

Prefabricated buildings: advantages and disadvantages



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There are many different types of construction buildings such as residential, commercial or industrial. Industrial buildings are mainly used for manufacture & warehousing, offices, showrooms, sport, retailing, agricultural and horticultural buildings, recreation & leisure, swimming pool enclosures as well as many other aspects. If your business is in need of extra space; whether it is for storage or to conduct aspects of business, an industrial building, such as a warehouse may be the answer that your business is looking for.

Industrial buildings, such as the ones named above are available from many different building contractor teams and they are often available as both a permanent or temporary business solution. You may need the use of an industrial building as a way of housing certain equipment and supplies as well as providing you with a space that can be dedicated for you to undertake aspects of business. Depending on what you need the industrial building for depends on what type of building you have constructed. If you need the extra space as a place where people can do business then a more permanent structure may be in order. Also if you are planning on using your industrial building as an added work space then it is important that you ensure the building is insulated and that your employees are protected.

Many of the industrial buildings that are open to you to use for your business provide you with a comfortable working environment and in many cases reduce energy through the quality and reliability which can be achieved with high performance insulation solutions. Also by choosing a reliable building contractor team to install your industrial building you will be getting a

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workspace which creates a clean environment for all of your production, storage, material handling and infrastructure needs.

Many building contractor teams will design your industrial buildings using cladding and lining and will incorporate windows and doors that in some cases are double glazed as well as being tough when it comes to security. You will be able to decide what features are and aren't included on your industrial building, meaning from the start you will know exactly what you are buying.

When you are deciding on including an industrial building into your workplace you need to ensure that the execution of the project is successful. One way of making sure that this happens is by conducting effective planning as this is essential to ensure that you get what you want from your industrial building. During your planning for your industrial building you should consider aspects such as the environmental impact of the job, the success of the scheduling, budgeting and site safety as well as the availability of materials, logistics and the inconvenience to the public caused by construction delays, preparing tender documents, etc.

If you are hoping to gain the extra help from the use of an industrial building then it is highly important that you gain the help of a professional building contractor team to construct your industrial building.

Identify the Differences of the Prefabricated and Pre Engineered Buildings.

Prefabricated building is a type of building that consists that of several factory built components or units that are assembled on site to complete the
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unit. Its Prefabricated / Pre-engineered components away from the site and bringing them to site and assembling. These methods reduce construction time at the site, facilitate better quality control and reduce labour component which involves in the site.

Prefabricated Buildings.

The term ' prefabricated' may refer to buildings built in components (e. g. panels), modules (modular homes) or transportable sections (manufactured homes), and may also be used to refer to mobile homes, i. e. houses on wheels. Although similar in nature, the methods and design of the three can vary wildly. There are two-level home plans, as well as custom home plans. There are also large differences in the construction types. Mobile and manufactured houses are constructed in accordance with the HUD building codes in the U. S. while modular houses are constructed in accordance with the IBC (International Building Code).

Modular homes are homes that are created in sections, and then transported to the home site for construction and installation. These are typically installed and treated like a regular house, for financing, appraisal and construction purposes, and are usually the most expensive of the three. Although the sections of the house are prefabricated, the sections, or modules, are put together at the construction much like a typical home. Manufactured and mobile houses are rated as personal property and depreciate over time.

Manufactured homes refer to homes that are built onto steel beams, and are transported in complete sections to the home site, where they are assembled.

Mobile homes are homes built on wheels, which are able to be moved from place to place.

Mobile homes and manufactured homes can be placed in mobile home parks, and manufactured homes can also be placed on private land, providing the land is appropriately zoned for manufactured homes.

As far as getting set up, prefabricated buildings can be erected rather quickly - some in as little as 45 days. Companies can start concentrating on making money rather than concerning themselves with when their building will be finished.

Prefabricated buildings can be constructed at almost half the cost of a traditional building. For a basic structure such as a portable office or classroom, expect to pay about \$35 per square foot. More complex prefabricated buildings - medical clinics and retail facilities - will cost you close to \$200 per square foot. While not exactly a drop in the bucket, it's still more affordable than traditional construction, particularly if the prefabricated buildings are only going to be used for a fixed period of time.

For those companies who look beyond price and convenience, prefabricated buildings do have a few downsides. The most obvious is the look and feel. At their most basic, prefabricated buildings are meant to be quick, affordable solutions - so they aren't the prettiest structures in the world. Elevated

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entrances and shorter ceilings don't really add to the décor, but if you are willing to spend a bit more, you can upgrade your prefabricated buildings to have more stylish designs.

