STEEL STRUCTURES

WE BUILD INDIA IN STEEL

SMT
sugam
MET TECH (P) LTD.
(Formerly **Sugam Engineers**)

www.sugamengineers.in

as strong as steel...

Sathyanarayana .A
CEO

About us

We at SUGAM ENGINEERS believe our success comes from integrity, passion and strong work ethics. Our strength and greatest asset is history of 30 years with the expertise we bring to work each day. Established in 1985, customers know they can trust us to deliver on our promises. We provide customized and cost effective solutions; we design and manufacture of steel components/structures used for building multistory buildings as per international standards. The range applications include industrial, commercial, recreational, warehousing, low cost group housing, etc., whether it is design-build from concept to completion, or adaptive reuse of an existing facility, SUGAM has the expertise, skill, and dedication to manage projects with commitment to quality, budget and schedule.

To build on the success SUGAM has achieved over the last two decades; it has set new targets for growth and is continuously investing in its modernization for meeting world standards. Sugam has invested on cutting edge technology, machinery and people up skilling initiatives; as well as preparing for their ISO 9001 Quality Management and by investing in safety equipment and updating their facilities. It takes great pride in its uncompromising commitment to world-class quality and service excellence, as well as their sound knowledge of steel construction. This unified team has unlimited passion for the steel industry that shows in their approach to both business and their customers.

About Expanded metal sections:

We are now entering this one of its kind product called the expanded Metals. In the world the maximum availability is 6mm and maximum opening is 75mm width 200 mm, we at SUGAM ENGINEERS are going to manufacture minimum 0.5 mm to maximum thickness upto 12 mm, the maximum which is 300 mm and strand height is 600 mm and we are able to produce in metal like Steel, Stainless steel, Copper, Brass, Aluminium, Titanium and also polycarbonate with shapes like Hexagonal, Square & Diamond shaped Expanded Metals.

About metal sections:

Company established with the vision to develop sheet folding technology, which is first of its kind in India. Pioneered in high quality sheet folding of most of the metal ranging from cold rolled steel, stainless steel, galvanized steel, Brass, Aluminum to Polycarbonate.

Company has been compatible and competitive to the growing demand for steel folding technology in automobile, civil engineering, building, electrical engineering, general engineering Highway Crash Barriers and heavy duty pelletized racking systems.

Our folding technology thickness ranging from 0.5mm to 12 mm and length up to 7 meters. With various kinds of surface finishes like painted, pre coated, Polished, stainless steel sheets, can be folded without scratch.

We are the only company specialized in Trapezoidal sections and manufacture according to desired specification in the country.

history & origin of steel structures

HISTORY & ORIGIN OF STEEL STRUCTURES

The journey of steel started in the late 1700s when the British began using steel structures. The need was driven mainly out of the fireproof property of steel structures. With time, by the late 1800s, steel began to be increasingly used for a number of metal building construction purposes. The early 1900s especially saw the number of skyscrapers in cities like Chicago that used steel as their basic supporting structure. Thus steel entered a new era in which the real properties of steel like strength, stability and durability could be exploited to make metal building thought to be a figment of imagination just a few years ago.

Today, with advances in manufacturing, steel is entering another phase where it is able to provide the highest quality of buildings in terms of strength, the best levels of customisation and at affordable prices. This seems like the magic material that buildings have been looking for ages.

Today in many developed countries a very large percentage of multi-storied buildings are built with steel, where as steel is not so commonly used in construction of multi-storied buildings in India even though it is a better material than reinforced concrete. India is lagging far behind in terms of percentage of commercial structures built with less than 1% market share. UK and China leads the pack with 65% to 70% share, with US, Japan and Western Europe clocking 25% to 45%.

Most of the prominent landmarks of the world viz., World Trade Centre (WTC), Burj Khalifa have been built on steel structures. Steel Structures are so popular in China within a span of two decades the Shangai City has more than 400 skyscrapers and nearly 4000 commercial structures. In spite of World Trade Centre destroyed on 9-11-2001 still many builders prefer to opt for steel for multi story building construction. Eiffel Tower built in 1869 and latest master piece construction- Burj Khalifa in 2010 have used steel as reliable material for construction. Steel based structures have become very popular in the last century and they managed to take architects' and engineers' imagination beyond limits.

sugam-design to build....

sophisticated & updated....

INFRASTRUCTURE

With long vision and a strong infra structural base, has made our success path to have a peerless performance that we are exhibiting in the industry. We are equipped with in-house production facilities and highly sophisticated machinery imported from Germany and other European countries; we are capable of manufacturing world class products /sections and offering them at an affordable price to our customer's. Our production capacity comprises of 20,000 MT to 40,000 MT with our state-of-the-art facilities to produce hundreds of custom-made steel buildings. Our principal facility houses design centre, product development, quality control laboratories & manufacturing space.

vision & value driven engineering...

VISION

To be a global leader in steel structural engineering as most reliable and technological advanced company.

MISSION

To offer best quality and service using cutting-edge technology in steel engineering industry to achieve highest level of customer satisfaction.

QUALITY POLICY

We at Sugam Engineers promise to adhere to strict and streamlined Quality Management Systems and we are committed towards providing high quality, reliable, efficient and cost effective steel products to customers on time with continuous improvements in process, management, sales and delivery.

design process & functional planning

DESIGN METHODOLOGY

In steel structure design we follow, design principles of Euro Code and Indian Standards (IS). We create structural plan before execution which is elaborately illustrated with 3D images with help of computer aided design.

STRUCTURAL ANALYSIS

The loads are defined and design is laid out, structural analysis would be performed to determine internal forces that will be produced in various members of the framework. Assumptions would be made to be ensuring that structural behaviour in reality and also in hypothetical situation. The load analysis -Dead load , Live load , Mean return period Recurrence interval, Live loads for various occupancies, reduction in basic design live load, Impact load and Wind load Factor of safety - The development of design specifications to provide suitable values of the margin of safety, reliability and probability of failure would be taken into consideration the following factors.

* Variability of the material with respect to strength and other physical properties
* Precision with which internal forces are calculated
* Possibility of corrosion
* Extent of damage, loss of life
* Operational importance
* Quality of workmanship

steel construction methodology

The methodology of construction of steel structures begins with interaction and discussion with architects. The planning and creation of structural design along with reference to the requirement analysis is conducted. The soil is tested for the compatibility of steel structuring and geo properties are ascertained for load bearing. Once the load bearing analysis is done a base is set in concrete and anchoring for steel structure is set with bolts and fasteners. A usually thick plate at the bottom of the column through the anchor bolts mechanically connects the column and transfers the forces to the foundation. The following process of construction explains the erection of steel structures.

COLUMN

A structural element that usually carries its primary load in compression or tension parallel to its axis.

BEAM

A structural element that usually carries its primary loads in bending perpendicular to its axis.

BRACKET ASSEMBLY

The part of the beam, column or that rests on a support.

PURLIN

The design of purlin is based on analysis of bending on a simple beam.

DECKING SHEET

It will support the weight of fresh concrete and construction loads without required shoring.

SHEAR STUDS

Shear connect the design where steel beams are made to composite with deck slab.

WIRE MESH

We provide welded wire mesh to strengthen the concrete slab.

