerce penetration and changing customer preferences, companies are also investing in warehousing and cold storage facilities. Additionally, due to rapid urbanisation and economic growth in developing countries, various companies are seeking faster and more cost-effective ways to construct their warehouses. Pre-engineered steel buildings are preferred for their cost-effectiveness and speedy construction compared with RCC buildings. They require less onsite manpower and construction time, leading to cost savings. Increased adoption of pre-engineered steel buildings in warehouse construction will boost overall pre-engineered steel market growth. Overall, CRISIL projects construction investments in the warehousing (agricultural and industrial) and cold storage (single- and multi-commodity) sectors to rise to Rs 460-500 billion during FY25-29 from Rs 270-310 billion during FY20-24 on expectations of increased demand. This increasing construction spends in warehouse segment coupled with growing penetration of PEB in warehousing, is expected to provide a fillip to the overall pre-engineered steel building industry.

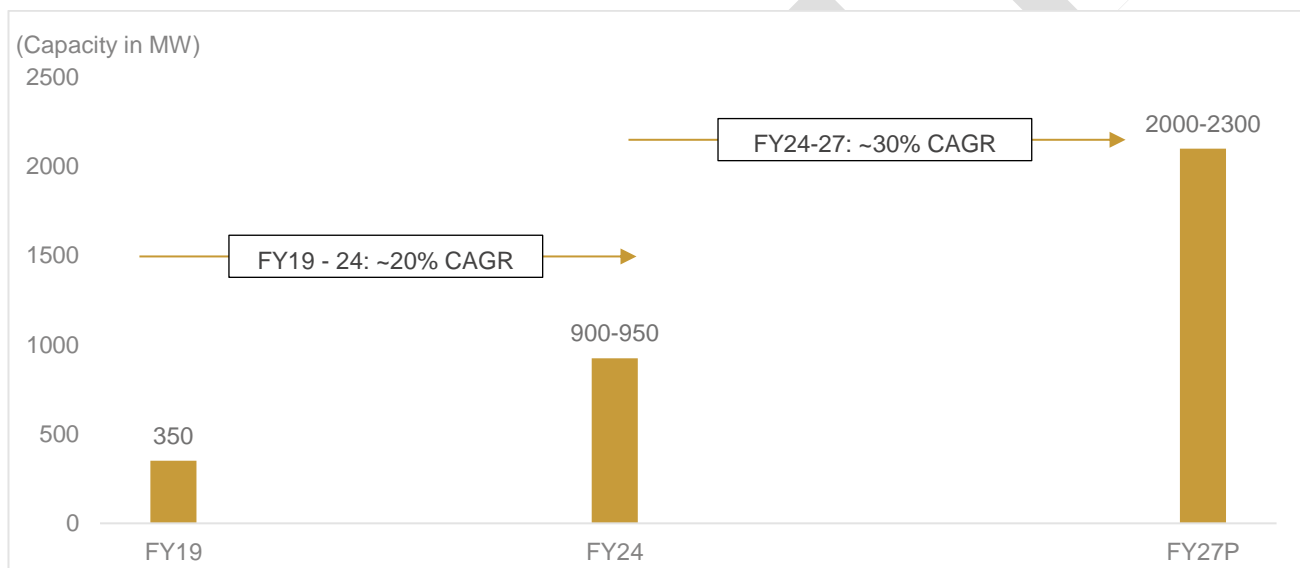
Increasing demand of data centres in India

From fiscal 2019 to fiscal 2024, the Indian data centre industry has seen a growth at CAGR of ~20% in terms of capacity. This growth can be attributed to factors such as growth in internet accessibility, surge in e-commerce adoption, rise in digital adoption, remote working, rise in OTT (over-the-top) consumption, etc.

Additionally, as per the draft Data Centre Policy 2020, data centres to be declared as an Essential Service under The Essential Services Maintenance Act, 1968 (as amended). Furthermore, Data Centre Economic Zones will also be set up for the long-term growth of data centres in India.

These policies combined with the RBI mandate advising all payment system providers to store entire data related to payment systems operated by them in a system only in India is expected to provide impetus to data centre in India, which in turn is expected to boast the demand of pre-engineered steel buildings.

Data centre industry in India (installed capacity)



Note: P: Projected, "Capacity" refers to the data centre load that is consumed or is dedicated to IT equipment such as servers, storage equipment, communications switches, routers. Power for lighting or cooling the data centre is excluded from IT power. Further, the capacity mentioned in the above chart pertains to third party data centre only.
 Source: Industry, company reports, CRISIL MI&A

Rise in government-led innovative construction projects

Policy and regulatory factors play a crucial role in shaping demand, growth and adoption of prefabrication and steel pre-engineering in the construction sector. For example, government schemes such as PMAY have been instrumental in driving demand and growth of the prefabrication and pre-engineering industry, especially in the housing sector. Light house projects under the ambit of Pradhan Mantri Awas Yojana-Urban (PMAY-U) use distinct technologies to offer affordable and quality housing in an accelerated timeframe.

The increased focus of both central and state governments on providing low-cost housing in the country is expected to boost demand for cold form structures in the future. Additionally, government initiatives such as the light house project are expected to encourage wider adoption of such technologies across India, thereby driving demand for prefabricated and pre-engineered steel construction structures.

Summary of growth drivers

Sector	Growth drivers
Overall	<ul style="list-style-type: none"> Low per capita steel consumption in India along with government schemes like National Steel Policy, which aims to boost domestic steel production is expected to help the PEB industry which is highly dependent on few steel suppliers. Approval of specialty steel under Production Linked Incentive (PLI) Scheme with a budgetary outlay of Rs 63.2 billion and capacity addition of 25 MT will positively impact the availability as well as quality of steel as a raw material.
Industrial/ Manufacturing	<ul style="list-style-type: none"> Industrial capex grew ~9% on average between FY19-23. In absolute terms, industrial capex averaged around Rs 3.9 trillion per annum during the period. It is estimated to rise to Rs 6.5 trillion (on average) between FY24-28, marking an increase of 1.7x on an annual basis. Construction investment in the industrial sector is projected at Rs 4.5-5.5 trillion between FY25-29, compared to Rs 3-4 trillion between FY20-24. Construction spends across industrial investments in FY25 are seen rising 5-7% driven by expansion in oil and gas and metals segment. Increasing popularity of green and sustainable buildings, along with the benefits of faster construction time and reduced material wastage is expected to increase adoption of PEB. Growing penetration of EV vehicles in India led by favourable government initiatives like FAME, reduction of GST will require robust EV infrastructure.
Infrastructure	<ul style="list-style-type: none"> Growing demand from warehouses and cold storage due to increase in the penetration of e-commerce in India. Additionally, post implementation of GST as well as shift to hub and spoke models, large PLI players have started investing in PEB warehouses. Total construction investments in this sector is expected to attract investments of ~Rs 51-53 trillion between FY25-29P, up from Rs 29-31 trillion between FY20-24. Increase in the demand of data centres in India along with RBI mandate to store payment data locally in India, will boost the demand of pre-engineered steel buildings in India owing to increasing penetration of PEBs in data centres. Growing focus on renewable energy capacity additions will require substantial capex in this field.
Building	<ul style="list-style-type: none"> Low share of pre-engineered steel construction in building construction (~0-1% as of FY25), along with increasing awareness of PEB in India will positively impact the demand of PEB. Construction investments in building sector is expected to rise to Rs 18-19 trillion between FY25-29 from an investment of Rs 12.5-13.5 trillion between FY20-24. Rise in government-led innovative construction projects like Light house project under the ambit of PMAY- U will provide more awareness of non-conventional construction methods like PEB in India.

Source: CRISIL MI&A

Key challenges

Vulnerability to fluctuations in raw material prices

Prices of raw materials, mainly steel, could affect project costs, profitability and project timelines. According to industry sources, the pre-engineered steel building industry relies heavily on a limited number of high-quality steel suppliers, including Tata Steel, Nippon Steel, ArcelorMittal Nippon Steel India, Steel Authority of India Ltd, Jindal Steel & Power Ltd, etc, for raw materials such as hot-rolled (HR) coils and high-grade S345 MP. The limited base gives these suppliers significant negotiating power, and the dependence on a small pool of suppliers makes the industry susceptible to supply-chain issues. Additionally, steel prices are also susceptible to global geopolitical events, which further emphasises the need for strategic resource planning.

Transportation challenges

As pre-engineered steel structures are manufactured offsite, transportation of these structures to the construction site involves logistics expenses, which are a function of the distance and the complexity of the transportation process and can significantly impact the overall project cost. Furthermore, these components are susceptible to damage during transportation and handling and may require rework or replacement, which, in turn, could lead to additional costs and project delays. Hence, increasing distance between the installation site and the manufacturing plant may impact price competitiveness.

Additional safeguards to withstand natural disasters

Pre-engineered steel structures should be designed after due consideration and study of the seismic classification and history of the construction site. However, this can complicate their design and manufacturing process and may involve incorporating additional engineering measures and special materials to enhance the structural durability of such prefabricated structures. Furthermore, even in the event of a fire, certain components of pre-engineered steel buildings, such as flange braces, sag rods and cross bracing rods, are susceptible to damage. The use of fire-retardant intumescent paint, while highly effective, is often limited due to its prohibitive cost. Consequently, its application is reserved for specialised cases, highlighting the need for alternative methods and materials to safeguard pre-engineered steel structures against fire-related risks.

Medium capital outlay and fragmented industry

The steel pre-engineering industry does not require significant upfront capital investments in terms of manufacturing facilities and suitable technology, leading to fragmentation with multiple manufacturers, suppliers and contractors operating independently. Hence, intense competition is impacting margins of players. Moreover, players in the unorganised industry may compromise on quality standards to ensure price competitiveness, which may weaken the structural security of the building.

Design limitations

Standardisation of pre-engineered steel components often results in modular sizes and shapes, limiting the freedom to create highly unique or unconventional designs that require non-standard dimensions. Structural constraints must be carefully considered in manufacturing pre-engineered steel structures to ensure the stability and safety of the structure. This imposes limitations on architects/designers in terms of design that can be structurally feasible. Furthermore, the integration of pre-engineered steel structures with traditional onsite construction can introduce additional challenges, which can exacerbate in difficult terrains.

Limited knowledge and lack of skilled manpower

The pre-engineered steel construction industry in India is in its infancy, because of which there is a shortage of skilled personnel with adequate technical knowledge of these structures. Designers play a crucial role in creating designs for the successful implementation and integration of pre-engineered steel buildings, but not all designers may possess adequate knowledge and experience in modular construction techniques. Despite the growing awareness about pre-engineered steel structures, traditional construction methods often dominate architectural education and practice. This results in a knowledge gap in understanding the specific requirements of pre-engineering.

3.3 Sandwich insulated Panels and Light Gauge Steel Framing (LGSF)

Sandwich insulated Panels

Sandwich insulated panels are building materials made of two durable outer layers and a lightweight internal core, usually composed of substances like polyurethane, polystyrene, mineral wool, glass wool, etc for insulation purposes. Furthermore, there are majorly two types of manufacturing technologies related to sandwich insulated panels- discontinuous lines and continuous line. In continuous line, all the materials used are processed together which leads to higher productivity, larger production volume, and enhanced automation compared to discontinuous line processing, where materials are processed separately. Furthermore, as majority of processes are automated in continuous line, the labour cost associated with production is decreased while increasing the overall quality of sandwich insulated panels.

Sandwich insulated panels are designed in a manner that enhances thermal insulation or acoustic insulation depending upon the insulation material used. Additionally, depending upon the core material, it also provides resistance to water, fire, etc. Due to these insulation and resistance capabilities, sandwich insulated panels are finding use cases in multiple industries where temperature control is required. More details about the end-use segments of sandwich insulated panels are provided in the following table.