The types of materials used for prefabricated buildings are usually aluminum, wood, steel, fiberglass, and concrete. The steel used in these structures is specially treated to resist corrosion, rust, and fire. The use of plastics and other composite materials offer a less expensive option for surface materials without sacrificing durability or quality. The construction of the components of the prefabricated building is accomplished inside the factory where the plumbing and electrical systems are tested before they are exported to their destinations. The wall finishes and countertops are also installed inside the factory. Although customization is available, prefabrication businesses are able to buy much of their material in bulk and thus are able to pass on the savings to their buyers.

Pre-engineered Buildings

In structural engineering, a pre-engineered building (PEB) is designed by a manufacturer to be fabricated using a pre-determined inventory of raw materials and manufacturing methods that can efficiently satisfy a wide range of structural and aesthetic design requirements. Within some geographic industry sectors these buildings are also called Pre-Engineered Metal Buildings (PEMB) or, as is becoming increasingly common due to the reduced amount of pre-engineering involved in custom computer aided designs, simply, Engineered Metal Buildings (EMB).

Historically, the primary framing structure of a pre-engineered building is an assembly of “ I” shaped members, often referred as “ I” beams. In pre-engineered buildings, the “ I” beams used are usually formed by welding together steel plates to form the “ I” section. The “ I” beams are then field-assembled (e. g. bolted connections) to form the entire frame of the pre-engineered building. Some manufacturers taper the framing members (varying in web depth) according to the local loading effects. Larger plate dimensions are used in areas of higher load effects.

Other forms of primary framing can include trusses, mill sections rather than 3-plate welded, castellated beams, etc. The choice of economic form can vary depending on factors such as local capabilities (e. g. manufacturing, transportation, construction) and variations in material vs. labour costs.

Typically, primary frames are 2D type frames (i. e. may be analyzed using 2-Dimensional techniques). Advances in computer aided design technology, materials and manufacturing capabilities have assisted a growth in alternate forms of Pre-engineered building such as the Tension fabric building and more sophisticated analysis (e. g. 3-Dimensional) as is required by some building codes.

Cold formed Z and C-shaped members may be used as secondary structural elements to fasten and support the external cladding.

Roll-formed profiled steel sheet, wood, tensioned fabric, precast concrete, masonry block, glass curtain wall or other materials may be used for the external cladding of the building.

In order to accurately design a pre-engineered building, engineers consider the clear span between bearing points, bay spacing, roof slope, live loads, dead loads, collateral loads, wind uplift, deflection criteria, internal crane system and maximum practical size and weight of fabricated members. Historically, pre-engineered building manufacturers have developed pre-calculated tables for different structural elements in order to allow designers to select the most efficient I beams size for their projects. However, the table selection procedures are becoming rare with the evolution in computer aided custom designs.

While pre-engineered buildings can be adapted to suit a wide variety of structural applications, the greatest economy will be realized when utilizing standard details. An efficiently designed pre-engineered building can be lighter than the conventional steel buildings by up to 30%. Lighter weight equates to less steel and a potential price savings in structural framework.

Applications of Pre Engineered Buildings (PEB)

- Warehouses
- Factories
- Workshops
- Offices
- Gas stations
- Vehicle parking sheds
- Showrooms
- Aircraft hangars
- Metro stations
- Schools

- Recreational
- Indoor stadium roofs
- Outdoor stadium canopies
- Bridges
- Railway platform shelters

Advantages of Pre Engineered Buildings

Reduced construction time:

Buildings are typically delivered in just a few weeks after approval of drawings. Foundation and anchor bolts are cast parallel with finished, ready for the site bolting. Our study shows that in India the use of PEB will reduce total construction time of the project by at least 50%. This also allows faster occupancy and earlier realization of revenue.

Lower cost:

Due to the systems approach, there is a significant saving in design, manufacturing and on site erection cost. The secondary members and cladding nest together reducing transportation cost.

Flexibility of expansion:

Buildings can be easily expanded in length by adding additional bays. Also expansion in width and height is possible by pre designing for future expansion.

Large clear spans:

Buildings can be supplied to around 80M clear spans.

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Quality control:

As buildings are manufactured completely in the factory under controlled conditions the quality is assured.

Low maintenance:

Buildings are supplied with high quality paint systems for cladding and steel to suit ambient conditions at the site, which results in long durability and low maintenance coats.

Energy efficient roofing and wall systems:

Buildings can be supplied with polyurethane insulated panels or fiberglass blankets insulation to achieve required “ U” values.

Architectural versatility:

Building can be supplied with various types of fascias, canopies, and curved eaves and are designed to receive pre cast concrete wall panels, curtain walls, block walls and other wall systems.