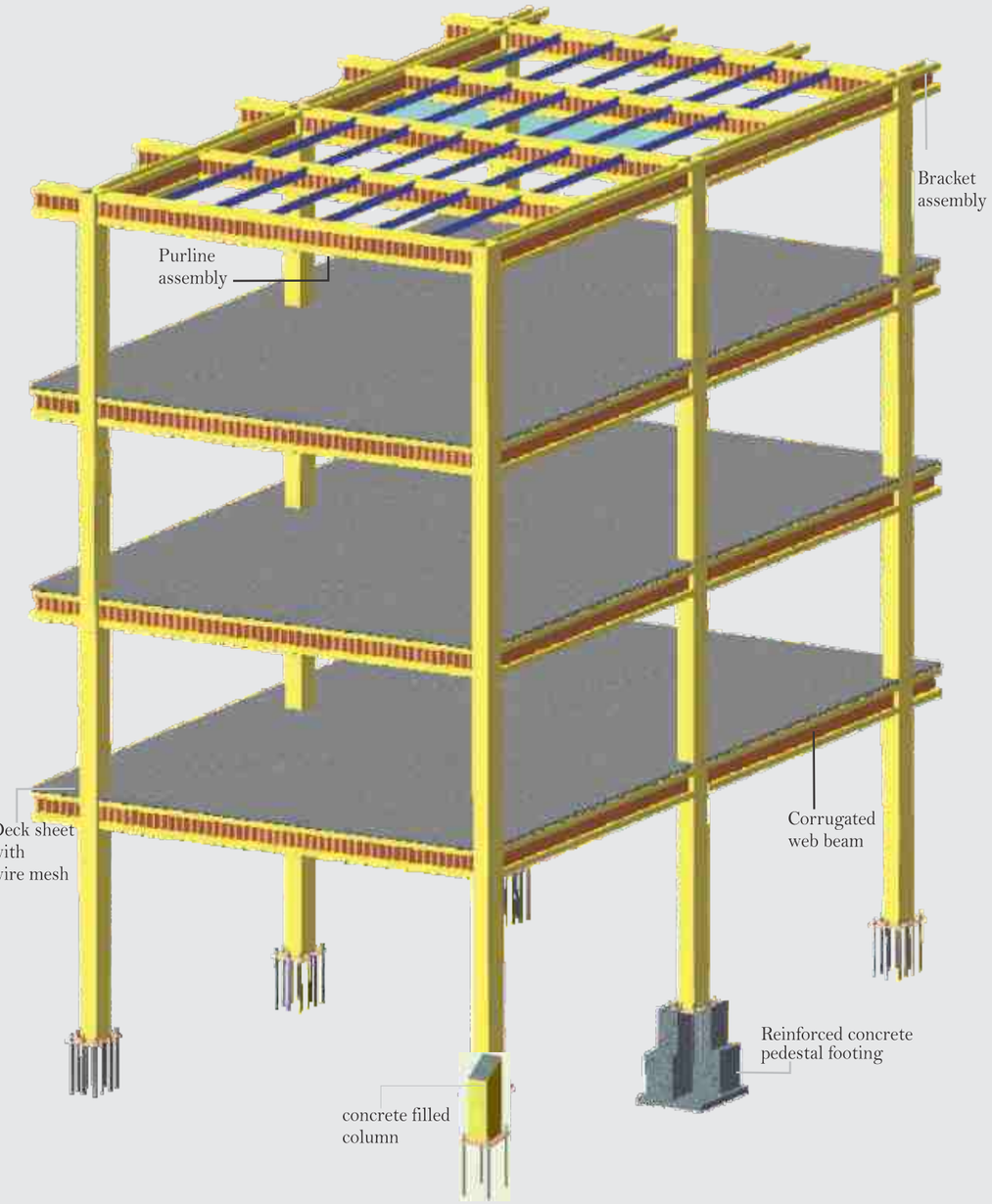
FINISHING & FLOORING

Walls - Side wall and Intermediate walls can be constructed by concrete/clay brick/hollow/solid blocks, glass / ACP claddings/gypsum board etc.,

Flooring - In steel structure concept on top of the deck sheet crest, normally 40mm thick concrete is poured. The floor can be finished by Vitrified tiles / Glass / Mosaic / Wood floorings / Granites / Marbles etc.,

Ceiling - In western countries steel decking system is quite common even if exposed looks attractive this could be hidden with fall ceiling.

3D Illustration of Typical Steel Structure



Best applications for steel structure are :

Commercial buildings, Shopping Mall, Multiplex Theatre, Hospitals, Schools, Complex, Convention Halls, Godowns, Factory, Hangers, Typical houses etc.,

analysis of steel structures with respect to concrete structures

General costing of steel structure is 15% to 20% economical than compared to conventional method.

REDUCED CONSTRUCTION TIME

Steel framing can be rapidly purchased, fabricated and erected. Steel´s ease of design and construction readily lends itself to fast-track construction. Steel can be erected more quickly and the building can be occupied sooner, which reduces interest costs on construction financing.

LARGER CLEAR SPANS & DESIGN FLEXIBILITY

Structural steel framing easily and economically accommodates 15 meters x 15 meters and larger clear spaces, which gives more flexibility with designing. Steel columns are smaller than concrete columns, which mean more useable space and less visual obstructions.

Clear spans, cantilevers, skewed walls; sloping surfaces, curved framing, atria, floor openings, special aesthetic features, and unusual loadings are all easily and economically accommodated with steel.

HIGH STRENGTH & TOUGHNESS

Steel has both strength and ductility, the weight of structure that made of steel will be less. Steel has the highest strength to weight ratio of any comparative building materials available in the world

LOAD BEARING

The load bearing capacity of steel is more than double when compared to RCC Normally conventional RCC beam carries a load of 350 kgs/sqm to 450 kgs/sqm and steel structure the load bearing capacity is 650 to 700 kgs/sqm. For special application the structures can be constructed up to 4000 kgs/sqm sustainable wind load up to 145 kmph.

DURABILITY & DUCTILITY

Steel will not shrink, twist, warp, rot crack and when coated/treated will resist rust and corrosion. Ductility is a very desirable of property of steel in which steel can withstand extensive deformation without failure under high tensile stresses, i.e., it gives warning before failure takes place.

SUPERIOR SEISMIC PERFORMANCE

Steel´s ductility makes it the premiere structural material for economically resisting earthquakes. An owner needs to consider both life safety and how much of the structure is recoverable after a seismic event. Steel framing maximizes both of these factors.

UNIFORMITY

Properties of steel do not change in comparison to concrete. Steel is more consistence even in size than other building materials so sleek, straight and geometric attractive buildings.

FLEXIBILITY & ADAPTABILITY

Building of steel can be easily renovated and altered, for varying span lengths or even entire new wings can be added to existing frame buildings, and steel bridges may easily be widened. If additional loads are added to the structure in the future, steel can be easily reinforced to handle the weight. Similarly, new floor openings for elevators, stairwells and architectural or mechanical requirements can also be easily accommodated.

COMPLETE RE-CYCLABILITY & ECO- FRIENDLY

Most of the steel sold today has been recycled, and nearly all steel taken from demolition projects are 100% recycled.

SAFETY & PASSIVE PROTECTION

Spray on fire proofing building steel structure can sustain greater temperature up to 1300 C and 60 minutes. We are seeing lot structure constructed taking into account progressive collapse of blast conditions that are designed very effectively and economically. Steel framing does very well under high (wind) loads because it is ductile, which means it has the ability to bend without breaking and absorb that kind energy.

SOIL BEARING CAPACITY

If the SBC (Soil Bearing Capacity) is low in conventional building method the depth/width of the foundation is to be increased whereas in Steel Structures method total weight of the structure itself is about 30% less hence footing cost is very nominal and also the number of load bearing columns and steel piling can be reduced. Concrete construction is not recommend for locations where the soil shifts unless a floating foundation is a part of the design because even slight movement and settling will result in cracks and fissures, concrete building on this type of soil requires special foundation or the use of pylons installed deeply in bedrock beneath the structure.

Concrete filled Steel column (CFSC)

The CFSC system has many advantages compared with the ordinary steel or the reinforced concrete system. One of the main advantages is the interaction between the steel column and concrete, local buckling of the steel column is delayed by the restraint of the concrete and the strength of concrete is increased by the confining effect of the steel column.

Advantages: The CFSC column system has many advantages compared with ordinary steel or reinforced concrete systems.

Interaction between steel column and concrete: Local buckling of the steel column is delayed and the strength deterioration after the local buckling is moderated, both due to the restraining effect of the concrete. On the other hand, the strength of the concrete is increased due to the confining effect provided by the steel column. Drying shrinkage and creep of the concrete are much smaller than in ordinary reinforced concrete.

Cross-sectional properties: The steel ratio in the CFSC cross section is much large than in reinforced concrete and concrete-encased steel cross sections. The steel of the CFSC section is well plasticized under bending because it is located most outside the section.

Construction efficiency: Labor for forms and reinforcing bars is omitted, and concrete casting is done by tremie or pump-up method. This efficiency leads to a cleaner construction site and a reduction in manpower, construction cost, and project length.

Fire resistance: Concrete improves fire resistance so that fireproof material can be reduced or omitted.

Cost performance: Because of the merits listed above, better cost performance is obtained by replacing a steel structure with a CFSC structure.

Ecology: The environmental burden can be reduced by omitting the form work and by reusing steel column and using quality concrete with recycled aggregates.

1. The Concrete filled column system has many advantages compared with ordinary steel or reinforced concrete systems. The main advantages are listed below:

2. Interaction between steel tube and concrete: Local buckling of the steel tube is delayed, and the strength deterioration after the local buckling is moderated, both due to the restraining effect of the concrete. On the other hand, the strength of the concrete is increased due to the confining effect provided by the steel tube, and the strength deterioration is not very severe, because concrete spalling is prevented by the tube. Drying shrinkage and creep of the concrete are much smaller than in ordinary reinforced concrete.

3. Cross-sectional properties: The steel ratio in the CFST cross section is much larger than in reinforced concrete and concrete-encased steel cross sections. The steel of the CFST section is well plastified under bending because it is located most outside the section.

4. Construction efficiency: Labor for forms and reinforcing bars is omitted, and concrete casting is done by Tremie tube or the pump-up method. This efficiency leads to a cleaner construction site and a reduction in manpower, construction cost, and project length.

5. Compared with the hollow steel sections, concrete filled steel sections will have a higher fire resistance, and the need less fire proof material around the steel tubes, because concrete has a larger thermal capacity than air which is enclosed in the hollow steel tubes. Even if the sustained loads carried by steel are decreased by heat, the column will not be crushed during the fire if the columns are designed to sustain the dead and live loads only by their concrete cores. So the structures will not surer great damage. Concrete improves fire resistance so that fire proof can be omitted Interaction b/w steel tube and concrete: Local buckling of the steel tube is delayed, and the strength deterioration after the local buckling is moderated, both due to the restraining effect of the concrete.

6. Significant economic advantages over either pure structural steel or reinforced concrete alternatives.

7. Identical cross sections with different load and moment resistances can be produced by varying steel thickness, the concrete strength and reinforcement. This allows the outer dimensions of a column to be held constant over a number of floors in a building, thus simplifying the construction and architectural detailing.

8. Higher strength and stiffness compared with RC columns of the same materials properties. Cross section properties: Steel ratio into CFST is much larger than in RC sections. The steel of CFST sections is well plastified under bending because it is located most outside the sections.

9. Cost performance: Cost effective when we compared to steel structure because of composite effect (steel and concrete).

10. Environmental: Form work can be reduced so that production of steel will be less and using high quality concrete with recycled aggregates.