Major end use segments for sandwich insulated panels

End use segments	Description	Demand drivers
Cold Storage and Refrigerated Facilities	<ul style="list-style-type: none"> Sandwich insulated panels are used in cold storage and refrigeration units due to their thermal insulation These panels reduce energy costs by maintaining consistent internal temperatures, which is essential for perishable goods. 	<ul style="list-style-type: none"> Growth in the food supply chain, especially for frozen and processed food sectors, Need for cold storage facilities close to urban centres are key drivers.
Industrial and Warehousing Facilities	<ul style="list-style-type: none"> Warehousing and industrial units utilize sandwich insulated panels for walls, roofing, and facades due to their ease of installation, and insulation properties In industrial settings, like electronics and electrical goods industries, semiconductor industry, etc sandwich insulated panels are utilised to maintain optimal temperature required for storage and operational purposes 	<ul style="list-style-type: none"> Rise of e-commerce and logistics has spurred demand for warehousing solutions. Growth of major end use industries like electrical goods, semiconductors, etc is also expected to provide impetus to sandwich insulated panels industry
Modular and Prefabricated Buildings	<ul style="list-style-type: none"> Prefabricated buildings, which are assembled off-site and transported, use sandwich insulated panels to streamline construction processes. In addition to providing insulation, sandwich insulated panels help achieve consistent quality in modular structures. 	<ul style="list-style-type: none"> Increasing urbanization, need for affordable housing, and demand for portable, temporary structures Growing awareness of non-conventional construction technologies
Commercial and Residential Buildings	<ul style="list-style-type: none"> Sandwich insulated panels are gaining popularity for cladding, roofing, and internal partitioning in both residential and commercial buildings due to their acoustic insulation and thermal capabilities. Sandwich insulated panels are finding use case in facades and elevations as well due to their insulating capabilities and aesthetics 	<ul style="list-style-type: none"> Increasing construction spends in buildings segment (both residential and commercial)
Clean rooms	<ul style="list-style-type: none"> Cleanroom is an essential requirement for industries like healthcare, pharmaceuticals, etc 	<ul style="list-style-type: none"> Growth in major end use segments like pharmaceuticals and healthcare

End use segments	Description	Demand drivers
	<ul style="list-style-type: none"> Sandwich insulated panels are used in cleanroom due to insulation properties like thermal insulation, etc which mentions optimal temperature requirements 	is expected to increase the demand of clean rooms

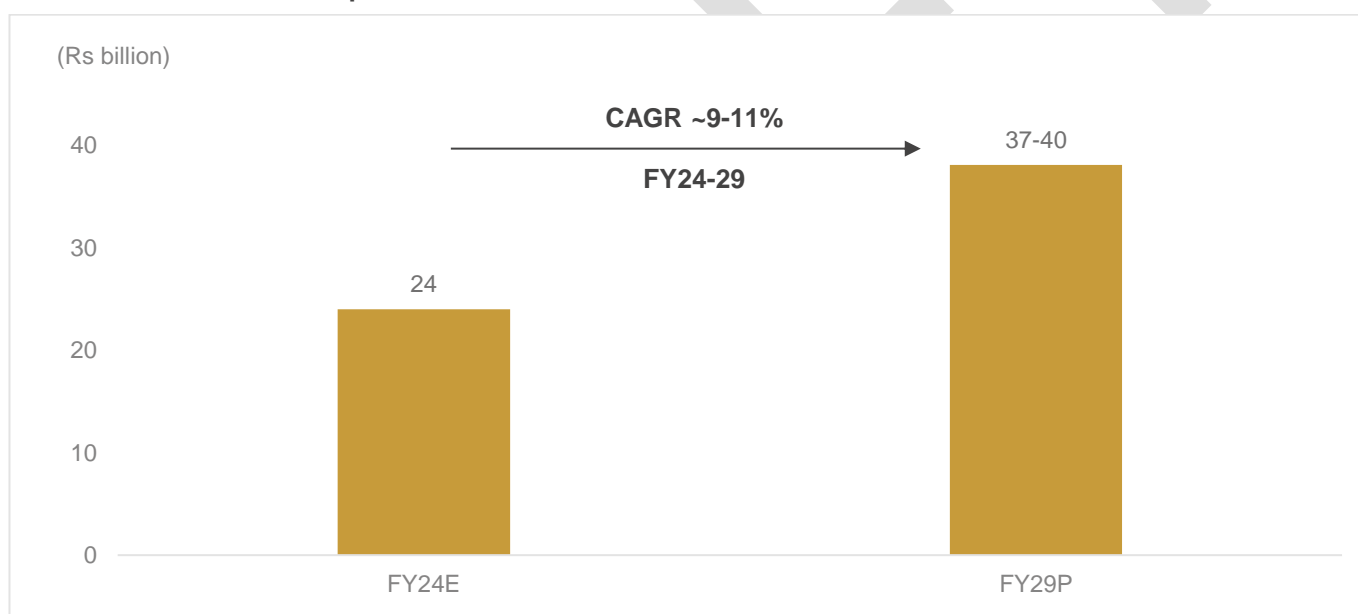
Source: CRISIL MI&A

Indian sandwich insulated panel market is estimated to register a CAGR of 9-11% between FY24-29

As of FY24, the Indian sandwich insulated panel market is estimated around Rs 24 billion. Key growth drivers of the industry include increase investments in end use segments like cleanrooms, cold storage, and warehouses. Some of the players present in domestic sandwich insulated panel industry are EPack Prefab Technologies Limited, Kingspan Jindal Private Limited, Metecno (India) Private Limited, Lloyd Insulations (India) Limited, Rinac India Limited, etc.

Moving forward, the industry is estimated to register a CAGR of 9-11% between FY24-29 and value around Rs 37-40 billion by FY29. This growth will be driven by continued construction investments, favourable government policies like Lighthouse project, and expanding end use segments like pharmaceuticals, etc.

Indian sandwich insulated panel market in value terms



E: Estimated, P: Projected

Source: CRISIL MI&A

Light Gauge Steel Framing (LGSF)

Light Gauge Steel Framed Structures (LGSF) is based on factory made galvanized light gauge steel components, designed as per codal requirements, produced by cold forming method and assembled as panels at site forming structural steel framework of a building of varying sizes of wall and floor. The basic building elements of light gauge steel framing are cold formed sections which can be prefabricated on site using various methods of connection. The assembly is done using special types of screws and bolts.

LGSF is typically ideal for one to three storey high buildings, especially in residential homes, apartments and commercial buildings. Compared to traditional construction, it provides faster construction timelines, mobility and is more environment friendly. As urbanization accelerates and the demand for housing and commercial spaces increases, LGSF offers a viable solution that meets the needs of modern construction.

Major End Use Segments for LGSF

Facilities	Insights	Demand drivers
Commercial and Office Buildings	LGSF is utilized in commercial and office buildings, especially where a high strength-to-weight ratio is beneficial, such as in urban settings where construction speed and space efficiency are priorities.	Demand for cost-effective commercial spaces, especially in high-density areas, and flexibility in design for interior configurations
Prefabricated Structures	LGSF is also widely used in prefabricated construction, where components are prefabricated and assembled on-site.	The need for flexible, fast-to-assemble structures that can be transported and installed with minimal disruption.
Infrastructure and Public Buildings	Public buildings, including schools, healthcare facilities, and government offices, can utilize LGSF for fast construction.	Population growth, expansion of public services, and budget constraints drive demand for efficient building solutions in the public sector.

Source: CRISIL MI&A

Major risk and challenges for Sandwich insulated panels and LGSF

Risk	Impact
Raw material price volatility	<ul style="list-style-type: none"> Sandwich insulated panels and LGSF rely heavily on materials like steel, aluminium, and insulation cores (e.g., polyurethane, polystyrene). Fluctuations in steel and metal prices due to global supply-demand dynamics, tariffs, and geopolitical issues directly impact manufacturing costs. Price increases can compress margins or require price adjustments, which may reduce demand if customers seek lower-cost alternatives.
Supply Chain Disruptions	<ul style="list-style-type: none"> The industry relies on a stable supply chain for metals, insulation materials, and finishing elements. Disruptions, such as those caused by geopolitical conflicts, pandemics, or natural disasters, can delay production and lead to cost increases. Extended delays may result in project backlogs, strained client relationships, and potential loss of contracts.
Environmental Regulations and Standards	<ul style="list-style-type: none"> There is increasing pressure to meet environmental standards, which an increase costs for raw material processing and production, thereby impacting pricing. Non-compliance could lead to penalties, increased production costs, or limitations on market access, especially in regions with stringent environmental laws
Technological Advancements and Competition	<ul style="list-style-type: none"> Companies may need to invest in research and development and employee training programs to stay informed and adapt to advances in construction technologies (e.g., 3D printing, alternative materials), which allows competitive pricing. Failing to innovate can lead to loss of market share to firms with more advanced products or those that can offer other benefits in terms of faster, more cost-effective solutions, etc.
Skilled Labor Shortages	<ul style="list-style-type: none"> Sandwich insulated panel and LGSF require skilled labour. Labor shortages may result in higher installation costs and longer project timelines, affecting both profitability and client satisfaction. Additionally, companies may be required to train man force about new technologies, methods to ensure quality work, which may further increase operational costs for companies
Construction Industry Cyclicity	<ul style="list-style-type: none"> The industry is cyclically influenced by seasonality, funding availability, and economic cycles. In downturns, construction projects may be delayed or cancelled, decreasing demand.

Risk	Impact
	<ul style="list-style-type: none"> • During low cycles, companies may face cash flow issues, requiring strong financial planning and contingency strategies
<p>Higher share of the unorganized market</p>	<ul style="list-style-type: none"> • This industry is largely characterized by having larger share of unorganized market that often lack standardization and can lead to structural issues and safety concerns in construction. • Furthermore, unorganized market players usually play on price, which further increases pricing pressures on the organized market players.

Source: CRISIL MI&A

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3.4 Prefabricated Modular Structure

Overview of prefabricated modular structures

Modular prefabricated construction is a sub section of the overall prefabricated industry and involves the off-site production of construction elements such as portable cabins, guard rooms, semi permanent buildings, etc within a controlled and regulated factory environment. These components are then transported to the construction site usually in an already assembled form, though some installation might be required based on the specific projects and structures. This method not only streamlines the construction process but also enhances efficiency and quality control, as the production takes place in a setting that is less susceptible to the unpredictable variables often encountered on-site.