Single source responsibility:

As the complete building package is supplied by a single vendor, compatibility of all the building components and accessories is assured. This is one of the major benefits of the pre engineered building systems.

Investigate various types of materials, which can be used for the factory and residential Buildings in this project.

Materials used for pre-fabricated buildings

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Prefabricated building materials are used for buildings that are manufactured off site and shipped later to assemble at the final location. Some of the commonly used prefabricated building materials are aluminum, steel, wood, fiberglass and concrete.

Prefabricated metal buildings use galvanized steel and galvalume as the chief materials for building. Galvalume is a form of steel coated with aluminum-zinc. This is to protect the building against corrosion, rust and fire. It also provides a sturdy and protective covering to the prefabricated building. Almost all the components of a metal building such as beams, frames, columns, walls and roofs, are made of steel. Most prefabricated military buildings use steel or aluminum frames. Synthetic materials are used for the walls and roofs. To provide enhanced security, a combination of both metal and cloth materials are used. Plastic flooring materials can be quickly assembled and are very durable.

Prefabricated building materials used for small prefabricated buildings are steel, wood, fiberglass, plastic or aluminum materials. These materials are cheaper than regular brick and concrete buildings. Materials like steel, fiberglass, wood and aluminum are used as prefabricated building materials for sports buildings. These materials provide flexibility and are preferred for making structures and accessories like stands and seats for stadium and gyms.

For making low cost houses, prefabricated materials like straw bale, Ferro cement, Calcium silicate products, composites and other cheap wood based materials are currently being used. Calcium silicate bricks are strong and

durable. Ferro cement consists of a cement matrix reinforced with a mesh of closely-spaced iron rods or wires. In this type of construction, the techniques used are simple and quick.

Using prefabricated materials one can make durable, water and fire resistant and cheap prefabricated buildings. Most of the prefabricated building materials are eco-friendly and affordable.

- Steel
- Aluminum
- Wood
- Fiberglass
- Materials used for pre-engineered buildings
- Steel / Stainless steel
- Galvalume roof sheeting
- Stainless steel capped fasteners
- Silicon zed polyester baked-on enamel paint
- Various types of materials

Steel

For prefabricated buildings, steel and galvalume materials are used.

Galvalume is a form of steel coated with aluminum-zinc. This is to protect the building against corrosion, rust and fire. It also provides a sturdy and protective covering to the prefabricated building. Most of components are built in steel in prefabrication buildings such as beams, frames, columns, walls and roofs, are made of steel.

Aluminum

Most prefabricated buildings use aluminum as a material for frames. It can be window frames or door frames. Because of its light weight it is very useful for prefabrication building production.

Wood

These materials provide flexibility and are preferred for making structures and accessories like stands and seats for stadium and gyms. And wood use for prefabricated buildings for some of the components. It is not a most probably used material. This material is used for making of low cost prefabricated homes.

Fiberglass

The fiberglass material is used for the partition walls in the buildings. And its light weight is useful for constructing prefabricated buildings. And for doors and window frames, doors fiberglass is used.

Advantages of Prefabricated Buildings

Prefabricated homes can be ordered and transported straight to your block. You can organize the stumping and plumbing and electrical connections or have it pre ordered into the overall package.

Prefabricated homes cause less damage to the environment than conventional brick homes. They can be mass produced or fabricated to your design and are quick to build so it will save you rent as brick homes tend to be dragged out with different contractors' being involved.

They will cost a lot less, than a double brick home by far. They can be insulated to reduce the cost of heating and cooling. Not only that they are environmentally friendly.

The real beauty of one of these is if you have a real bad neighbor you can up and take your home and chattels to another town without any problems.

- As it saves time
- It saves money and labour
- Enables money and standardization.
- Enhances aesthetic appeal.
- It is lightweight and easy to transport.
- Easy to installing and maintaining: i. e. rust, fire, and pest retardant and insulated.
- It is re-locatable and eco-friendly.

The disadvantages of prefabricated homes

The cost of your prefabricated home will depend on the site your home will be put on. Site costs will vary from block to block. If you are doing the stumping etc yourself then that is not a problem. If they need to factor that into the price they will need to make varying changes to prices due to level and position of the block where the prefabricated home will be built.

Your choice of prefabricated home will be affected by your particular budget. Low cost designs may suit those on a tight budget. Then if you can afford the better styles, then price may not affect your decision.

The better high quality designs are made for the higher income families and could be out of your price range.

Prefabricated homes are improving like other forms of buildings and the main advantage of a prefabricated home is the potential to reduce the harmful impact on our environment. This is one of the world's biggest concerns these days.