Corrugated Web Beam (CWB)

The Corrugated web beam stands for the structural beam. The production process is exclusive designed by Sugam Engineer's .It is built up girder with thin corrugated web and two “C” channel flanges. For the larger span, we use two webs. Corrugation in webs enormously increases their stability against buckling and can result in very economical designs.

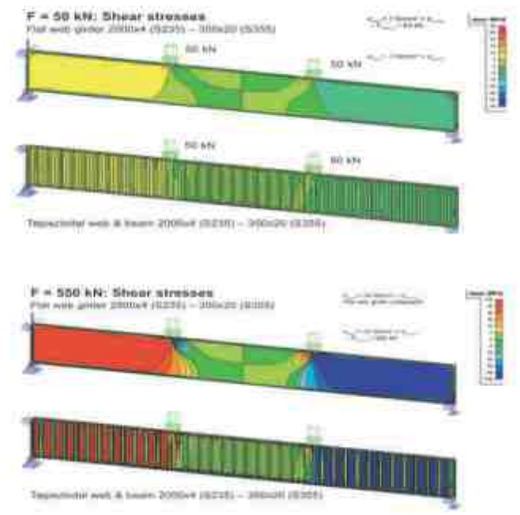
Because of the high strength to weight ratio, the span lengths could be wider, so a less number of columns are needed. Further there are costs saving possible at the weight, concrete, transport, and erection comparing a standard I-girder. Since the corrugation of the web provides higher resistance against bending about the weak axis, none of auxiliary lifting equipment normally required. Due to weight advantages with the same per running meter corrugated we beam enables significantly greater clear span of 30meter for multi floor building and 60meter of single span for PEB.

The advantages of corrugated web beam

- Thinner web
- Span 30meter for multi floor building 75 meter for PEB that to 4column spacing.
- The flexibility of CWB allows for beam depth of 200mm to 2000 mm.
- Lower dead weight.
- Better buckling behavior.
- Due to lower weight, the erection and transport cost reduce.
- To reduce the height of the beam we can design double corrugated web beam.

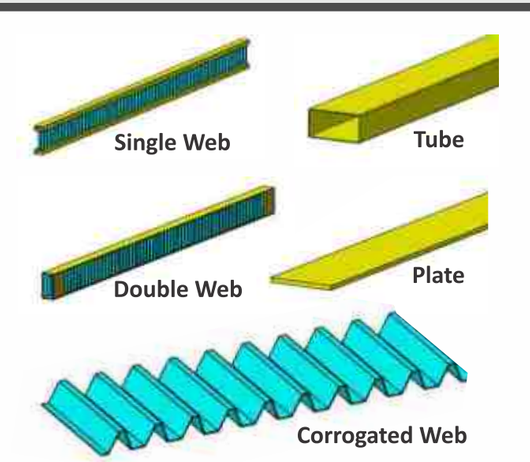
- Engineers have realized that corrugation in webs increase their stability against buckling and can result in very economical designs.

  Less cost and higher load carrying Capacity.
- Corrugated web beam provide a high strength-to-weight ratio.
- Furthermore, erection cost is reduced, since the corrugation in the web provides a higher resistance against bending about the weak axis.
- Corrugated steel web beam introduces the use of thin plates without stiffeners to improve both aesthetics and the economy of the buildings and bridges. Research has shown that corrugated web beam have improved shear stability and better fatigue resistance than conventional I-beam with flat webs. It can eliminate the use of larger thickness stiffeners plate that allow the reduction in beam weight and result in economic design. When the corrugated webs are compared with stiffened flats webs, it can be found that the corrugated steel web beam enables the use of thinner webs. It was found that corrugated steel web beam have 9 to 13 % less weight than current traditionally stiffened girders with flat webs.
- Corrugated web steel beam is build up of two steel flanges welded to a corrugated web .The web and flanges can be made from different type of steel grade depending on design requirement. The trapezoidal profile used in structures that has special requirement to avoid fatigue failure.
- In construction application, the corrugated web beam is usually carry most of the compressive stress and transmits shear in the beam while flanges support the major external loads.
- The corrugated web beam is usually investigated by comparing the thickness and the shape. It can decrease the cost and materials without weakening the load-carrying capability of the beam.



Conclusion

Maximum capacity trapeziodal web & beam 550 / 50 = 11...!
Maximum capacity flat web girder



Decking Sheets

Composite metal deck is a cost-effective flooring system used in may multi story buildings. Floors constructed of composite metal deck ate typically designed such that the corrugated of composite metal deck are typically designed such that the corrugated metal deck will support the weight of fresh concrete and some construction loads without requiring shoring.

Once the concrete gains strength, the concrete and metal deck act together as a composite member. The metal deck acts as tensile reinforcement for the slab in resistance to positive moment stresses induced by dead and live loads.

Traditional design practice dictates that minimum reinforcement is required in the transverse direction to control any cracks that may occur due to temperature and shrinkage movements. This minimum requirement for reinforcing has traditionally been addressed via the use of light-gauge welded wire mesh.

Decking : There are many advantages to using metal decking.

Versatility : Steel decks complying with Specifications are available in various depths and rib spacing's, with and without stiffening elements. With and without stiffening elements, with and without acoustical material, cellular and non-cellular, and in varying material thicknesses. This extensive choice makes steel deck applicable to a wide range of projects and structural designs.

Structural Strength with Less Weight : The properties of steel are used with maximum efficiency in the design and fabrication of steel decks, resulting in products with a high strength to weight ratio. As a result, delivery, erection, and structural framing costs can be lower than with other systems.

Attractive Appearance : Although steel decking is primarily a structural component, it is visually attractive when left exposed in other applications. With the properly specified factory and field coatings, steel deck is easy to maintain, durable, and esthetically pleasing.

All Weather Construction : Steel deck can be erected in most weather conditions, eliminating the costly delays that can occur with other types of floor and roof systems,

Required Fire Ratings : U.L. fire resistance ratings on standard roof and floor assemblies have been obtained by the Steel Deck Institute. Individual Sugam Steel Structures having ratings on their own products. Most fire resistance

requirements can be met with products manufactured by Sugam Steel Structures.

Uniform Quality : Through engineering and continuously refined production techniques, Sugam Steel Structures produce decks that conform to specified standards.

Proven Durability : Steel deck in place and performing satisfactorily for more than a half century is indicative of the product's durability.

Economy and Value : Value is determined by combining initial costs, life cycle costs, and overall performance. Steel deck assemblies are the best value in floor and roof designs. They combine low cost with top performance.

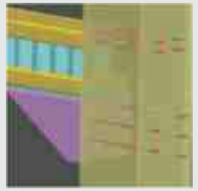
purline

Purlin

Purlin is the latest technology now replace conventional tubes and angles used in steel structures and have different varieties of Purlin { 'C' Purling, 'Z' Purlin.}

bracket assembly

We have different varieties of Bracket as per design.



shear studs & wire mesh

Shear studs are used in stud welding to secure steel framed buildings to create a shear connection between the steel and the concrete. We supply and fix all available sizes of welded shear studs for through deck and straight to steel welding.

WIRE MESH

We provide welded wire mesh to strengthen the concrete slab

HOW WE DESIGN

STRUCTURAL DESIGN AND EVALUATION AT

INTRODUCTION

At Sugam Engineers, we give utmost importance to our design and design validation process. Each project goes through a rigorous verification of design as per the Standard Codes. We design the structure as per INDIAN/ EURO/AMERICAN code based on the structure type and its application. We come up with optimised design without compromising on the safety of structure.

The structures are qualified under various loads and load combination.

1.Dead Load
2.Live loads
3.Wind Load
4.Seismic Loads (Earth Quake Load)
5.Erection loads
6. Fire Rating

DESIGN PROCEDURE

During the design process, we continuously interact with Architect and customer to build safe structure accommodating all the necessary requirements.

- Site inspection by Engineer
- Soil testing and evaluation of SBC
- Creation of initial column and beam grid layout for the given load specification
- Extracting the column reactions for Foundation (Load combinations as per IS standards)
- Perform structural calculation through analytical procedure and using software. Extract the joint forces and moments.
- Qualify Anchor bolts, Base plates
- Qualify Columns, Bracket and Beams
- Once the design is through, take final approval from architect and client
- Fabrication starts
- Erection of the structure and co-ordinate for the civil work
- Completion of the structure on time

COMPONENTS

Steel structure consists of following important components.

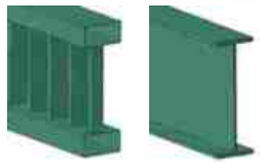
- Anchor bolts and Base Plate
- Columns
- Brackets
- Beams
- Cleats
- Purlins
- Side plates
- Face plates
- Deck sheets/Light roofing sheet
- Reinforced expanded metal (Mesh)
- Wall Cladding

COMPARATIVE STUDY

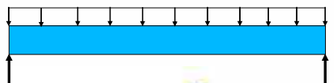
Type of Beam	Weight/Meter	Depth of Section	Width of Flange	Thickness of Flange	Thickness of Web
Rolled Steel Beam (ISMB 400)	61.6	400	140	16	8.9
Corrugated Web beam	61.9	600	200	5	3

Tube Dimension:
200mm*100mm*5mm

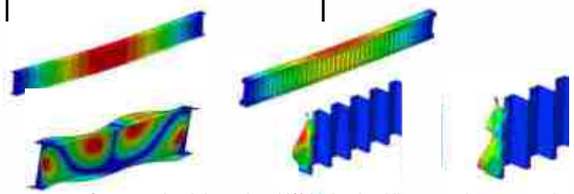
Corrugated Web:
400mm height, 3mm thickness



COMPARATIVE STUDY



Comparative study has been carried out between standard rolled section and corrugated beams for buckling capacity.