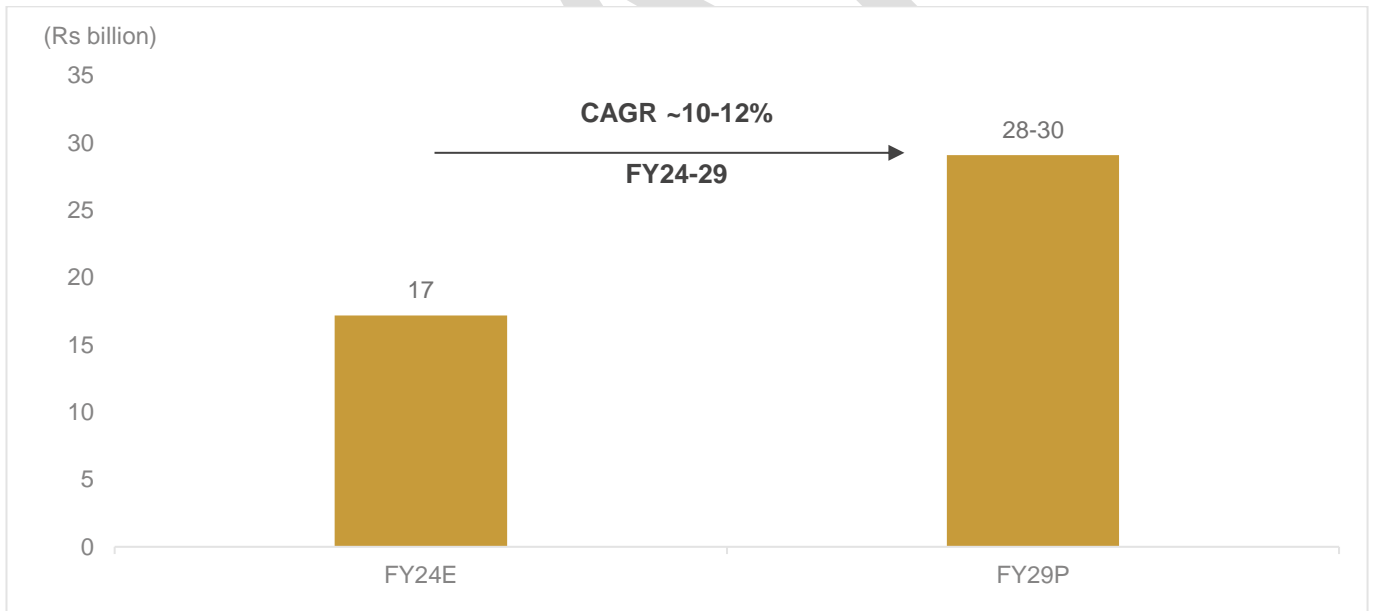
By utilizing prefabricated modular construction, projects can be completed more swiftly, as much of the work is done simultaneously in the factory while site preparation occurs. This parallel processing reduces the overall construction time and helps meet tight deadlines.

Indian modular prefabricated structure market is estimated to register a CAGR of 10-12% between FY24-29

As of FY24, the Indian prefabricated market was estimated around Rs 17 billion. Key growth drivers of the industry include increase investments in end use segments like warehouses, growing ecommerce segments and increasing preference for sustainable and quick construction

Moving forward, the industry is projected to register a CAGR of 10-12% between FY24-29 and value around Rs 28-30 billion by FY29. This growth will be driven by continued growing end use segments like ecommerce, increased demand from end use industries like defence and construction, growing need of sustainable and scable infratstructure.

Indian modular prefabricated structure market in value terms



E: Estimated, P: Projected
Source: CRISIL MI&A

Key growth drivers of Indian modular prefabricated structure market

Drivers	Description
Rising demand of modular structures from industry like defence	Prefabricated modular structures are witnessing demand from industries like defence, roadside construction, etc due to flexible nature and quick installation. Defence forces are utilizing modular structures for temporary housing/ base camps, etc whereas construction companies are utilising it for temporary roadside offices.
Adoption in education and healthcare Sectors	Prefabricated modular structures are used for educational and healthcare facilities, especially in remote areas where traditional construction faces challenges. Their efficiency and quality make them ideal for quickly establishing structures like schools, colleges, hospitals, and clinics, etc.
Integration of advanced construction technologies	Prefabricated modular construction is expected to benefit from innovative technologies like robotics, 3D printing, and IoT solutions. Automation in prefabrication, robotic assembly, and IoT sensors for energy management are improving the efficiency and performance of modular structures, driving their adoption across industries.
Growing infrastructure and industrial construction	Prefab modular units like portable cabins, guard rooms, etc are being utilised as onsite infrastructure due to their easy assembly and portable nature. Hence, increasing infrastructure and industrial construction activities will provide an impetus to the modular prefabricated market

Source: CRISIL MI&A

Key challenges and threats in Indian modular prefabricated structure market

Challenges and threats	Description
Lack of awareness	Even though awareness about non-conventional construction methodologies like prefabricated modular construction is improving, misconceptions about the overall design and quality of these structures still exist, which hinder the overall acceptance and demand of these structures.
Fragmented supply chain and quality control issues	India's construction supply chain exhibits significant fragmentation, with the prefab modular sector frequently relying on various suppliers for essential materials such as concrete, insulation, and interior fittings. This reliance can complicate quality control, as variations in material quality or delays within the supply chain may adversely affect the overall quality of the final structure, leading to extended project timelines and increased costs
Limited expertise	Being a relatively new technology compared to traditional constructions, modular prefabricated construction also faces manpower issues. The industry faces challenges in terms of skilled manpower, who are experienced in prefabrication techniques and can deliver high quality structures. This, in turn require additional resources from the companies, which may increase operating costs for them.
Freight challenges	Prefabricated modular structures are usually bulky and requires due care will transportation. This requires proper expertise during its transit and final assembly. Additionally, any damage or delay due to transit can further increase the final cost to the company and harm its reputation. Furthermore, in case of unavailability of proper road infrastructure, it can further increase challenges for the company.
Competition from substitute products	Even though prefab modular structures are finding increasing use cases in the construction space, it still faces competition from traditional construction methods like RCC due to limited awareness.

Source: CRISIL MI&A

4 Assessment of competitive landscape of pre-engineered steel buildings industry in India

In this section, CRISIL has analysed some key players operating in the integrated pre-engineered steel buildings industry in India. Integrated PEB players are considered to be providing complete end-to-end PEB solutions, including, design, engineering, fabrication of the structure, and onsite delivery and installation. Major steel players such as Steel Authority of India Limited (SAIL), Rashtriya Ispat Nigam (RINL), Tata Steel Limited Group (TSL), ArcelorMittal and Nippon Steel (AM/NS), Jindal South West Group (JSWL) & Jindal Steel & Power Limited (JSPL), are not considered in this section. Major business of these steel players come from manufacturing of steel and steel products including structural steel products. These steel players are suppliers to the integrated PEB players.

Note: The list of competitive landscape peers considered in this section is not exhaustive but an indicative list. Only players which provide integrated pre-engineered steel building offerings within a comparable revenue range are considered in this section.

Data has been obtained from publicly available sources, including annual reports available in the public domain/ filed with the RoC, investor presentations of listed players, regulatory filings, rating rationales, and/or company websites and social media pages.

Overview of key players in PEB industry

Company name	Year of incorporation	Business overview ¹
Epack Prefab Technologies Limited	1999	Epack Prefab Technologies Limited is a group company of EPack and has over 24 years of experience. The company offers multiple products/ services including pre-engineered buildings, prefabricated modular buildings, sandwich insulated panels, light gauge steel frames, roofing and cladding solutions, porta cabins and its accessories, etc.
Everest Industries Limited	1934	Everest Industries Ltd provides multiple solutions in building space, including roofing solutions, ceiling solutions, walls solutions, flooring solutions, cladding solutions, pre-engineered steel buildings, etc.
Interarch Building Products Limited	1983	Interarch Building Products Ltd is promoted by Mr. Gautam Suri and Mr. Arvind Nanda based at Noida, Uttar Pradesh. The company started operations by manufacturing PEBs, metal ceilings, roofing, and claddings.
Kirby Building Systems & Structures India Private Limited	2005	Kirby Building Systems & Structures India Pvt Ltd is a part of Kuwait-based Alghanim Industries, which has experience of more than 40 years in PEB industry
M & B Engineering Limited	1981	M & B Engineering Ltd is a parent company of Phenix Construction Technologies and Proflex Roofing Solutions, and a part of M&B Group. The company deals in pre-engineered buildings, structure steels, steel roofing and components thereof.
Pennar Industries Limited	1975	Pennar Industries has experience of over 48 years in offering multiple products/ services including Cold Rolled Steel Strips, Railway wagons / Coaches, Precision Tubes, pre-engineered buildings, etc.

Company name	Year of incorporation	Business overview ¹
Smith Structures (India) Private Limited	2011	Smith Structures (India) is engaged in design, fabrication and erection of pre-engineered buildings. The company is managed by the Panchal family.
Zamil Steel Buildings India Private Limited	2003	Zamil Steel Buildings India is the subsidiary of Zamil Steel Pre-Engineered Buildings Co. Ltd, which was established in 1977 in Dammam, Saudi Arabia.

¹ Details about sector presence of companies are taken from their respective websites and are not exhaustive.

Note: This list is indicative only and non-exhaustive

Source: Company websites, annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

Operational parameters

Key services and offerings

Company name	PEB	Sandwich insulated panels	LGSF	Metal doors	Aluminium windows	Overall product offering description
E-Pack Prefab Technologies Ltd	✓	✓	✓	✓	✓	Pre-engineered steel buildings, Prefabricated Structures, Porta Cabin, EPC turnkey projects, panels, light gauge steel frames, roofing and cladding solutions, porta cabins and its accessories, etc.
Everest Industries Ltd	✓		✓			Pre-engineered steel building solutions, Roofing solutions, Wall solutions, Ceiling solutions, Cladding solutions, Flooring solutions
Interarch Building Products Ltd	✓		✓			Pre-engineered steel construction products, metal roofing & cladding system, metal false ceiling and light gauge framing system
Kirby Building Systems & Structures India Pvt Ltd	✓			✓	✓	Pre-engineered steel buildings, Structural steel, Storage solutions
M & B Engineering Ltd	✓			✓		Pre-Engineered steel buildings, Self-Supported Roofing, Structural Steel Components
Pennar Industries Ltd	✓					Pre-Engineered steel buildings, Solar structures, Engineered component businesses,
Smith Structures (India) Pvt Ltd	✓					Pre-Engineered steel buildings solution, Roofing and wall panels, Mezzanine systems
Zamil Steel Buildings India Pvt Ltd	✓			✓		Pre-engineered steel buildings, Roof and wall panels, construction, structural steel buildings

Note: The above list is indicative and not exhaustive representation of the offerings of the company

Source: Companies websites, annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

PEB related manufacturing plants, capacity and order book

Company name	Manufacturing plants	Installed capacity (MT/ annum)	Order book (Rs million)
E-Pack Prefab Technologies Ltd ¹	3	133,924	6,547
Everest Industries Ltd ²	2	72,000	N.A.
Interarch Building Products Ltd ³	5	161,000	13,030
Kirby Building Systems & Structures India Pvt Ltd ⁴	3	300,000	N.A.
M&B Engineering Ltd ⁵	2	103,800	6,765
Pennar Industries Ltd ⁶	3	90,000	~8,400+
Smith Structures (India) Pvt Ltd ⁷	1	72,000	6,383
Zamil Steel Buildings India Pvt Ltd ⁸	1	100,000	N.A.

Requesting company team to share backup documents for the installed capacity and manufacturing plants related to PEB

N.A.: Not available

¹The company has three manufacturing plants in Greater Noida (unit 2), Ghiloth (unit 3) and Mambattu, AP (Unit4) regarding PEB. Capacity mentioned in the above table is as of December 2024. Pending order book mentioned in the above table relates to PEB and is as of FY25.

²According to Everest Industries Ltd FY24 annual report, it has capacity of 72000 MT related to PEB. Everest has two manufacturing facilities related to PEB in Gujarat and Uttarakhand as per its website accessed in November 2024.

³As per Interarch Building Products Ltd Q2FY25 investor presentation, it has aggregate installed capacity of 161,000 MTPA and 5 manufacturing facilities in Uttarakhand, Andhra Pradesh & Tamil Nadu. Total Order book as on October 28, 2024, is Rs 13,030 million as per the company Q2FY25 presentation. Total order book as on October 28, 2024, is INR 13,030 million

⁴Kirby Building Systems network produces ~515,000+ MT per annum across all plants globally as per its website accessed in November 2024

⁵As per M&B Engineering Ltd DRHP filings, it has two manufacturing facilities at Sanand, Gujarat and Cheyyar, Tamil Nadu for the manufacturing of PEBs and complex structural steel components with a combined installed capacity of 103,800 MTPA as of August 31, 2024 for manufacturing PEBs. As of August 31, 2024, the company had an order book of Rs 8,330.47 million, the order book number mentioned in the above table is of Phenix division (as of August 31, 2024).