Materials used for pre-engineered buildings

- Steel / Stainless steel
- Galvalume roof sheeting
- Stainless steel capped fasteners
- Silicon zed polyester baked-on enamel paint

The Advantages of pre-engineered buildings

- Fast erection
- Low cost if choosing manufacturer's standard package/inventory and no add on
- Open clear span
- Can be easily expanded to grow with needs
- The disadvantages of pre-engineered buildings
- Marginal design, material and construction
- Not energy efficient
- Higher lifetime maintenance
- Not durable for long term use, generally last 10 to 15 years
- May not include all construction/fit-up needed for the building to serve the intended purpose.

- No secondary roof membrane
- Usually no internal finished walls
- Pre-engineered steel fabric buildings vs. Conventional steel buildings

Steel Fabric Structures

Conventional Steel Buildings

Overall Price

Price per square foot is about 30% lower than conventional steel

More expensive than a pre-engineered steel fabric building

Maintenance Costs

The building and fabric cover is virtually maintenance free. The fabric will not attract or hold dirt contaminants and proves to be self-cleaning

Shingling or painting may be

necessary to maintain the outside of the building

Interior

Clear span throughout building does not interfere with any operations

Columns or posts may need to be in place to maintain structural

integrity of the building

Corrosion

Our buildings are made with hot

dipped galvanized steel and are corrosion resistant

Due to the exterior of the building being exposed in all weather conditions, corrosion may become an issue

Temperature Control

Our membrane fabric cover had

non-conductive qualities keeping

buildings cooler in the summer

and warmer in the winter

Steel buildings are conductive of

heat, creating a virtual oven in

hot weather conditions

Operational Costs

Lower costs for lighting, heat,

and A/C due to non-conductive

translucent cover

Operational costs are higher for

lighting, heat, and A/C

Future Expansions

Our buildings are easily expandable and reloadable. Can be used as a temporary and permanent structure.

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Steel buildings are permanent and cannot be relocated. Expansion will be timely and costly, if possible.

Foundation

Foundation can be as little as

Footings at truss and end column base plate locations. Foundation requirements are typically a fraction of that of similar conventional buildings.

Extensive, heavy foundation

required

Installation and delivery

Depending on the size of the

Structure installation takes an average of 7-10 days. Delivery after order takes about 6-12 weeks.

Delivery of material averages

From 20 to 26 weeks. Installation Time is more than double that of a steel fabric structure.

Noise

Sound absorbing covers keep

building quiet even during adverse weather conditions

Buildings are loud during rain and hail storms creating unpleasant working conditions

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Condensation

Our membrane fabric design

allows natural light to filter through the building while keeping out moisture and condensation

Condensation is a known problem in steel buildings and can damage the building and its contents

Structure weight

Pre engineered buildings are on the average 30% lighter because of the efficient use of steel. Primary framing members are tapered built up section. With the large depths in areas of higher stress.

Secondary members are light weight roll formed “ Z” or “ C” shaped members.

Primary steel members are selected hot rolled “ T” sections. Which are, in many segments of the members heavier than what is actually required by design? Members have constant cross section regardless of the varying magnitude of the local stresses along the member length

Secondary members are selected from standard hot rolled sections which are much heavier.

Design

Quick and efficient: since PEB's are mainly formed by standard sections and connections design, time is significantly reduced. Basic design based on international design codes are used over and over.

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Specialized computer analysis design programs optimize material required.

Drafting is also computerized using standard detail that minimizes the use of project custom details.

Design shop detail sketches and erection drawings are supplied free of cost by the manufacturer. Approval drawing is usually prepared within in 2 weeks.

PEB designers design and detail PEB buildings almost every day of the year resulting in improving the quality of designs every time they work

Each conventional steel structure is designed from scratch with fewer design aids available to the engineer.

Substantial engineering and detailing work is required from the very basic is required by the consultant with fewer design aids.

Extensive amount of consultant time is devoted to the alterations that have to be done.

As each project is a new project engineers need more time to develop the designs and details of the unique structure.

Erection simplicity

Since the connection of compounds is standard the learning curve of erection for each subsequent project is faster.

Periodic free of charge erection is provided at the site by the manufacturer.

The connections are normally complicated and differ from project to project resulting tin increasing the time for erection of the buildings.

There has to be separate allocation of labour for the purpose of erection.

Erection cost and time

Both costs and time of erection are accurately known based upon extensive experience with similar buildings.

The erection process is faster and much easier with very less requirement for equipment.

Typically, conventional steel buildings are 20% more expensive than PEB in most of the cases, the erection costs and time are not estimated accurately.