Corrugated web beam has 30% higher buckling capacity compared to standard beams based on the support conditions of the beam.

ADVANTAGES

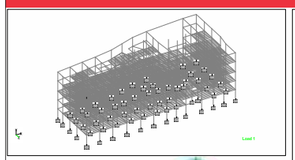
Following Advantages have been realised by the Structural engineers about corrugated beams.

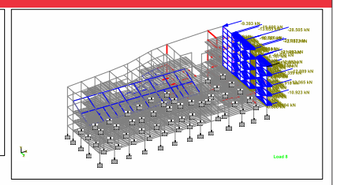
- Higher buckling capacity
- Higher beam height to achieve increased section modulus (More load carrying capacity)
- Higher Strength to Weight Ratio
- Aesthetic

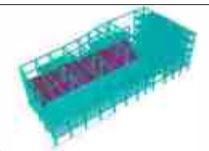
FOOTING STAGES AT PEDASTAL LEVEL

PROJECTS CASE STUDIES

MULTI-STOREY MALL

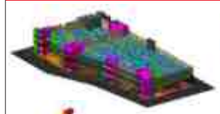


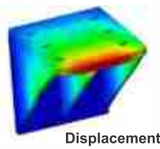


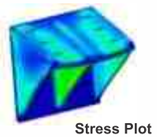


The structure is having more than 1000 tonnes of steel. Structural analysis carried out for all types of load combinations to qualify the structure. The structure is nearly 1.5lakh square feet.

MULTI-STOREY MALL

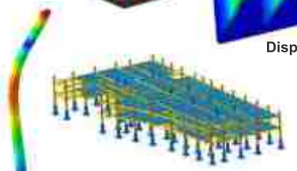






Displacement plot

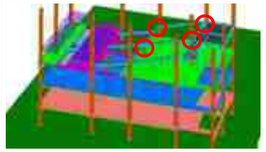
Stress Plot

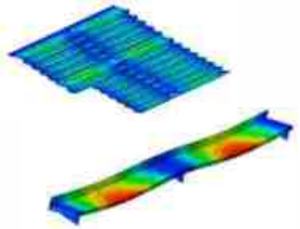


Each joint is critical in the structure. We evaluate each joint to understand the critical zones before it is manufactured.

Composite columns are evaluated for buckling and load carrying capacity to construct a safe structure.

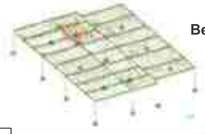
MULTI STOREY THEATER - ANALYSIS



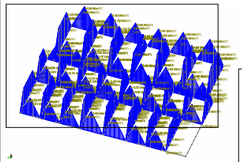


Seating arrangement in the Audi has been evaluated to check the design.

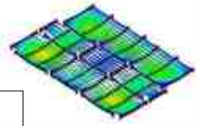
CAR PARKING - ANALYSIS

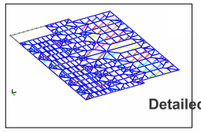


Bending Moment Evaluation



Floor load distribution



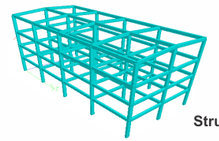


Detailed Analysis using FEM

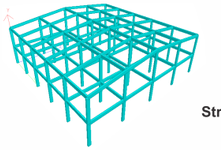
INDUSTRIAL SHED - ANALYSIS

The Structural design was evaluated with Tie-bar and without Tie-bar.

MULTI-STOREY COMMERCIAL BUILDING - ANALYSIS

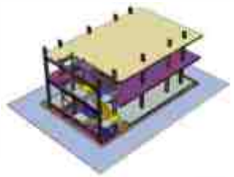


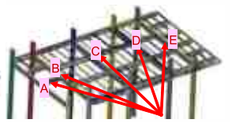
Structure - 1



Structure - 2

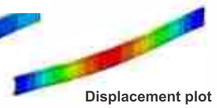
MULTI-STOREY COMMERCIAL BUILDING - ANALYSIS





Beams	Factor of safety
A	2.80
B	1.76
C	1.19
D	1.21
E	2.27

Stress Plot



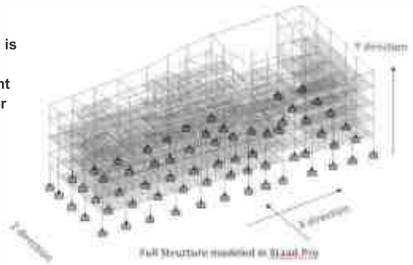
Displacement plot

We check safety factor of each beam in the structure.

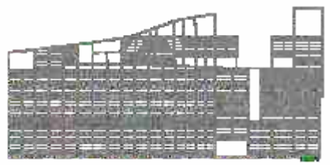
REACTION FORCES AT COLUMNS

This report describes the procedure followed for extraction of reactions at columns for static load conditions.

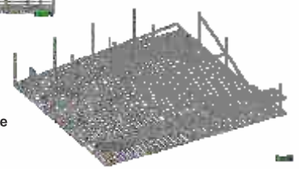
Assumptions Made:
Floor load of 850Kg/m2 is considered
Equivalent Area moment of inertia considered for Corrugated beams and concrete filled steel columns.



REACTION FORCES AT COLUMNS

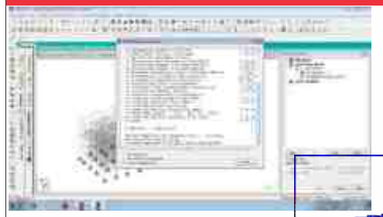


Floor beams

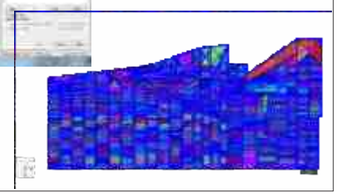


Audi Structure

REACTION FORCES AT COLUMNS



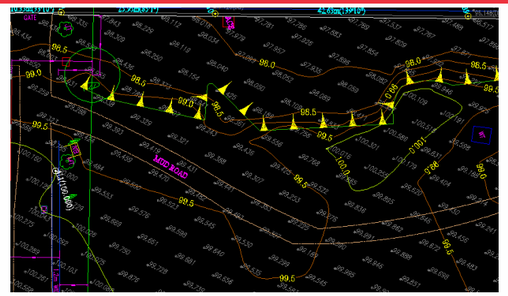
Staad.Pro Static Run



Floor load distribution

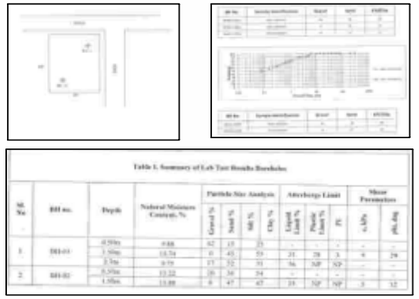
HOW WE BUILD

LAND SURVEY IMFORMATION



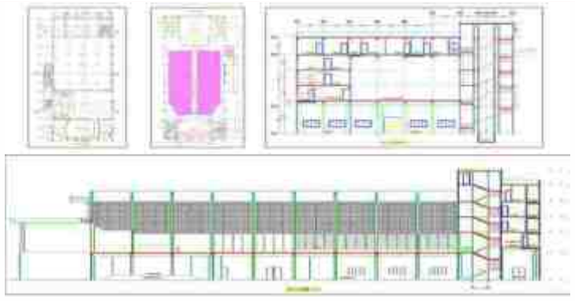
TYPICAL LAND SURVEY DETAILS FOR PROPOSED BUILDING CONSTRUCTION

SOIL TEST IMFORMATION



SOIL SAMPLES COLLECTING AT PROPOSED CONSTRUCTION SITE AREA

ARCHITECTURAL DRAWINGS



STRUCTURAL DESIGN IN 3D MODELING

PROJECT PLANING SCHEDULE

SUGAM PROJECT PLAN OF ACTIONS

A LIST ACTIVITIES ARE SCHEDULE AND PLANNED BEFORE THE MATERIALS ARE PROCURED AND EVEN BEFORE THE FABRICATION DRAWINGS ARE PREPARED. THIS PLAN OF ACTION DRAWINGS. MATERIAL PROCUREMENT INCLUDES: QUANTITY SURVEYING, PLANING THE MILL ORDER, DELIVERY OF STEEL FROM THE MILL AND STORAGE OF THE STEEL IN THE FABRICATION SHOP. THE STEEL IS THEN FABRICATION VERY PRECISELY AND THEY ARE TAKEN INTO THE ASSEMBLY YARD AND LOADED ON TRAILER TRUCK AND TRANSPORTED TO THE JO SITE FOR ERECTION.

ARCHITECTURAL DESIGN CONCEPTS

CONVENTIONAL HALL

COMMERCIAL BUILDING

CONVENTIONAL HALL

INDUSTRIAL BUILDING

INITIAL SITE SET-UP PHOTOS

INITIAL SITE SET-UP WORKS LIKE LEVELLING, DEBRIS CLEARING, ACCESS TO CRANE MOVEMENTS ETC.

LAYOUT WORKS LIKE, EXCVATION FOR COLUMNS, PLINTH BEAMS, GRADE BEAMs, FOOTING FOR COLUMNS, ANCHOR BOLT SETTING ETC.