⁶Pennar Industries has 13 manufacturing plants and 3 related to PEBs as per Q2 FY25 investor presentation. Pennar Industries has manufacturing facility near Hyderabad with a production capacity of 90,000 MT per annum for steel buildings as per its website accessed in November 2024. Additionally, as per the company's' Q2FY25 presentation, order book of PEB India is Rs. 8,400+ million and the order book of PEB US is USD 54+ Mn.

⁷According to company's website accessed on in November 2024, Smith Structures (India) manufacturing facility located in Ahmedabad, Gujarat, and has an annual production capacity of 72,000 MT. The company has outstanding order book of Rs.6,383.4 million as on May 31, 2024, with orders generally ranging from 3 to 8 months as per the rating rationale dated August 2024.

⁸Zamil Steel operates 12 manufacturing facilities around the world as per its website accessed in November 2024

Global fabricated steel manufacturing capacity of Zamil Steel is more than 500,000 MT as per its website accessed in November 2024. Figure in the table represents capacity of the Ranjangaon, Pune manufacturing plant of the company (Pre-engineered buildings capacity of 80,000 MT per annum + Structural Steel fabrication capacity of 20,000 MT per annum)

Source: Company filings, annual reports available in the public domain/ filed with the RoC, company websites, CRISIL MI&A

- E-Pack Prefab Technologies Limited has the third largest production capacity in the industry amongst the above considered players in India.

PEB related Manufacturing plants and capacity (fiscal year basis)

Company name	FY22		FY23		FY24	
	Manufacturing plants	Installed capacity (MT/ annum)	Manufacturing plants	Installed capacity (MT/ annum)	Manufacturing plants	Installed capacity (MT/ annum)
E-Pack Prefab Technologies Ltd	1	38,262	2	61,012	3	70,632
Interarch Building Products Ltd	4	132,000	4	141,000	4	141,000
M&B Engineering Ltd	1	72,000	1	72,000	1	72,000

Note:

Manufacturing plants and capacities related to PEB not available on fiscal year basis for rest of the peers (Everest Industries Ltd, Kirby Building Systems & Structures India Pvt Ltd, Pennar Industries Ltd, Smith Structures (India) Pvt Ltd, Zamil Steel Buildings India Pvt Ltd)

Source: Company public documents, annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

Financial parameters

Vertical overview

Company	Vertical Information	Revenue contribution** FY24
E-Pack Prefab Technologies Ltd ¹	1. Pre-engineered and Prefabricated Building Solutions	82%
	2. EPS (Expanded Polystyrene) Packaging	18%
Everest Industries Ltd	1. Building Products (includes manufacturing and trading of roofing products, boards and panels, other building products and accessories)	73%
	3. Steel Buildings (consist of manufacture and erection of pre-engineered and smart steel buildings and its accessories)	27%
Interarch Building Products Ltd	1. Manufacturing, supply, erection and installation of pre-engineered buildings, metal roofing & cladding system and metal false ceilings	100%
Kirby Building Systems & Structures India Pvt Ltd [#]	4. Manufacture and construction of Pre-Engineered Buildings/ Steel Structural/ Industrial Racking and components of iron and steel. It also provides designing, drafting, and engineering services for construction of Pre-Engineered Buildings/ Steel Structural/ Industrial Racking and components of iron and steel.	100%
M & B Engineering Ltd	5. Phenix division (product portfolio for the Phenix Division consists of pre-engineered buildings and structural steel. Offerings under PEBs includes main frames, secondary structural components, accessories, etc. Structural steel offerings including H-Type Beams, I-Type Beams, etc.)	73%
	1. Proflex division (manufacture and install self-supported steel roofings)	27%
Pennar Industries Ltd	1. Diversified Engineering (railways-wagons, steel, solar module mounting solutions, industrial boilers & heaters, chemicals & fuel additives, solar panels, precision tubes, BIW, hydraulics and auto components.)	52%
	2. Custom designed building solutions & auxiliaries (Pre-engineered Buildings, construction equipments and Engineering Services) ²	48%
	1. Design and Engineering Services	12%

Company	Vertical Information	Revenue contribution** FY24
Smith Structures (India) Pvt Ltd ^{§3}	2. Retail Trade (related to prefabricated buildings/ construction)	88%
Zamil Steel Buildings India Pvt Ltd	3. The Company's activities involve predominantly one business segment i.e. manufacturing of steel structural materials and parts thereof which are considered as single business segment.	100%

Note:

§As of fiscal 2023

**Revenue contribution is considered as disclosed in the respective company's annual report and have not been reclassified by CRISIL

#Financials for Kirby Building Systems & Structures India are on a calendar year basis (e.g., in the above table, Financial Year 2023 is calendar year 2022, etc)

1 Following formula has been used for calculating revenue contribution: (Revenue from external customers of the required segment/ Total revenue

2 Pennar industries' custom designed building solutions & auxiliaries vertical includes revenue from pre-engineered buildings, construction equipment and engineering services

3 For Smith Structures (India) Pvt Ltd, vertical represent types of principal product or services as disclosed in the company's annual report. Furthermore, revenue contribution is calculated on the basis of turnover of product or service category divided by revenue from operations

Source: Company annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

Revenue from operations

Company name (Rs million)	FY22	FY23	FY24	CAGR (FY22-24)
EPack Prefab Technologies Ltd*	4,501.06	6,567.61	9,049.02	41.79%
Everest Industries Ltd*	13,647.06	16,476.34	15,754.52	7.44%
Interarch Building Products Ltd	8,349.43	11,239.26	12,933.02	24.46%
Kirby Building Systems & Structures India Pvt Ltd*	17,248.11	23,123.80	23,956.95	17.85%
M & B Engineering Ltd*	6,882.25	8,804.70	7,950.60	7.48%
Pennar Industries Ltd*	22,657.50	28,946.20	31,305.70	17.55%
Smith Structures (India) Pvt Ltd	3,769.57	4,558.97	N.A.	N.A.
Zamil Steel Buildings India Pvt Ltd	5,307.26	6,227.92	7,617.52	19.80%

Note:

* On consolidated basis

Financials for Kirby Building Systems & Structures India are on a calendar year basis (e.g., in the above table, FY24 is calendar year 2023, etc)

Source: Company annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

- Among the players considered, EPack Prefab Technologies Ltd is the fastest growing in terms of revenue from operations, registering a CAGR of 41.79% between FY22-24. EPack Prefab Technologies Ltd revenue from Pre-engineered and prefabricated building solutions had registered a CAGR of 55.48% between FY22-24.
- EPack Prefab Technologies Ltd had a market share of ~2%, as of FY24 within the Indian Prefabricated Industry

Operating profit before depreciation, interest and taxes (OPBDIT)

Company name (Rs million)	FY22	FY23	FY24	CAGR (FY22-24)
E-Pack Prefab Technologies Ltd*	355.40	515.30	869.93	56.45%
Everest Industries Ltd*	689.51	675.19	409.61	-22.92%
Interarch Building Products Ltd	328.89	1,063.80	1,130.15	85.37%
Kirby Building Systems & Structures India Pvt Ltd*	1,727.21	2,086.45	2,594.23	22.56%
M & B Engineering Ltd*	418.34	664.30	796.22	37.96%
Pennar Industries Ltd*	1,713.60	2,211.90	2,729.70	26.21%
Smith Structures (India) Pvt Ltd	197.81	275.70	N.A.	N.A.
Zamil Steel Buildings India Pvt Ltd	(96.64)	82.19	262.10	n.m.

Note:

N.A. Not available

n.m. not meaningful

* On consolidated basis

Financials for Kirby Building Systems & Structures India are on a calendar year basis (e.g., in the above table, Financial Year 2024 is calendar year 2023, etc)

Formula used for OPBDIT calculation is as follows:

$OPBDIT = \text{Revenue from operations} - \text{total expenses} + \text{finance cost} + \text{Depreciation and amortisation expense}$

Source: Company annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

- E-Pack Prefab Technologies Ltd registered the second highest CAGR in OPBDIT between FY22-24 at 56.45% among the considered players

Profit after tax (PAT)

Company name (Rs million)	FY22	FY23	FY24	CAGR (FY22-24)
E-Pack Prefab Technologies Ltd*	195.23	239.72	429.59	48.34%
Everest Industries Ltd*	440.85	423.60	179.98	-36.10%
Interarch Building Products Ltd	171.33	814.63	862.62	124.38%
Kirby Building Systems & Structures India Pvt Ltd*	1,069.08	1,334.92	1,649.93	24.23%
M & B Engineering Ltd*	163.13	328.92	456.34	67.25%
Pennar Industries Ltd*	419.10	754.30	983.50	53.19%
Smith Structures (India) Pvt Ltd	77.63	138.66	N.A.	N.A.
Zamil Steel Buildings India Pvt Ltd	(204.37)	(66.16)	98.92	n.m.

Note:

N.A. Not available

n.m. not meaningful

* On consolidated basis

Financials for Kirby Building Systems & Structures India are on a calendar year basis (e.g., in the above table, Financial Year 2024 is calendar year 2023, etc)

Source: Company annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

Key financial Ratios (FY24)

Company name	OPBDIT %	PAT%	RoE [@]	RoE	RoCE (with other income)	RoCE (without other income)	Current ratio
E-Pack Prefab Technologies Ltd*	9.61%	4.74%	29.93%	29.12%	28.16%	27.21%	1.12
Everest Industries Ltd*	2.60%	1.13%	3.07%	3.05%	4.12%	1.34%	1.33
Interarch Building Products Ltd	8.74%	6.60%	20.45%	20.44%	27.29%	24.27%	1.71
Kirby Building Systems & Structures India Pvt Ltd*	10.83%	6.80%	46.55%	46.38%	66.47%	58.29%	1.16
M & B Engineering Ltd*	10.01%	5.65%	22.31%	22.07%	22.01%	18.44%	1.36
Pennar Industries Ltd*	8.72%	3.10%	12.02%	11.87%	16.50%	13.71%	1.04
Smith Structures (India) Pvt Ltd	N.A.	N.A.	N.A.	N. A	N.A.	N.A.	N.A.
Zamil Steel Buildings India Pvt Ltd	3.44%	1.30%	9.50%	9.37%	13.55%	12.96%	1.12

Note:

Financial ratios of Smith Structures (India) Pvt Ltd for FY23 are as follows:

Company name	OPBDIT%	PAT%	RoE [@]	RoE	RoCE (with other income)	RoCE (without other income)	Current ratio
Smith Structures (India) Pvt Ltd	6.05%	3.02%	41.42%	41.09%	36.14%	30.99%	1.43

* On consolidated basis

Financials for Kirby Building Systems & Structures India are on a calendar year basis (e.g., in the above table, Financial Year 2024 is calendar year 2023, etc)

Formulae used for the above table are as follows:

OPBDIT% = OPBDIT / Revenue from operations

PAT% = PAT / Total income

RoE[@] = PAT / Average of tangible equity; Tangible equity = Total equity - intangible assets

RoE = PAT / Average of total equity

RoCE% (including other income) = (EBITDA - Depreciation and amortization cost) / Average of (Total debt + total tangible equity)

RoCE% (excluding other income) = (EBITDA - Depreciation and amortization cost - other income) / Average of (Total debt + total equity)

Current ratio = Current assets / Current liabilities

Interest coverage ratio = (Finance cost + PBT + Depreciation and amortization cost) / Finance cost

Source: Company annual reports available in the public domain / filed with the RoC, CRISIL MI&A

- E-Pack Prefab Technologies Ltd registered the second highest RoE (based on average total equity) of 29.12% in FY24 among the considered players
- E-Pack Prefab Technologies Ltd registered the second highest RoCE of 28.16% in FY24 among the considered players

Key financial Ratios (FY24)