Erection process is slow and extensive field labors required. Heavy equipment is also needed.

Architecture

Outstanding architectural design can be achieved at low cost using standard architectural details and interfaces.

Special architectural design and features must be developed for each project which often requires research and thus resulting in higher cost.

Sourcing and coordination

Building is supplied complete with all accessories including erection for a single “ ONE STOP SOURCE”.

Many sources of supply are there so it becomes difficult to co ordinate and handle the things.

Building accessories

Designed to fit the system with standardized and inter changeable parts. Including pre designed flashing and trims. Building accessories are mass produced for economy and are available with the building.

Every project requires different and special design for accessories and special sourcing for each item. Flashing and trims must be uniquely designed and fabricated.

Future expansions

All project records are safely and orderly kept in electronic format which makes it easy for the owner to obtain a copy of his building record at any time.

Future expansion is very easy and simple.

It would be difficult to obtain project records after a long period of time. It is required to contact more than one number of parties.

Future expansion is most tedious and more costly.

Safety and responsibility

Single source of responsibility is there because the entire job is being done by one supplier.

Multiple responsibilities can result in question of who is responsible when the components do not fit in properly, insufficient material is supplied or parts fail to perform particularly at the supplier/contractor interface.

Performance

All components have been specified and designed specially to act together as a system for maximum efficiency, precise fit and peak performance in the field.

Experience with similar buildings, in actual field conditions worldwide, has resulted in design improvements over time, which allows dependable prediction of performance.

Components are custom designed for a specific application on a specific job. Design and detailing errors are possible when assembling the diverse components into unique buildings.

Each building design is unique, so prediction, of how components will perform together is uncertain. Materials which have performed well in some climates may not do well in other conditions.

Explain the appropriateness, advantages and disadvantages of using prefabricated buildings in the project

The advantages of having prefabricated buildings in this project

Prefabricated buildings can be ordered and transported straight to your block. Client can organize the stumping and plumbing and electrical connections or have it pre ordered into the overall package. Prefabricated buildings cause less damage to the environment than conventional brick buildings. They can be mass produced or fabricated to the design and are quick to build so it will save you rent as brick buildings tend to be dragged out with different contractors' being involved. They will cost a lot less, than a

double brick building by far. They can be insulated to reduce the cost of heating and cooling. Not only that they are environmentally friendly.

The disadvantages of having prefabricated buildings in this project

The cost of your prefabricated building will depend on the site your home will be put on. Site costs will vary from block to block. If you are doing the stumping etc yourself then that is not a problem. If they need to factor that into the price they will need to make varying changes to prices due to level and position of the block where the prefabricated home will be built.

The choice of prefabricated building will be affected by your particular budget. Low cost designs may suit those on a tight budget. Then if you can afford the better styles, then price may not affect your decision.

Prefabricated homes are improving like other forms of buildings and the main advantage of a prefabricated home is the potential to reduce the harmful impact on our environment. This is one of the world's biggest concerns these days.

The advantages of having a prefabricated steel building

Steel is a remarkable material that has been steadily increasing in popularity for construction. It is 66% recyclable, which offers both environmental and financial benefits, and is especially strong and durable. There are a number of options available for building with steel, and one of the most innovative of those options are pre-engineered steel buildings. They are planned, designed and almost pre-built at the factory itself. They just have to be assembled after they reach the building site. They are pre-drilled, pre-cut and pre-welded and just need to be bolted together. This can often be done quickly

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and with a minimum of professional assistance, and sometimes with none at all.

They are quicker, easier and almost 50% less expensive than conventional buildings. Besides, they can be designed as per exact specifications.

Elements of the site, other buildings in the area, proposed purpose, and other elements can be taken into consideration.

This is the reason for the increasing use of pre-engineered steel buildings for schools, offices, houses, stores, churches and recreational places.

Pre-engineered steel buildings, which have no support columns, are known as clear-span buildings. Though they maximize floor space, they cannot be expanded in width. On the other hand, multi-span buildings have unlimited scope for expansion and are thus are often a popular choice for offices and residential buildings.

Pre-engineered steel homes have also become very popular in recent years. They offer affordability and flexibility, among many other benefits. There are two kinds of pre-engineered steel buildings: modular and manufactured homes. The only difference is that manufactured homes need not be built as per the building codes, unlike modular homes. For this reason, modular homes are often considered to be more sturdy and reliable.

Whether you're creating a manufactured home, modular home, or even a new office, pre-engineered steel buildings offer a vast array of affordable and durable options.

Specification for a Pre-fabricated building

Panels for a Pre-fabricated building

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