FOOTING STAGES AT PEDASTAL LEVEL

MAT CONCRETE BELOW PEDASTAL

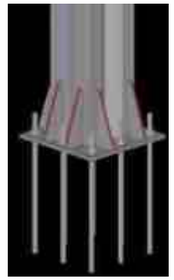
CONCRETE PEDASTAL FOR STEEL COLUMN

FOOTING STAGES AT PEDASTAL LEVEL

ANCHOR TO THE REINFORCEMENT

SHUTTERING STAGE

BASE PLATE

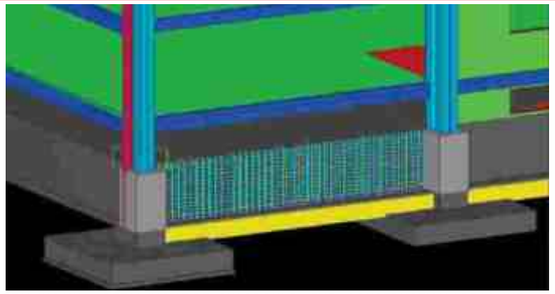


STEEL COLUMN WITH ANCHOR RODS & BASEPLATE AS PER DESIGN MODEL

COLUMN ERECTION STAGE

CONCRETE FILLING INTO THE STEEL COLUMN

RETAINING WALL DETAILING



RETAILING WALL DETAILING AT BELOW GROUND LEVEL CONSTRUCTION AREASLIKE BASEMETENS, SILT LEVELS ETC.. THE REINFORCEMENT BARS ARE WELDED TO THE MAIN COLUMNS FOR STABILITY AND SUPPORTS.

RETAINING WALL EXECUTION AT SITE

STEEL STRUCTURE BEAM ERECTION

STRUCTURAL STEEL FLOOR AREA EXECUTION

STRUCTURAL STEEL DECK SHEET AND MESH FIXING

STEEL DECK SHEET IS LAYED OUR THE STRUCTURAL STEEL BEAMS USING SELF TAPPING SCREWS.

ABOVE THE STEEL DECK SHEET, EXCLUSIVE EXPANDED METAL (MESH) IS SPRED ALL OVER THE AREA AND WELDED.

ADVANCED METHODS USAGES

SHEAR STUDS ARE USED TO ENSURE A COMPOSITE ACTION BETWEEN THE CONCRETE SLAB AND STRUCTURAL STEEL BEAMS, THE USAGES SHEAR STUDS DEPENDS ON CASE TO CASE SITUATIONS PER DESIGN INTENT.

CONCRETE ON DECK SHEET

STRUCTURAL FLOOR DETAILING

STRUCTURAL STEEL ROOFING DETAILS

STRUCTURE BEFORE AND AFTER ROOF WORK FINISHES

SKELETON BEFORE ROOFING SHEET

AFETR ROOF SHEET LAYED

STRUCTURAL STEEL & VARIOUS MASONARY WORKS

WIENERBERGER BLOCKS

MANGALORE (LATERITE) BLOCKS

TRADITIONAL BLOCK MASONRY

FLY ASH BLOCK WORKS

STRUCTURAL STEEL FINISHES

LIGHT FIXING AS REQUIRED

DETAILING WITH ACP & GLASS FINISHES

DETAILING FOR DOOR & WINDOW FINISHES

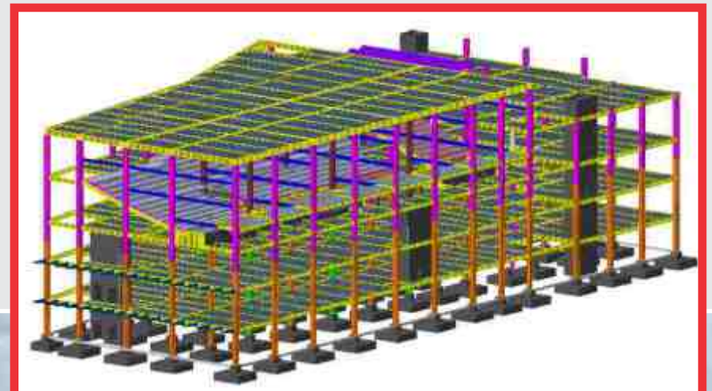
NORMAL CEMENT CONCRETE BLOCK

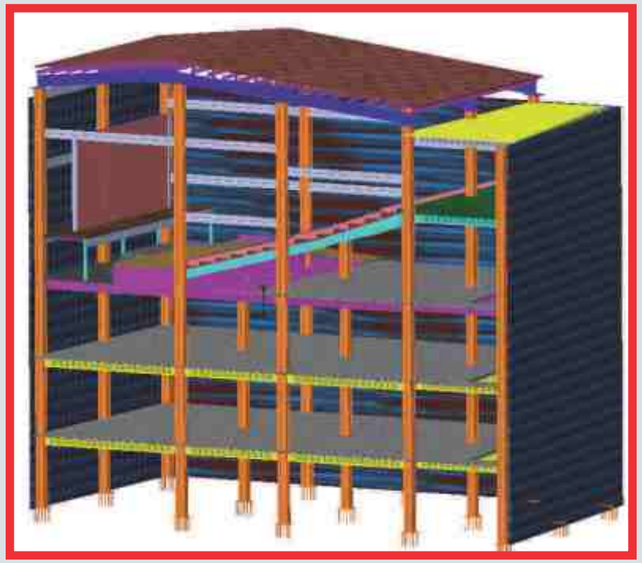
COMPLETED PROJECT

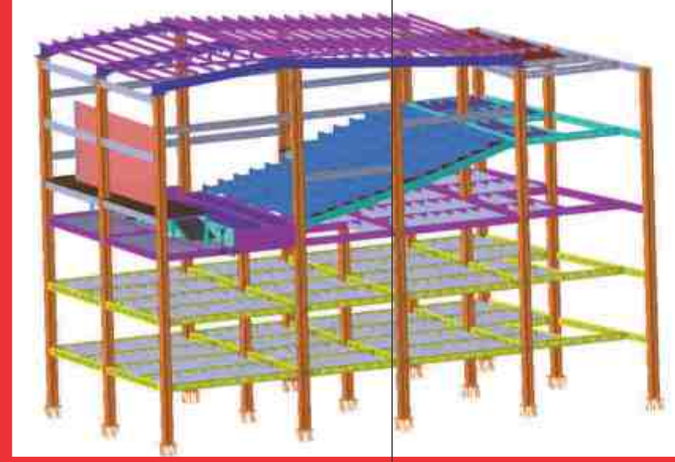
SHANKAR GALAXY MALL, SIRA ROAD, TUMKUR

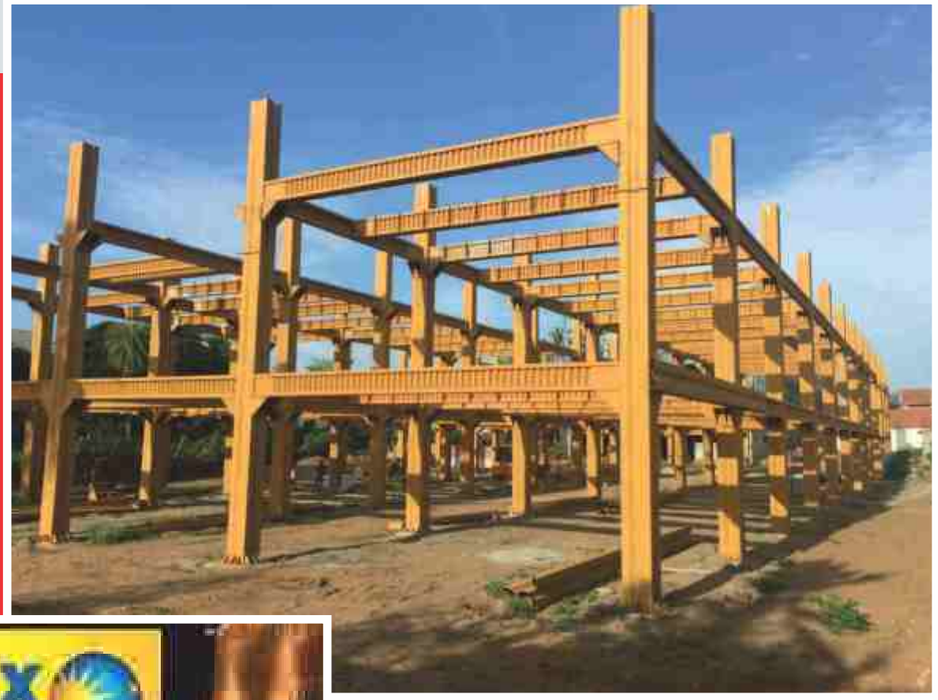
Project : **MULTIPLEX THEATRE, MALL AND SUPER MARKET**
Location : TUMKUR , KARNATAKA
Types of Structure : MALL , Ground + 4 With deck slab in steel structure
Grid Spacing : 10.5MX8.7M
Area : GROUND FLOOR-47,877 Sq. Ft. , **FIRST FLOOR**-49,790 Sq. Ft. , **SECOND FLOOR**-49,790 Sq. Ft. , **THEATRE FLOOR**-57,077 Sq. Ft. , **TERRACE FLOOR**- 26,031 Sq. Ft. **(Total- 230565 Sq. Ft.)**
Floor Height : Each Floor Clear Height is 5.2Mtr.
Highlights :