Company name	Interest coverage ratio	Net debt (Rs million)	Net debt / OPBDIT	Net Debt / Equity	Net fixed asset turnover ratio	Working capital days
E-Pack Prefab Technologies Ltd*	5.12	1,296.20	1.49	0.77	4.70	3.56
Everest Industries Ltd*	5.20	(186.28)	(0.45)	(0.03)	3.56	46.90

Company name	Interest coverage ratio	Net debt (Rs million)	Net debt/ OPBDIT	Net Debt/ Equity	Net fixed asset turnover ratio	Working capital days
Interarch Building Products Ltd	58.27	(1,274.99)	(1.13)	(0.29)	7.77	34.42
Kirby Building Systems & Structures India Pvt Ltd*	7.49	(4,826.34)	(1.86)	(1.11)	11.63	73.08
M & B Engineering Ltd*	4.03	1,056.10	1.33	0.45	7.24	104.29
Pennar Industries Ltd*	2.72	5,916.10	2.17	0.67	3.83	14.09
Smith Structures (India) Pvt Ltd	N.A.	N.A.	N.A.	N.A.	-	N.A.
Zamil Steel Buildings India Pvt Ltd	2.75	621.75	2.37	0.56	11.16 s	43.06

Note:

Financial ratios of Smith Structures (India) Pvt Ltd and Zamil Steel Buildings India Pvt Ltd for FY23 are as follows:

Company name	Interest coverage ratio	Net debt (Rs million)	Net debt/ OPBDIT	Net Debt/ Equity	Net fixed asset turnover ratio	Working capital days
Smith Structures (India) Pvt Ltd	7.69	165.72	0.60	0.41	15.09	18.56

* On consolidated basis

Financials for Kirby Building Systems & Structures India are on a calendar year basis (e.g., in the above table, Financial Year 2024 is calendar year 2023, etc)

Kindly note that for Smith Structures (India) Pvt Ltd and Zamil Steel Buildings India Pvt Ltd total tangible fixed assets are considered for calculation of net fixed asset turnover ratio

Ratios used for the above table are as follows:

Net debt= Total debt- Cash and cash equivalents- Bank balances other than cash and cash equivalents

Net fixed asset turnover ratio = Revenue from operations for the year/ Average of (Net Property, plant and equipment, Capital work-in-progress and Right-to-use assets)

Working capital days= Inventory days+ Receivable days- Payable days

Inventory Days= Inventories/ COS

Receivable Days= Receivables/ Revenue from Operations

Payable Days= Payable Days/ COGS

Source: Company annual reports available in the public domain/ filed with the RoC, CRISIL MI&A

Credit Rating

Company name (Rs million)	Issuer	Date	Rating
Epac Prefab Technologies Ltd (Epac Polymers Pvt Ltd)	ICRA Limited	March 2024	A-
Everest Industries Ltd	CRISIL Ratings Limited	September 2024	A+
Interarch Building Products Ltd	CRISIL Ratings Limited	January 2024	A-
Kirby Building Systems & Structures India Pvt Ltd	ICRA Limited	September 2024	AA-
M & B Engineering Ltd	CRISIL Ratings Limited	April 2024	A-
Pennar Industries Ltd*	CARE Ratings Limited	October 2024	A
Smith Structures (India) Pvt Ltd	CARE Ratings Limited	August 2024	BBB-
Zamil Steel Buildings India Pvt Ltd		N.A.	

Source: Quantix, CRISIL MI&A

5 Assessment of Expanded Polystyrene Market in India

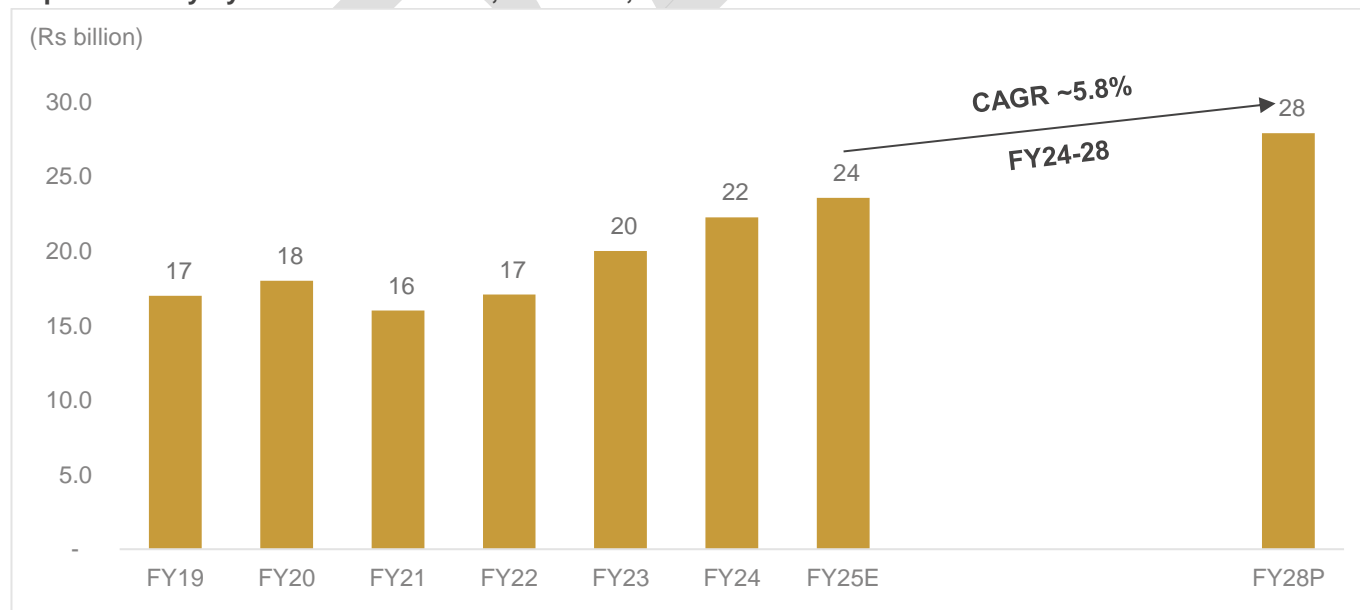
5.1 India Market Overview

Indian Expanded Polystyrene market is expected to grow at 5.8% till FY28

Expanded polystyrene (EPS) is a versatile and lightweight closed-cell foam material produced from solid polystyrene beads and a blowing agent, typically pentane, which leads to an air-filled structure comprising about 98% air. Known for its exceptional insulation properties, EPS is widely utilized in various industries, including construction for thermal insulation in walls, roofs, and floors, for its excellent impact resistance and cushioning capabilities for fragile items. Additionally, EPS is widely used as packaging buffer for electronics and home appliances, glass ware in medical applications, grapes packaging, cold storage of other fruits and vegetables. Also, EPS is employed in the automotive sector for lightweight components like seat cores and door panels, and in marine applications for buoyancy devices. The material is praised for its recyclability, moisture resistance, and durability, making it an eco-friendly choice suitable for diverse applications across multiple fields.

The expanded polystyrene market was valued at Rs 22 billion in FY24 and is expected to grow at a rate of 5.8% till FY28 reaching Rs 28 billion. The growth trajectory is driven by increasing demands across various sectors, particularly construction and packaging. One of the primary drivers is the expanding construction sector. EPS is valued for its thermal insulation properties, lightweight characteristics, and cost-effectiveness, making it a preferred material for insulation applications in roofs, walls, and floors of both residential and commercial buildings. In addition, government initiatives in India aimed at sustainable building practices and energy efficiency are further fueling the demand for EPS in construction. The growing urban population and rising disposable income in India also contribute significantly to this growth.

Expanded Polystyrene Market in India, Rs billion, FY19 to FY28P



Note: E-Estimated, P-Projected

Source: CRISIL MI&A

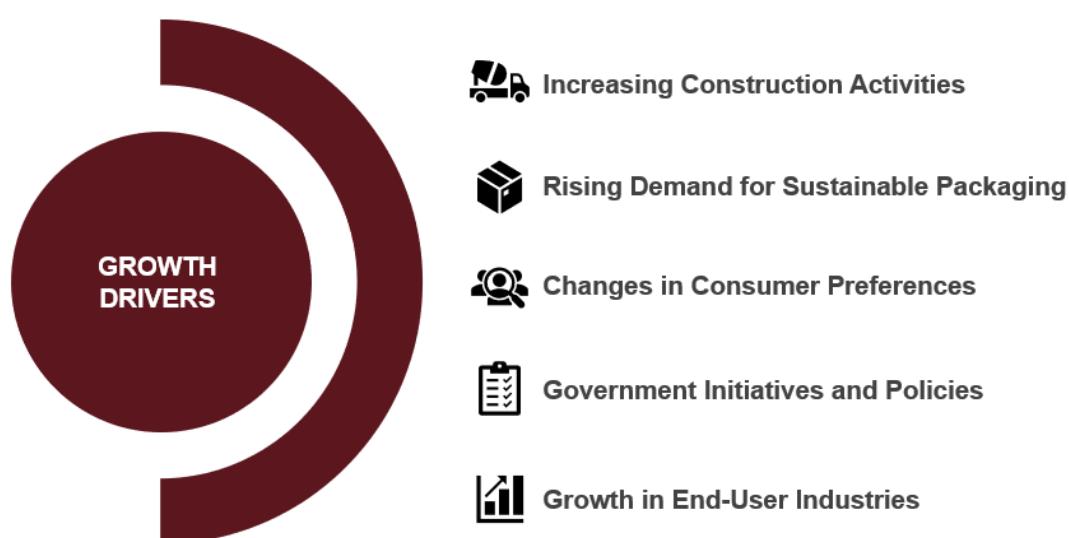
The expanded polystyrene industry is another crucial segment propelling EPS demand. Expanded polystyrene is widely used for food packaging, as it helps maintain the freshness and quality of products during transportation. Its excellent cushioning and protection properties make it a popular choice for packaging fragile goods, including

electronics and consumer products. The significant increase in online shopping and takeaway food services, especially during and after the COVID-19 pandemic, has further amplified the demand for EPS packaging solutions.

Key trends within the market indicate a shift towards sustainability and recyclability. Manufacturers are developing eco-friendly EPS products that utilize recycled materials, aligning with the global push for sustainable business practices. Additionally, advancements in manufacturing technologies and research initiatives are likely to enhance the efficiency of EPS production processes, further driving market growth.

Key Growth Drivers

The expanded polystyrene market in India is poised for robust growth, driven by several key factors. This growth is reflective of changing consumer demands and advancements in industry practices.



- Increasing Construction Activities:** The booming construction sector is a primary driver for the EPS market in India. With significant investments in infrastructure and real estate, EPS is increasingly utilized for its lightweight and insulating properties. It is extensively used in building applications such as insulation panels for roofs and walls, which enhance energy efficiency in buildings. The EPS market is anticipated to grow as residential and commercial construction projects proliferate, necessitating efficient and sustainable building materials.
- Rising Demand for Sustainable Packaging:** The escalating demand for sustainable packaging solutions significantly influences the EPS market. Businesses are shifting towards environmentally friendly packaging options due to growing environmental concerns and regulatory pressures. EPS is lightweight and recyclable, making it an ideal material for packaging in various sectors, including food and beverages. Its capacity to maintain product integrity during shipping further enhances its demand, especially in industries reliant on delicate products that require careful handling.
- Changes in Consumer Preferences:** Shifts in consumer preferences towards convenience and quality have led to increased usage of EPS packaging. As disposable incomes rise, there is a growing trend of consumers seeking premium products that offer better protection and quality assurance, impacting industries like e-commerce and food services. EPS's role in packaging ensures that products remain safe, fresh, and intact when delivered to consumers, meeting their expectations for quality.