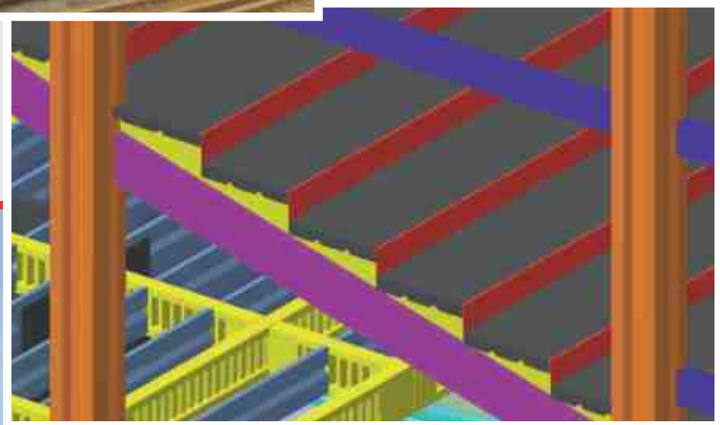
- The main entrance standing on the clear span of beam **77'.**
- Ground and First floor designed for live load of **850Kg/Sq. Mtr.** for D-Mart and Super Market.
- Second floor designed for live load of **650Kg/Sq. Mtr.** for Gold class theatre, Lobby area and box office.
- Third Floor area designed for live load of **650Kg/Sq. Mtr.** for 4 big screen multiplex theatre sitting area and projector rooms.
- Above the theatre area sloped terrace designed for live load **650Kg/Sq. Mtr.** and considered the load of theatre false ceiling.
- Above the Escalator Terrace area provided for **O.H.T** capacity of **40,000 Ltrs.**
- The Entire structure bearing the Dynamic load and Static load of **6-Escaltor, 9-Lifts and 6-Staircase.**

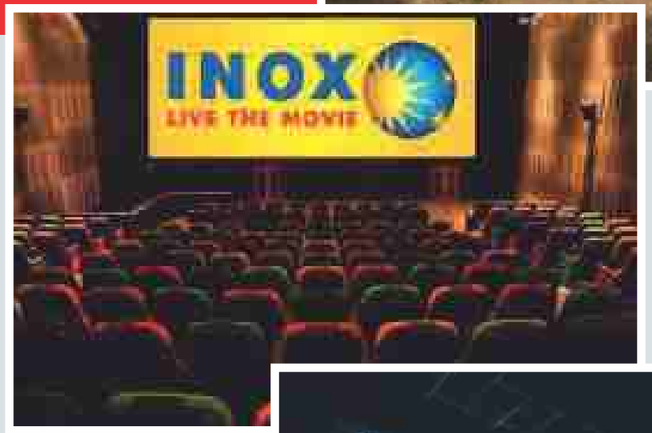










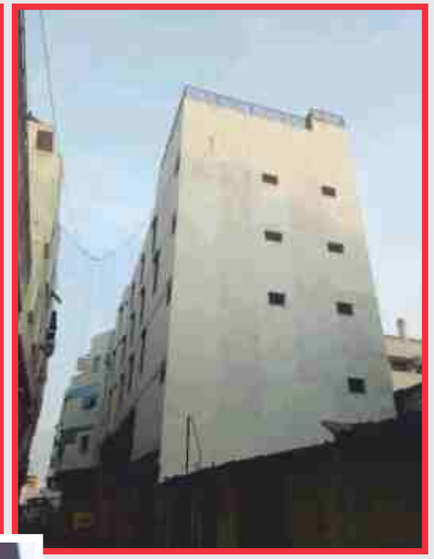

INOX
LIVE THE MOVIE

CONVENTIONAL HALL, BSK 3rd STAGE, BANGALORE

Project : **CONVENTIONAL HALL**
Location : Hosakerehalli, BSK 3rd Stage, Bangalore
Types of Structure : Multi Floor Structure (G+5 With Steel Deck Slab)
Grid Spacing : 7.6M x 6M (Dining Hall) 18.2M x 6M (Party Hall)
12.1M x 6M (Room Area) & 6M x 32M (Main Hall)
Area : Width 32M x Length 67M =2,144 Sq. Mtr (65,000 Sq.ft)
Floor Height : 3.0M (Room Area) 4.0M (Dining Hall) and 8.5M (Stage Area)
Highlights : The Entire 2nd floor area rooms above the stage area supported only on two Main Beams for length 17.6M clear span.
The clear Head room height stage area is 8.5M
The main hall area above the party hall is supported on 18.2M Clear span.
At Roof area, the gutters are resting on a 3.6M Cantilever supports.

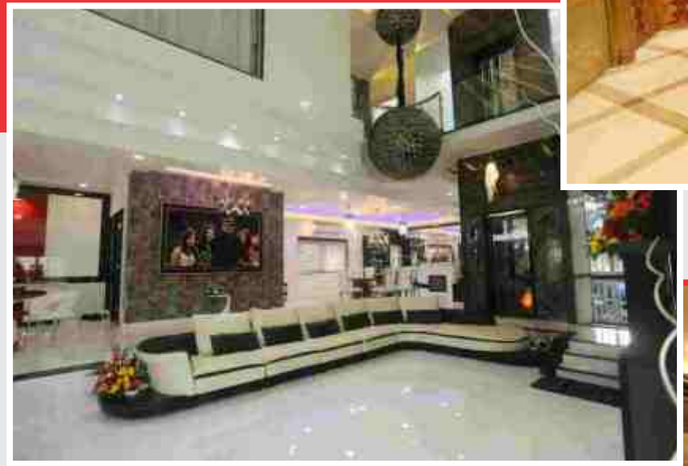
SIVA TRADERING CO., JC. ROAD, BANGALORE

Project : **SIVA TRADING CO.**
Location : JC. ROAD, BANGALORE
Types of Structure : COMMERCIAL BUILDING (G+5, Deck sheet slab)
Grid Spacing : 20' x 36'
Area : 78'-1" x 30'-6" = 2389.8 Sq.ft Each Floor
Floor Height : Mezzanine floor 7'-6", First floor 16'-7",
Second, Third and Terrace Floor 9'.
Highlights : This 5 Floor Commercial Building is Designed for 1.5Tons/Sq.Mtr each.The Roof Terrace is Designed for 400Kgs/Sq.Mtr.
The Structure is having a clear span of 36' without any mid supports at the centre to accommodate the clear Vehicle movement at Ground floor.
The Entire floor load is equally distributed and balanced on the two Main Beams of span 36'.
The four corners of the structure are having cantilever loads from 2'-6" to 8' lengths.
During the Footing excavation, it was found a traditional deep well of 30' depth and 12' diameter at one of the main corner column which is now standing on a steel piling of lengths 9mtr driven inside the WELL.



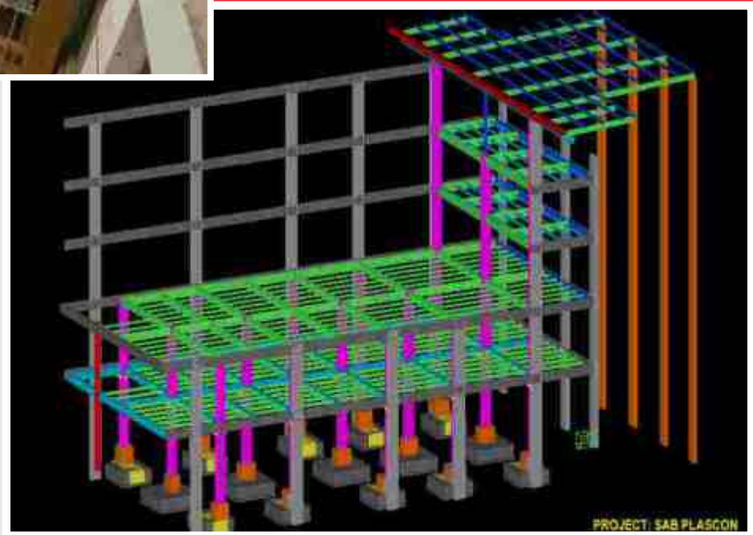
SUGAM HOUSE, RR NAGAR, BANGALORE

Project : **SUGAM RESIDENCE**
Location : Rajrajeshwarinagar, Bangalore
Types of Structure : Residential Building (G+4 With Steel Deck Slab)
Grid Spacing : 45' ft x 60' ft
Area : 19.5M x 14.3M x 10M (Corner site with Un-symmetrical)
Floor Height : 3.2M. & 5.2M
Highlights : The Entire Building supported only 8 Columns. The first floor and second floor rooms are supported on single beam which are having a clear span of 14.6M. The open pooja room is self supported on 3.0M Cantilever from the structure and has a dead load of 2tons idol sitting on the slab. The structural staircase is self supported and cantilever throughout the building for a length of 1M. The Swimming pool is resting in-between the columns without any supports at centre on roof terrace.



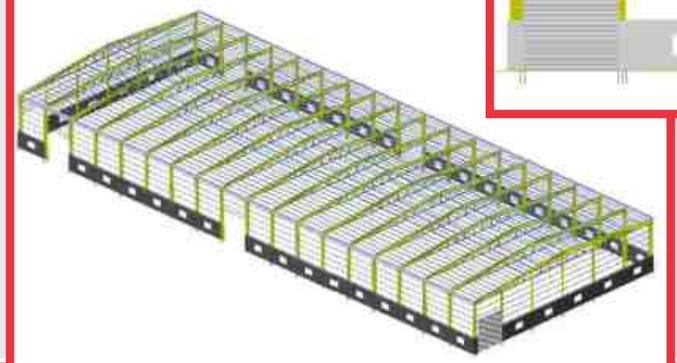
SAB PLASCON, HOSUR ROAD, BANGALORE

Project : **SAB PLASCON**
Location : KUDLUGATE, HOSUR ROAD, BANGALORE
Types of Structure : INDUSTRIAL BUILDING
(G+4, Deck sheet slab and one side slop Light Roof)
Grid Spacing : 21' x 20'-5"
Area : 40'-9" x 89'-3" = 3636 Sq.ft, Each Floor
Floor Height : First floor Clear Height 16', second, third & forth floors 12'.
Highlights : The Structure is constructed within the existing RCC building surround. This Industrial Building consists of 4 Floors. The First Floor is Designed for 2Tons/Sq.Mtr and remaining 3 Floors are Designed for 400 Kgs/Sq.Mtr and 600 Kgs/Sq.Mtr.
The Terrace Floor is having Puff Insulated Panels of 50mm Thick.



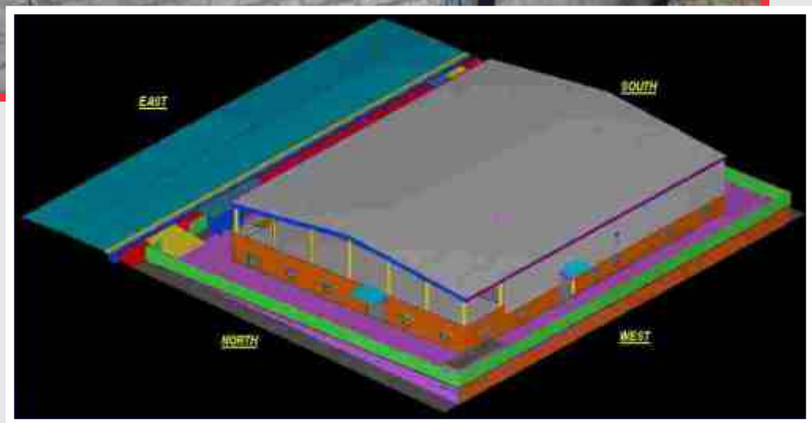
KABADI SHANKARASA CO., DODDABALLAPUR

Project : **KABADI PROCESSING UNIT**
Location : DODDABALLAPUR
Types of Structure : INDUSTRIAL SHED ('A' Type Light Roof)
Grid Spacing : 20' ft x 142' ft
Area : 142' ft x 360' ft = 51,120 Sq.ft
Floor Height : Eave Height 30' ft
Highlights : This Covered Structure enables the Garment Industry for the Processing unit.
The Structure is self supported with span of 142’ out to out of the columns and with a clear working span for 140’.
The side Eave height is 30’ clear which serves for the Processing machines to accommodate the area.
To maintain the flat ground profile, the East side area is back filled and the retaining wall height about 12’ is constructed.



LIGEON ENERGY, DODDABALLAPUR

Project : **LIGEON ENERGY**
Location : DODDABALLAPUR
Types of Structure : INDUSTRIAL BUILDING (G+1 Mezzanines With 'A' Type Light Roof)
Grid Spacing : 25' ft x 140' ft
Area : 140' ft x 180' ft =25,200 Sq.ft
Floor Height : Eave Height 22' ft
Highlights : This is a Industrial Building and Designed for 140’ clear span in between the columns and having capacity to carry 5MT EOT cranes later if required at any column area as required.
Within the Structure area, it also have a closed Covered Galvanizing unit area. The Structure also has the Administration office and cafeteria at Mezzanine floor areas.



METAL CRAFT, AMBATTUR INDUSTRIAL ESTATE, CHENNAI

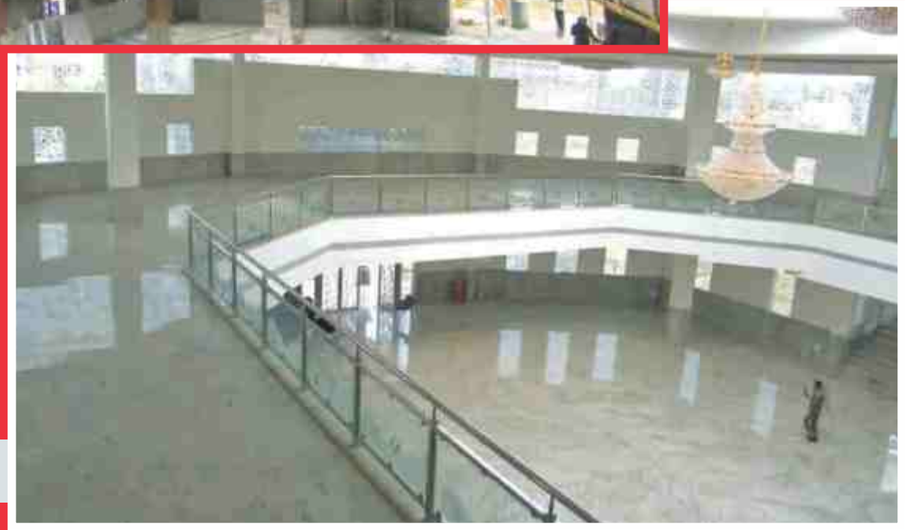
Project : **METAL CRAFT**
Location : AMBATTUR INDUSTRIAL ESTATE CHENNAI
Types of Structure : Ground+3 with deck slab in steel structure.
Area : W 16 m x L 43 m - 2064 Sqm.
Floor Height : The ground floor height 6 meter ,The first floor height is 3.35meter .The second floor height is 3.35 meter.
Highlights : 8m x 15 m grid and provided Eot crane of 10 tons on each floor. The design load bearing is 1.5ton/sqm,

MPHASIS SOFTWARE BUILDING, MANGALORE, KARNATAKA

Project : **SOFTWARE INFRASTRUCTURE**
Location : Mangalore , Karnataka
Types of Structure : Combination of PEB & Multi floor building with Deck slab.
Area : W 18 m x L 72 m - 2600 Sqm.
Floor Height : 3.2 meter, the first floor eave height is 3.5meter, center height is 4.5.
Highlights : Between column 9meter x 6 meter grid. The design load bearing is 400 Kgs/sqm.

M. K. CONVENTION HALL, THANNIRHALLA, HASSAN, KARNATAKA

Project : **MULTI FLOOR MARRIAGE HALL**
Location : Hassan Karnataka
Types of Structure : Ground+4 with deck slab in steel structure.
Area : W 30m X L 41m - 4900 sqm
Floor Height : 3.2 mts
Highlights : The centre of hall is 17m X 17m grid, provided with 11 meter diameter dome and floor height is 12 meter rest of the columns are peripheral columns. Back portion we have constructed 5 floors with cantilever of 3meter.



NANDI TVS SHOW ROOM, HUNSUR ROAD, MYSORE

Project : AUTOMOBILE SHOWROOM
Location : Hunsur Road, Mysore
Types of Structure : Multifloor, G+2 with deck slab.
Area : 17 Mtrs. X 10 Mtrs.
Floor Height : Each floor is 12 ft.
Highlights : 9 Mtrs. X 5 Mtrs Grid & design load bearing of each floor is commercial.

NINE STAR MOTORS - SUZUKI SHOW ROOM, HOSUR ROAD, BANGALORE

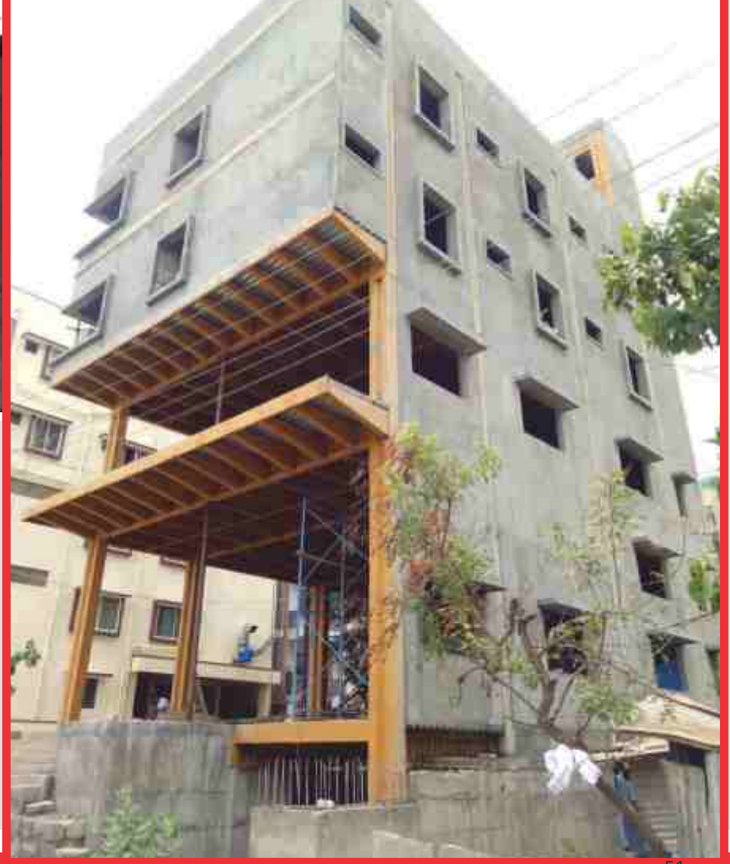
Project : AUTOMOBILE SHOWROOM
Location : Hosur Road, Bangalore
Types of Structure : Multifloor, G+2 with deck slab & top roof is lite roof.
Area : 20 Mtrs. X 17 Mtrs.
Floor Height : Each floor is 10 ft.
Highlights : 7 Mtrs. X 6 Mtrs Grid & design load bearing of each floor is commercial.