- **Government Initiatives and Policies:** Government initiatives such as the "Housing for All" mission and other infrastructure projects are significantly boosting the demand for EPS. The Indian government encourages the adoption of technologies that support energy-efficient and sustainable practices in construction through various incentives. With a focus on improving the construction landscape, these policies are expected to propel the consumption of EPS in the upcoming years, aligning with national goals for energy conservation and sustainability.
- **Growth in End-User Industries:** The growth of industries utilizing EPS as a core material also drives market expansion. The automotive sector, which relies on EPS for applications like seats and insulation, is experiencing rapid growth and innovation. Similarly, the food packaging sector is embracing EPS to preserve the freshness of products during distribution, thus increasing its utilization in packaging applications. The diverse applications of EPS across various industries highlight its versatility and contribute significantly to market growth.

Key Trend for Expanded Polystyrene Market

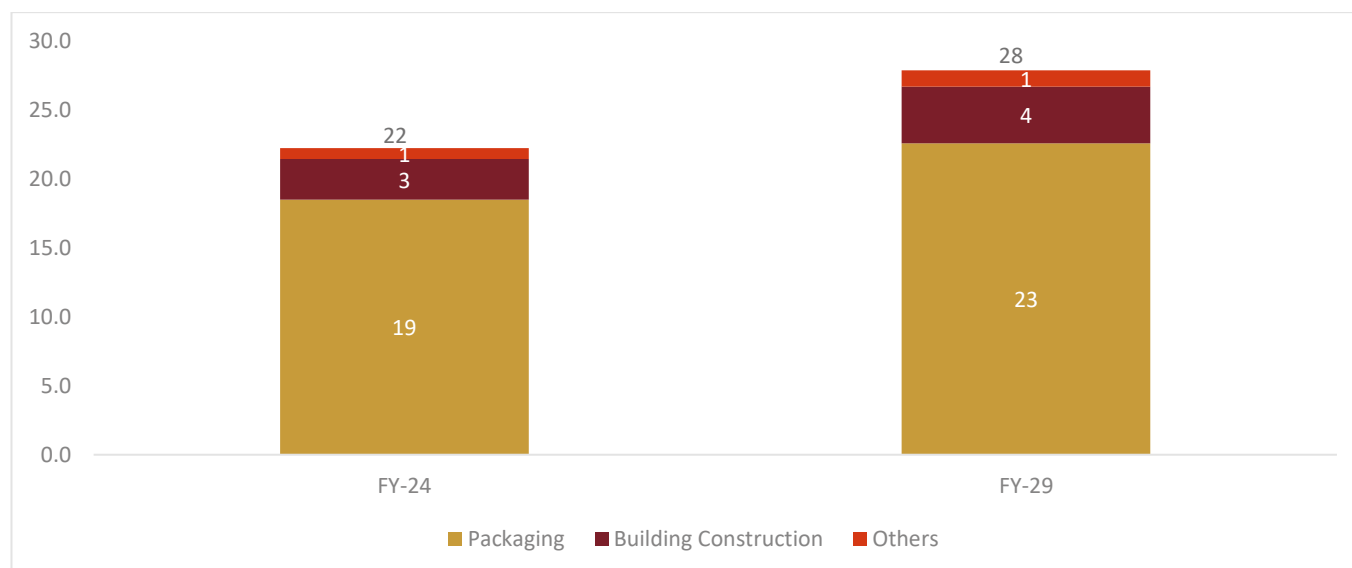
The expanded polystyrene market in India is experiencing significant transformations driven by various trends which reflect broader market dynamics. Below are the key trends with detailed explanations:

- **Increased Demand in Packaging:** A major driver of the EPS market is the escalating demand from the packaging industry. EPS packaging is particularly beneficial in the food and pharmaceutical industries, where maintaining temperature and ensuring the safety of delicate items during transit is crucial. Its shock absorption capabilities make it ideal for packaging fragile goods, thereby enhancing product safety during shipping.
- **Applications in Construction:** The construction sector remains a dominant consumer of EPS, accounting for a substantial market share. EPS is utilized for thermal insulation in buildings due to its excellent insulating properties which help in reducing energy costs. As the construction industry evolves, there is a growing trend towards using EPS in various applications such as load-bearing panels and as aggregates in lightweight concrete, which boasts durability and structural integrity. The rise in residential and commercial construction projects under government schemes significantly boosts the demand for EPS.
- **Regulatory and Environmental Considerations:** With increasing environmental awareness, there has been a notable push for sustainable practices within the EPS market. The government of India has implemented regulations to phase out single-use plastics, presenting an opportunity for EPS which is recyclable. As companies are pushed towards more sustainable materials, the EPS industry's ability to adapt and innovate to meet environmental standards will be key to sustaining its growth.
- **Technological Advancements:** Advancements in manufacturing technologies have led to improved production efficiencies and the development of innovative EPS products. Techniques that enhance the properties of EPS, such as reducing its weight while maintaining strength, are gaining traction. This trend not only improves the performance of EPS applications in various industries but also positions the manufacturers favorably in a competitive market by meeting diverse customer needs.
- **Growing Disposable Income and Urbanization:** The increasing disposable income, alongside rapid urbanization, is driving the demand for packaged goods and enhanced living conditions, which directly impacts the EPS market. A growing middle class is more inclined towards consuming packaged products, where EPS plays a critical role in ensuring product integrity and appeal.

Segmentation by Application

In FY24, the packaging sector dominates the Indian EPS market, accounting for 83%, followed by building and construction at 13%, and other applications (such as automotive components and consumer goods) making up 4%.

Segmentation by Application, value, FY24 to FY29



Source: CRISIL MI&A

Packaging: The dominant share of EPS in packaging is driven by its lightweight, shock-absorbing, and insulating properties, making it indispensable for food containers, electronics, and fragile goods. Globally, the packaging sector for EPS is expected to grow due to increasing e-commerce and the need for protective packaging of consumer goods. In India, rising disposable incomes and urbanization are further fueling demand. Sustainable packaging innovations and recycling initiatives are likely to mitigate environmental concerns and sustain growth.

- **Industrial Packaging:** EPS plays a significant role in industrial packaging due to its lightweight and insulating properties. Its closed-cell structure offers excellent thermal insulation, bacterial and pest resistance, making it ideal for protecting delicate products during transportation.
- **Food Packaging:** The food packaging sector heavily utilizes EPS to maintain the freshness of food items. EPS containers are widely used due to their ability to insulate and protect food during shipping and storage, which is critical for perishables. This application is expected to grow as the food delivery and retail sectors expand, demanding robust packaging solutions that ensure food safety and quality.

Building and Construction: In construction, EPS is widely used for thermal insulation in walls, roofs, and floors, contributing to energy efficiency and reduced carbon emissions. The growth of urban infrastructure projects in India, including residential and commercial buildings, is driving demand. Globally, governments' focus on energy-efficient buildings and green initiatives, especially in regions like Europe and Asia-Pacific, is expected to accelerate EPS adoption in this sector.

Others: EPS is also used in other applications such as automotive components and consumer goods. In automotive components, EPS is valued for its energy absorption and lightweight characteristics. It is extensively used in safety applications, such as car seat padding and sports helmets, to absorb impacts. Additionally, EPS is employed in seating for sports cars and as load-bearing elements in structurally insulated automotive panels. For consumer products, EPS is often used in packaging delicate items like electronics and toys. Its ability to mold into custom

shapes ensures effective shock absorption during transport. Beyond packaging, EPS is also used in household items and garden products due to its mechanical resistance and low water absorption.

Segmentation by Product Type

The Indian expanded polystyrene (EPS) market is characterized by two primary product segments: plain EPS sheets and molded EPS packaging. Each segment plays a crucial role in various end-use industries and has specific growth outlooks.

Plain EPS Sheets

Plain EPS sheets are primarily utilized for insulation and packaging purposes. They are lightweight, durable, and have excellent thermal insulation properties, making them a preferred choice in several industries.

End-Use Industries

- **Construction:** EPS sheets are extensively used for thermal insulation in walls, roofs, and floors. They contribute to energy efficiency in buildings, influencing the demand in residential and commercial construction.
- **Food Packaging:** These sheets serve as liners in storage chambers, preserving freshness and temperature for perishable items.
- **Automotive:** EPS sheets are employed for lightweight applications that require thermal insulation and protection.

Molded EPS Sheets

Molded packaging refers to EPS products that are shaped into different forms using molds, facilitating their use in various packaging applications. This segment is particularly strong due to its adaptability and efficiency in protecting products during transit.

End-Use Industries

- **E-commerce:** The surge in e-commerce has amplified the demand for molded packaging, as it provides safe cushioning for fragile items like electronics and glass products.
- **Electronics:** Molded packaging is crucial for transporting sensitive electronic components, ensuring they remain undamaged during shipping.
- **Pharmaceuticals:** This packaging is used to protect temperature-sensitive medications, enhancing their stability during transportation.

Key Challenges for Expanded Polystyrene Market

The expanded polystyrene (EPS) market in India is currently facing several key challenges that significantly impact its growth and sustainability. Below are detailed explanations of these challenges, all supported by reliable sources.

Environmental Concerns: One of the primary challenges confronting the EPS market is the significant environmental concerns associated with its disposal and the recycling process. Expanded polystyrene is not biodegradable, contributing heavily to plastic waste pollution, which poses risks to wildlife and ecosystems. The disposal of EPS materials, particularly in landfills, generates substantial pollution, and the challenges surrounding effective recycling hinder sustainable practices. Increased regulations and consumer demand for environmentally friendly alternatives are forcing companies to seek out greener production and disposal methods.

Strict Regulations: The expanded polystyrene industry is also under pressure due to stringent government regulations regarding its production and use. Many countries, including India, have implemented laws that limit the use of certain types of plastic, including EPS, to combat environmental degradation. This regulatory environment compels manufacturers to innovate and invest in alternatives that comply with sustainability mandates, which can incur significant costs and slow market growth. The necessity for compliance with these regulations adds another layer of complexity to operations and market positioning.

Cost Fluctuations of Raw Materials: Another critical challenge is the volatility in the prices of raw materials essential for EPS production, such as styrene, which is derived from crude oil. Fluctuations in crude oil prices directly impact the cost of production, affecting profit margins for manufacturers. For example, if the price of styrene increases, the overall production costs rise, leading to higher prices for consumers, which can reduce demand. This instability influences not just EPS but also broader polystyrene markets, complicating forecasting and financial planning for businesses.

Competition from Alternative Materials: Competition from alternative materials represents a significant hurdle for the EPS market. With a growing focus on sustainable packaging solutions, businesses are increasingly turning to biodegradable materials, paper, and other eco-friendly substitutes. These alternative materials often come with lower environmental impacts, attracting consumers and businesses seeking to reduce their ecological footprints. As a result, EPS manufacturers must innovate and enhance the sustainability of their products to remain competitive.

Supply Chain and Infrastructure Issues: The EPS market faces logistical challenges related to supply chain disruptions, particularly those exacerbated by the COVID-19 pandemic. Issues such as inadequate transportation networks and insufficient local production facilities impact the efficiency of distribution and increase overhead costs. Transportation disruptions can cause delays in fulfilling orders while leading to increased costs for importing materials or exporting products. Moreover, the current infrastructure does not adequately support the recycling of EPS, which hinders circular economy initiatives for these materials.

6 Assessment of Competitive Landscape of Expanded Polystyrene Market in India

6.1 Key Manufacturers

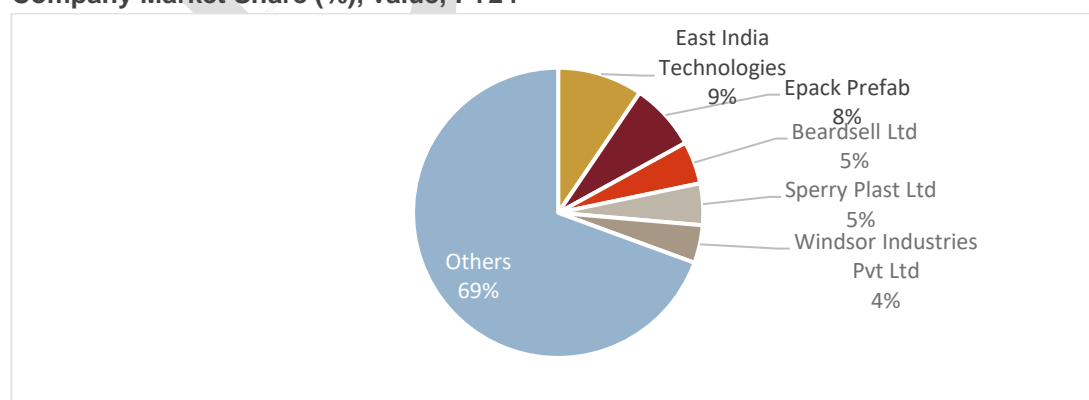
Expanded polystyrene (EPS) is widely used in various industries due to its lightweight, insulating properties, and versatility. In India, several key manufacturers dominate the market, each with distinct capacities, products, and geographic footprints. Some of the manufacturers are listed in the table below:

Key Manufacturers of Expanded Polystyrene in India

Manufacturers	Location	Manufacturing Capacities (MTPA)
Beardsell Ltd	Chennai, Tamil Nadu	2,880
Epack Prefab Solutions Ltd	Greater Noida, Uttar Pradesh	8,400
K K Nag Pvt Ltd*	Pune, Maharashtra	12,000
Sperry Techno Solutions Pvt Ltd	Greater Noida, Uttar Pradesh	4,800
Sperry Packagings Pvt Ltd	Sri City, Andhra Pradesh	2,160
Windsor Industries Pvt Ltd	Chandigarh, Punjab	4,500
East India Technologies	Greater Noida, Uttar Pradesh and Roorkee, Uttarakhand	9,000
Arnav Polymers Pvt Ltd	Eluru, Andhra Pradesh	-
Andhra Expanded Polystyrene Pvt Ltd	Medchal, Telangana	-
Hakimuddin Thermo India Pvt Ltd	Pune, Maharashtra	-
Lakshmi Samanvaya Polymers	Chebrole, Andhra Pradesh	-
Machhar Polymer Pvt Ltd	Vadodara, Gujarat	-
Rhyno Thermopack Industries	Rajkot, Gujarat	-
Rishika Packaging	Rajkot, Gujarat	-
Shri Sirinivasa Polymers	Bhimavaram, Andhra Pradesh	-
Styrotech Industries Pvt Ltd	Mumbai, Maharashtra	-
Surinda Packaging Pvt Ltd	Ghaziabad, Uttar Pradesh	-
Shri Hari Shankar Industries	Ghaziabad, Uttar Pradesh	-

Note: *Combined capacity of Expanded Polystyrene (EPS), Expanded Polypropylene (EPP) and other foams at 5 five manufacturing plants

Company Market Share (%), value, FY24



Source: CRISIL MI&A

EPack Prefab Solutions Ltd

EPack PreFab Solutions Ltd was established in 1999 and is headquartered in Greater Noida, Uttar Pradesh, India. With over 2 decades, EPack PreFab Solutions is a notable company in India's construction industry, specializing in prefabricated building solutions. The company focusses on engineering, fabrication, and project management. The company offers a broad array of pre-engineered building solutions that cater to diverse industries, including logistics, healthcare, education, and power generation. The company is accredited with ISO 9001:2015 and ISO 14001:2015 certifications, underscoring its commitment to quality and environmental management.

Key Product Offerings

EPack PreFab Solutions offers a wide range of products tailored for various sectors. Their key offerings include:

- **Pre-Engineered Buildings (PEB):** Constructed for quick assembly and designed to cater to diverse needs such as industrial complexes, commercial structures, and warehouses.
- **EPS Packaging Solutions:** The company is a leading manufacturer of EPS products, which play a crucial role in insulation and protective packaging for various industries, including electronics and automotive.
- **Prefabricated Structures:** These structures utilize quick construction processes, allowing for significant timelines and cost reductions in building construction.

Geographical Presence

EPack PreFab Solutions operates primarily out of Greater Noida and has expanded its geographical footprint across India. The company has manufacturing plants located in various regions, including Uttar Pradesh, Rajasthan, and Andhra Pradesh.

Current Manufacturing Capabilities

The company has a robust manufacturing infrastructure with a current annual production capacity of 187,000 metric tonnes per annum (MTPA). The company has commissioned a new facility in Andhra Pradesh in 2023, significantly increasing its production capabilities. The manufacturing facilities employ modern techniques and equipment, ensuring high-quality standards and efficiency in production. The company is also known for utilizing digital systems for client onboarding and communications, reflecting its commitment to innovation.

With an annual production capacity of 8,400 MT the EPS business segment contributes 17% to the total revenues. The revenue from EPS business segment has grown at a rate of ~5% from FY22 to FY from Rs 1,448.66 million to Rs 1,670.59 million.

EPack PreFab Solutions Financial

Particulars	UOM	FY-22	FY-23	FY-24
Revenue From Operations	Rs Million	4,501.06	6,567.61	9,049.02
Adjusted EBITDA	Rs Million	355.40	515.30	869.93
Adjusted EBITDA Margin	%	7.90%	7.85%	9.61%
PAT	Rs Million	195.23	239.72	429.59
PAT Margin	%	4.31%	3.63%	4.74%

Return on Equity	%	21.16%	21.01%	29.12%
Return on Capital Employed	%	19.33%	20.31%	27.21%
Net Debt	Rs Million	655.00	926.33	1,296.20
Net Debt to EBITDA	ratio	1.84	1.80	1.49
Net Debt to Equity	ratio	0.64	0.73	0.77
Net Fixed Assets Turnover Ratio	ratio	3.13	4.46	4.70
Net Working Capital Days	days	6.04	16.18	3.56
Segmental Revenue:				
Pre-fab Business	Rs Million	3,052.40	4,754.66	7,378.43
EPS Packaging Business	Rs Million	1,448.66	1,812.95	1,670.59

Formulae used for calculation is as follows:

$EBITDA(\text{excluding other income}) = \text{Revenue from Operations} - \text{Total Expenses} + \text{Finance Costs} + \text{Depreciation and Amortization}$

$EBITDA \text{ Margin: } EBITDA / \text{Revenue from Operations}$

$RoE = PAT / \text{Average of total equity}$

$RoCE\% (\text{excluding other income}) = (EBITDA - \text{Depreciation and amortization cost} - \text{other income}) / \text{Average of (Total debt} + \text{total equity)}$

$\text{Net debt} = \text{Total debt} - \text{Cash and cash equivalents} - \text{Bank balances other than cash and cash equivalents}$

$\text{Net fixed asset turnover ratio} = \text{Revenue from operations for the year} / \text{Average of (Net Property, plant and equipment, Capital work-in-progress and Right-to-use assets)}$

$\text{Working capital days} = \text{Inventory days} + \text{Receivable days} - \text{Payable days}$

$\text{Inventory Days} = \text{Inventories} / \text{COS}$

$\text{Receivable Days} = \text{Receivables} / \text{Revenue from Operations}$

$\text{Payable Days} = \text{Payable Days} / \text{COGS}$

Source: Company Filings, CRISIL MI&A

Beardsell Ltd

Founded in 1936 and headquartered in Chennai, Beardsell Limited has established itself with significant expertise and experience spanning nearly nine decades, specializing in manufacturing and installing prefabricated cold storage solutions, cleanrooms, and insulated packaging products.

Key Offerings to End-Use Industries

The company's product portfolio is diverse and caters to several end-use industries, including:

- **Prefabricated Cold Storage Solutions:** These systems provide efficient storage for perishable goods, utilizing innovative ISOBUILD sandwich insulated panels and ISOTEK doors that ensure temperature control across industries such as food processing and pharmaceuticals.
- **Cleanroom Solutions:** Beardsell offers comprehensive cleanroom systems including structural insulated panels, cleanroom doors and partitions, HVAC systems, and modular housing solutions that meet the stringent cleanliness requirements of the pharmaceutical and electronics sectors.
- **Insulated Packaging Products:** With an annual manufacturing capacity of 2,880 MT the company offers a range of thermal insulation materials, including Expanded Polystyrene (EPS) products that cater to various industrial applications.

Geographical Presence

Beardsell primarily operates within India but also engages in international trade, exporting products to various Asian and African markets. With multiple manufacturing and design facilities, the company is well-positioned to cater to its clientele efficiently.

Windsor Industries Pvt Ltd

Windsor Industries Pvt Ltd, founded in 1989, is a prominent manufacturer in India, specializing in disposable products and packaging materials, particularly EPS (Expandable Polystyrene) and BOPP (Biaxially Oriented Polypropylene) products. The company has established a significant presence in the market since its inception, driven by a commitment to quality and innovation.

Current Manufacturing Capabilities

The company's manufacturing capabilities are extensive, with state-of-the-art facilities designed to handle high volumes. The EPS plant, with a production capacity of 4500 MT, is equipped with advanced machinery that supports rapid production cycles and high-quality output.

Key Offerings to End-Use Industries

The company offers a diverse range of products tailored for various end-use industries, including:

- **EPS Disposable Glasses:** Available in multiple sizes including 135ml, 150ml, 200ml, 250ml, and 300ml, the company produces around two million glasses per day.
- **EPS Disposable Plates and Bowls:** The range includes various designs and sizes, suitable for different culinary needs.
- **BOPP Self-Adhesive Tapes:** These products cater to packaging requirements, with a production capacity of approximately 400 MTPA.
- **Bio-Degradable Crockery:** A recent innovation, Windsor produces eco-friendly disposables made from biodegradable corn starch.

Geographical Presence

The company has a strong geographical presence in Northern India, particularly in Kurali and Baddi. These locations serve as key operational hubs for manufacturing and distribution, allowing the company to efficiently reach its clients across the region and beyond.

Sperry Group

Sperry Group operates in diverse sectors, primarily focusing on the manufacturing of plastics, polymers, and expanded polystyrene (EPS) products. It has established a notable presence in the market through its subsidiaries, particularly Sperry Techno Solutions Pvt Ltd (STSPL) and Sperry Packagings Pvt Ltd (SPPL). With a focus on efficiency and innovation, both STSPL and SPPL have established themselves as reliable players in the packaging industry. Their operational scale and advanced infrastructure allow them to meet the growing demands of their clients, further solidifying their competitive edge.

Key Offerings to End-Use Industries

Through its subsidiaries, the group offers high-quality EPS products primarily used for packaging and insulation purposes. These products are lightweight, durable, and provide excellent thermal insulation properties.

Geographical Presence

The group has a robust geographical presence with manufacturing plants strategically located across India. Their facilities in Greater Noida, and Sri City in Andhra Pradesh caters regional demand in Northern and Southern India.

Current Manufacturing Capabilities

Sperry Group operates state-of-the-art manufacturing facilities that are ISO 9001:2015 certified. STSPL, with experience of over two decades, is located at Greater Noida with a production capacity of more than 4,800 MTPA. Similarly, SPPL, located near Sri City in South India, has manufacturing capacity of 2,160 MTPA with cutting-edge manufacturing processes.

East India Technologies Pvt Ltd

East India Technologies Pvt. Ltd. (EITPL) is a significant player in the manufacturing of Expanded Polystyrene (EPS) products, based in Greater Noida, Uttar Pradesh, India. The company has been operational since its inception in 1989 and has developed considerable expertise in the EPS market. The company specializes in a diverse range of products including packaging for kitchenware, ice boxes, and protective packaging solutions for various industries. The experience accumulated over more than three decades has enabled EITPL to become a leading Original Equipment Manufacturer (OEM) in several sectors, including medical electronics, telecom, and automotive industries.