YOGA DHAMA, SRIRANGNGAPATNA, MANDYA DIST.

Project : YOGADHAM
Location : Srirangapatna, Mandya Dist.
Types of Structure : Resort (G + 1 With Steel Deck Slab)
Grid Spacing : 9.1M x 4.8M
Area : Width 22.7M x Length 26.7M = 606 Sq.Mtr (13,045 Sq.ft)
Floor Height : 3.6mtr
Highlights : The Building is constructed on the river banks of kaveri and the SBC of the soil is below 9kn/Sq.mtr which is very low when compared to normal bearing capacity. The foundation depth is only 1.5M & has clear span of 9.1M between the columns. The YOGA room at second floor (1,790 Sq.ft) is cantilevered for a length of 3M.

LAKSHMAN COMMERCIAL COMPLEX, NAGARBAVI, BANGALORE

Project : **Commercial Building**
Location : Nagarbahavi, Bangalore
Types of Structure : Multi Floor Building, (Ground + 4 Floor With deck slab)
Grid Spacing : 4.6M X 9.5M
Area : W12M X L 18M - 216 Sq. Mtr.
Floor Height : Ground Floor Height is 4.8Mtr. First Floor Height is 3.6Mtr, And List floor Height is 3Mtr.
Highlights : 4.6 M X 9.5 M Grid Span. The design load bearing at ground floor 1ton/Sq. Mtr, For Commercial Shops, and list floor is 650Kg/ Sq. Mtr, Considering the PG accommodation.



ALUFIT INDIA Pvt., LTD., HOSUR, TAMILNADU

Project : **Industrial Shed (warehouse)**
Location : Hosur, Tamilnadu
Types of Structure : PEB structure (Shed)
Grid Spacing : 7.7M X 17M
Area : W 36m X L 62m- 2294 Sq. Mtr.
Floor Height : Eave Height is 7Mtr. Center Height is 8.8Mtr.
Highlights : This Covered Structure enables the Glazing Industry for the Processing unit. The Structure is self supported with span of 36mtr out to out of the Columns. The side Eave height is 7mtr clear, which serves for the Processing glazing to accommodate the area.

SRI RAGHAVENDRA ENGINEERINGS WORKS, Kumbalgudu, Mysore Road, Bangalore

Project : INDUSTRIAL BUILDING
Location : Mysore road , Bengalore, Karnataka
Types of Structure : PEB building with 'A' shape
Area : 98 m X 34 m - 3724 Sqm.
Height : 9 m centre height, Eave height-7m
Highlights : Column are placed at 34 m centre to centre on the longer side of the building. Columns are placed at 6m periphery at shorter side of the building

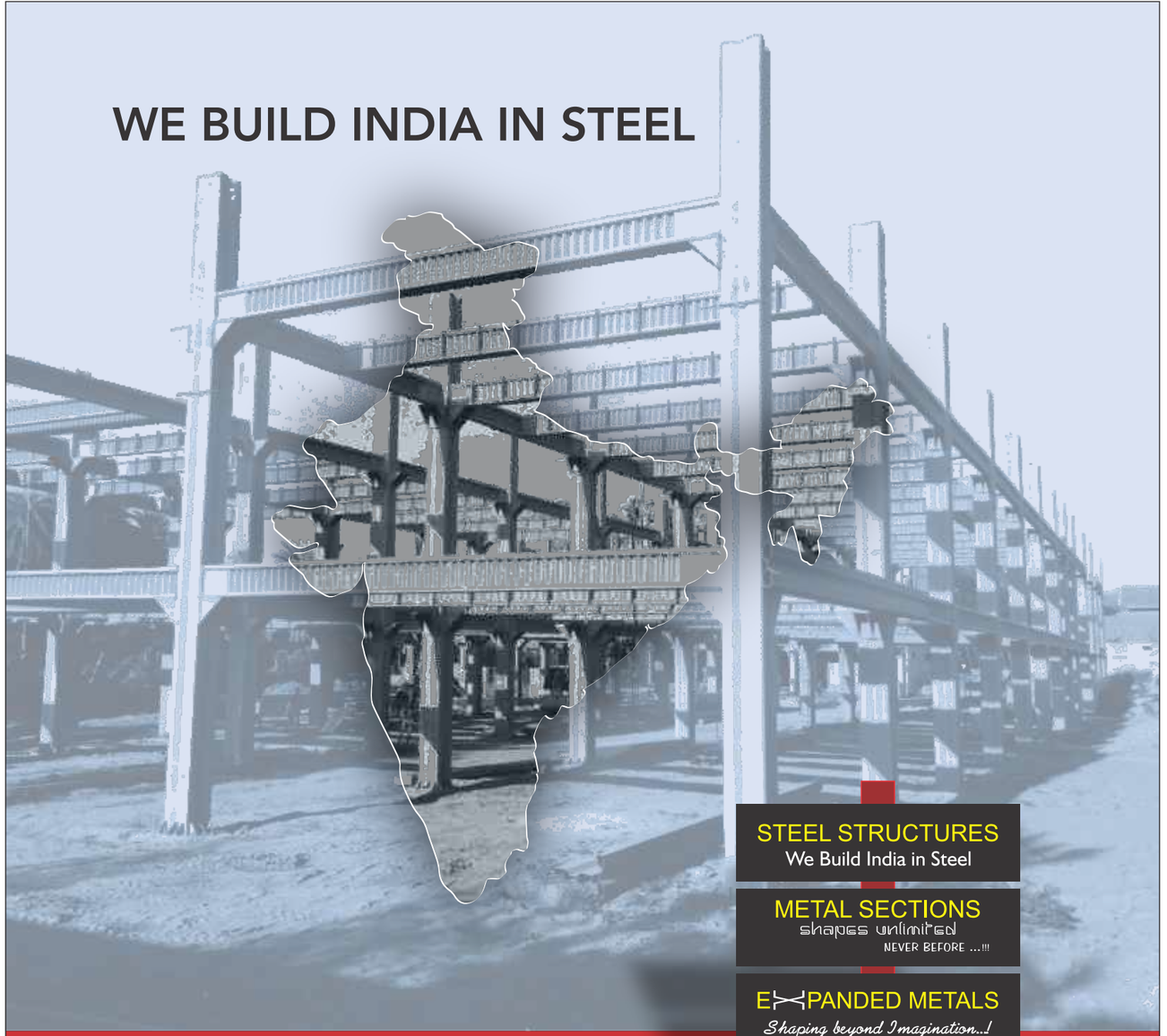
LAKSHMI CONVENTION HALL, Nelamangala, Bangalore

Project : INDUSTRIAL BUILDING
Location : Mysore road , Bengalore, Karnataka
Types of Structure : PEB building with 'A' shape
Area : 98 m X 34 m - 3724 Sqm.
Height : 9 m centre height, Eave height-7m
Highlights : Column are placed at 34 m centre to centre on the longer side of the building. Columns are placed at 6m periphery at shorter side of the building.

Some of our prestigious Clients

Infosys, Biocon, Simplex, Urban Ladder, Puravankara, INOX, TVS, ETA Melco, BEML, Suzuki, L&T, Jindal Steel & Power, JGI Jain Group of Institutions, Mphasis an HP company, Lufit, Rexam, Magna Sys, Satrac, Hensel, Hero, Honda, DivyaSree, Legion Energy, Rockline mall & cinemas Bannerghatta, Mysuru, B L Hashyap, Veda, Kabadi Shankarsa And Company Pvt Ltd, Ace Designers, Fowler Westrup, Malligarjun Associates, Aditya Green, K-Lite, Saileela Group, KMS Coach Builders Pvt Ltd, Metalcraft, IMAC, Urban Homez, Geodesic Techniques, Universal Urethane Products, Ambient Controls Pvt. Ltd., Kailash Roofing Solutions, Ingersoll Rand, geodesictechniques, LMW Lakshmi Machine Works, P G Setty Construction Technology Pvt Ltd., Super, Shadeflex, Anger Valley, Tanglin, tenova Delkor

and many more...



STEEL STRUCTURES
We Build India in Steel

METAL SECTIONS
shapes unlimited
NEVER BEFORE ...!!!

EXPANDED METALS
Shaping beyond Imagination..!

Deco GRILL
Ready to FIT..!!

SMT
sugam
MET TECH (P) LTD.
(Formerly **Sugam Engineers**)

REGD. OFFICE & WORKS:
12 - 15, "A" Cross,
Opp. Gopalan Arcade, Near Sports Authority of India, Mysore Road,
Bengaluru - 560039. Karnataka, INDIA

BIDADI PLANT: Survey No. 15/1,
(Behind Maharshi Institute of Excellence) Vaishnodevi Industrial Estate, (Next to Malgudi Vattika Veg. Restaurant),
Bheemanahalli Village, Hosadoddi, Mysore Road,
Bidadi Hobli, Ramanagara Taluk & District - 562109,
KARNATAKA, INDIA.

T +91 80 2860 0732 / 2860 1422
M +91 95901 12191, 95901 12151
M +91 99001 01880
E sales@SugamMetTech.com
E marketing@SugamMettech.com
W **www.SugamMetTech.com**