Key Offerings to End-Use Industries

East India Technologies provides a comprehensive range of EPS products and services tailored to meet the needs of different industries. Their key offerings include:

- **EPS Moulding:** Customized moulding solutions for various applications, ensuring dimensional accuracy and quality.
- **EPS Packaging:** Protective packaging materials for items like electronics, glassware, and handicrafts.

Geographical Presence

East India Technologies operates primarily in India, with manufacturing centers located in Greater Noida & Roorkee. The company's strategic positioning within major industrial hubs allows it to serve both domestic and international clients effectively, particularly targeting markets in the automotive, energy, and medical industries.

Current Manufacturing Capabilities

The company boasts modern manufacturing capabilities, including state-of-the-art machinery and automated processes. The company has an annual manufacturing capacity of 9,000 MT, facilitating high-volume production capabilities.

K.K Nag Pvt Ltd

K.K. Nag Pvt. Ltd is a prominent player in the plastic manufacturing industry in India, known for its innovative contributions and wide-ranging product offerings. The company was founded in 1965 in Pune, India, has been a pioneer in developing new plastic processes. With over 50 years of industry experience, the company has established itself as a reputable and reliable manufacturer in India's plastics sector. Originally focused on producing Expanded

Polystyrene (EPS), the company has significantly expanded its offerings over the decades. It was one of the first companies in India to manufacture products from Fibreglass Reinforced Plastic (FRP) and EPS.

Key Offerings to End-Use Industries

K.K. Nag Pvt. Ltd. offers a diverse range of products that cater to various end-use industries, particularly focusing on packaging and insulation solutions. Their key offerings include:

- **Expanded Polystyrene (EPS):** Commonly used for packaging consumer goods and thermal insulation.
- **Expanded Polypropylene (EPP):** Known for its durability, EPP is pivotal in the automotive industry for applications requiring lightweight and shock-absorbent materials.
- **Rotational Moulding Products:** This includes products like insulated boxes and pallets that are used extensively in transportation and storage solutions.
- **Fibreglass Reinforced Plastic Products:** Utilized across various sectors, including the chemical process industry, for their strength and corrosion resistance.

Geographical Presence

The headquarters of K.K. Nag Pvt. Ltd. is located in Pune, India, with manufacturing facilities spread across multiple locations, including Puducherry and Chennai. This geographical footprint allows the company to effectively address the diverse needs of its clients across different regions, enhancing its service and distribution capabilities.

Current Manufacturing Capabilities

K.K. Nag Pvt. Ltd. has made significant investments in enhancing its manufacturing capabilities. The company utilizes advanced technologies and maintains stringent quality control practices to ensure high standards across its product range. Its manufacturing processes enable the production of high-quality EPS and EPP products, adhering to both domestic and international standards. The company continues to innovate its production techniques, ensuring resilience and sustainability in its operations.

6.2 Financial Benchmarking

Revenue from Operations (Rs. Million)

Manufacturers	FY22	FY23	FY24	CAGR (FY22-24)
Epack Prefab Technologies Ltd	4,501.06	6,567.61	9,049.02	41.79%
Beardsell	1,861.34	2,320.12	2,449.50	14.72%
Sperry Plast Pvt Ltd [#]	1,722.74	2,193.30 ¹	-	27.31%
East India Technologies Pvt Ltd	2,463.52	4,729.97	2,707.12	4.83%
K. K. Nag Pvt Ltd [#]	2,463.52	3,169.32	-	28.65%
Windsor Industries Pvt Ltd	1,292.85	1,533.23	1,343.68	1.95%
Sperry Techno Solutions Pvt Ltd	0.19	1,130.62	1217.90	-

Note:

[#]Financials for FY24 are not available. Growth is on YOY basis

¹Revenue from operations is on standalone basis

Source: Company Filings, CRISIL MI&A

Operating profit before depreciation, interest and taxes (OPBDIT) (Rs. Million)

Manufacturers	FY22	FY23	FY24	CAGR (FY22-24)
Epack Prefab Technologies Ltd	355.40	515.30	869.93	56.45%
Beardsell	125.70	177.65	204.93	27.68%

Sperry Plast Pvt Ltd*	159.17	-	-	-
East India Technologies Pvt Ltd\$	147.68	340.65	292.75	40.80%
K. K. Nag Pvt Ltd#	147.68	234.59	-	58.85%
Windsor Industries Pvt Ltd	45.30	272.01	-104.28	-
Sperry Techno Solutions Pvt Ltd	0.10	60.28	65.19	-

Note: Financials for Sperry Packagings Pvt Ltd is not available on MCA

*Financials for FY23 & FY24 are not available

#Financials for FY24 are not available. Growth is on YOY basis

Formula used for OPBDIT calculation is as follows:

OPBDIT= Revenue from operations- total expenses+ finance cost+ Depreciation and amortisation expense

Source: Company Filings, CRISIL MI&A

Profit after tax (PAT) (Rs. Million)

Manufacturers	FY22	FY23	FY24	CAGR (FY22-24)
Epack Prefab Technologies Ltd	195.23	239.72	429.59	48.34%
Beardsell	28.12	84.94	82.27	71.05%
Sperry Plast Pvt Ltd#	62.62	-23.60 ¹	-	-
East India Technologies Pvt Ltd	467.02	824.92	676.58	20.36%
K. K. Nag Pvt Ltd#	46.70	82.49	-	76.63%
Windsor Industries Pvt Ltd	10.29	34.92	34.05	81.91%
Sperry Techno Solutions Pvt Ltd	0.10	25.93	24.29	-

Note: Financials for Sperry Packagings Pvt Ltd is not available on MCA

#Financials for FY24 are not available. Growth is on YOY basis

¹PAT is on standalone basis

Source: Company Filings, CRISIL MI&A

Key financial Ratios (FY24)

Manufacturers	OPBDIT%	PAT%	Gross Margin, %	RoE@	RoE	RoCE (with other income)	RoCE (without other income)	Current ratio	Interest coverage ratio
Epack Prefab Technologies Ltd	9.61%	4.75%	9.61%	29.93%	29.12%	28.16%	27.21%	1.12	5.12
Beardsell	8.37%	3.36%	8.37%	12.70%	12.68%	17.57%	13.79%	1.16	5.35
Sperry Plast Pvt Ltd*	9.24%	1.08% ¹	9.24%	19.42%	16.38%	15.52%	18.28%	1.42	3.15
East India Technologies Pvt Ltd	10.81%	2.50%	10.91%	8.54%	8.53%	15.29%	14.83%	0.93	2.45
K. K. Nag Pvt Ltd#	7.40%	2.60%	7.57%	18.29%	18.15%	22.78%	21.87%	0.97	6.74
Windsor Industries Pvt Ltd	-7.76%	2.53%	15.61%	7.72%	7.72%	-26.56%	-26.71%	2.21	9.04
Sperry Techno Solutions Pvt Ltd	5.35%	1.99%	5.35%	37.13%	37.13%	20.46%	20.22%	1.09	15.61

Note: Financials for Sperry Packagings Pvt Ltd is not available on MCA

*Financial ratios are for FY22

#Financials ratios are for FY23

¹PAT% for Sperry Plast is for FY23 on standalone basis

Formulae used for the above table are as follows:

OPBDIT%= OPBDIT/ Revenue from operations

PAT%= PAT/ Total income

RoE @%= PAT/ Average of tangible equity; Tangible equity= Total equity- intangible assets

RoE= PAT/ Average of total equity

RoCE%(including other income)= (EBITDA- Depreciation and amortization cost)/ Average of (Total debt+ total tangible equity)

RoCE% (excluding other income) = (EBITDA- Depreciation and amortization cost- other income)/ Average of (Total debt+ total equity)

Current ratio= Current assets/ Current liabilities

Interest coverage ratio= (Finance cost+ PBT+ Depreciation and amortization cost)/ Finance cost

Source: Company Filings, CRISIL MI&A

Key financial Ratios (FY24)

Manufacturers	Net debt (Rs. Million)	Net debt/ OPBDIT	Net Debt/ Equity	Net fixed asset turnover ratio	Working capital days
Epac Prefab Technologies Ltd	1,296.20	1.49	0.77	4.70	3.56
Beardsell	230.313	1.12	0.32	4.05	48.03
Sperry Plast Pvt Ltd*	475.32	2.99	1.15	2.58	28.19
East India Technologies Pvt Ltd	932.766	3.19	0.85	2.42	41.78
K. K. Nag Pvt Ltd#	158.45	0.68	0.32	5.55	-23.63
Windsor Industries Pvt Ltd	94.48	-0.91	0.21	4.21	46.20
Sperry Techno Solutions Pvt Ltd	121.74	1.87	1.17	4.33	-11.52

Note: Financials for Sperry Packagings Pvt Ltd is not available on MCA

*Financial ratios are for FY22

#Financial ratios are for FY23

Ratios used for the above table are as follows:

Net debt= Total debt- Cash and cash equivalents- Bank balances other than cash and cash equivalents

Net fixed asset turnover ratio = Revenue from operations for the year/ Average of (Net Property, plant and equipment, Capital work-in-progress and Right-to-use assets)

Working capital days= Inventory days+ Receivable days- Payable days

Inventory Days= Inventories/ COS

Receivable Days= Receivables/ Revenue from Operations

Payable Days= Payable Days/ COGS

Source: Company Filings, CRISIL MI&A

Credit Rating

Manufacturers	Issuer	Date	Rating
Epac Prefab Technologies Ltd	ICRA Limited	Mar-24	A-
Beardsell	Care Edge	Aug-24	BBB-
Sperry Plast Pvt Ltd	Crisil Limited	Feb-24	BB Stable
East India Technologies Pvt Ltd	ICRA Limited	Jul-23	BBB Stable
K. K. Nag Pvt Ltd	Crisil Limited	May-24	BBB+
Windsor Industries Pvt Ltd	Care Edge	Aug-24	BB+, Stable

Note: Credit ratings for Sperry Techno Solutions Pvt Ltd & Sperry Packagings Pvt Ltd are not available

Source: CRISIL MI&A

7 Annexure I: Glossary

Abbreviations used in the report

Abbreviation	Full form
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
NSO	National Statistics Office
TANSIDCO	Tamil Nadu Small Industries Development Corporation Limited
GVA	Gross Value Added
NNI	Net National Income
IIP	Index of Industrial Production
PFCE	Private final consumption expenditure
WPI	Wholesale Price Index
CPI	Consumer Price Index
PEB	Pre-engineered building/ Pre-engineered steel building
RCC	Reinforced Cement Concrete
GFCF	Gross fixed capital formation
3PL	Third-party logistics
PLI	Production Linked Incentive
NMP	National Monetisation Pipeline
NIP	National Infrastructure Pipeline
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
PMAY-U	Pradhan Mantri Awas Yojana - Urban
PMAY-G	Pradhan Mantri Awas Yojana – Gramin
LGSF	Light Gauge Steel Framing
SCM	Smart Cities Mission
BIM	Building Information Modeling
PPGL	Pre-Painted Galvalume
BIS	Bureau of Indian Standards
ISO	International Organization for Standardization
BMTPC	Building Materials and Technology Promotion Council
MoHUA	Ministry of Housing and Urban Affairs
NBC	National Building Code
DMI&SP	Domestically Manufactured Iron & Steel Products
EPS	Expanded Polystyrene

Abbreviation	Full form
STSPPL	Sperry Techno Solutions Pvt Ltd
SPPL	Sperry Packagings Pvt Ltd
EITPL	East India Technologies Pvt Ltd
OEM	Original Equipment Manufacturer
FRP	Fibreglass Reinforced Plastics
EPP	Expanded Polypropylene

Source: CRISIL MI&A

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