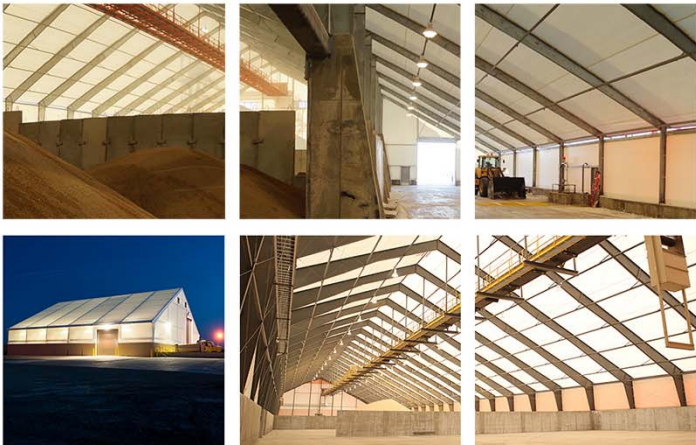


# Smart Construction for Volatile Economies

## Advantages of Legacy Fabric Structures



### INTRODUCTION

Current economic conditions have created an urgent demand for high-quality industrial structures. Naturally these buildings should make sense economically, but to truly meet users' needs, they should also be durable, adaptable and fast to construct.

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**LEGACY**  
BUILDING SOLUTIONS  
*Innovation Beyond Fabric. Service Above All.*



In today's economy, companies are continually tasked to do more with less. Rather than relying on the lowest bidder to complete building and construction projects, consider the building's complete life cycle costs and performance.

- Fabric structures deliver compressed construction schedules
- A design-build or design-assist team improves efficiency and cuts costs during construction
- Fabric building construction translates to significantly lower life cycle costs
- Fabric works better than other materials for innovative designs
- Legacy's new design approach changed the landscape of the fabric building industry

### Accelerated Schedule

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Quick construction naturally saves money during the construction process. Shorter construction means less money spent on equipment rentals, equipment use time and living out allowances for the crew. Accelerated construction also means the building will be completed sooner, allowing the owner that much more time to make a profit.

Often with traditional building construction projects on an accelerated schedule, actual construction needs to begin before all the design and project parameters are known and finalized.

Fabric structures are often fast-track, accelerated projects. The design process has been streamlined from start to finish to accommodate tight construction schedules. This reduces the risk of costly change orders due to intense design. And the agility of the construction process accommodates last-minute owner-appointed change orders as needed.

### Expedited Design and Delivery

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The Legacy team includes in-house engineering, drafting and design departments that allow us to deliver innovative building solutions. We use cutting-edge building design software to develop and enhance every rigid frame fabric structure we produce.

Our design process is significantly faster than with comparable metal buildings, and we can also deliver much faster. When it comes to getting a building up and running quickly, fabric is the way to go.

### Reduced Construction Time

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Delivering a project through a collaborative design-assist or design-build process should reduce the time needed for construction, as well as the cost to construct.

Simply getting a structure up sooner than later to support a given operation can mean a big difference to CapEx. Most fabric structures install 2 to 3 times faster than conventional buildings. A fabric structure requires .02 to .03 man-hours per square foot, compared to .04 to .07 for a steel building.

### Design Assist Project Delivery

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The design assist method of project delivery can reduce the cost and time of construction by allowing all consultants, manufacturers and contractors involved with a project to collaborate as a team. This can be especially advantageous for projects that require a high level of customization.

For example, a company might want a building to store six different types of materials in varying volumes, and they provide a statement of needs and wants that a new structure must be able to achieve. With design-assist project management, the consultant then works with the design-assist contractor to establish specifications that will accommodate the owner's goals.

In this specific example, the team members would work together to consider all factors – amount of usable floor space for storage, overhead clearances, pressures on the sidewalls, etc. This way, everyone benefits from each other's experience and expertise more directly



and quickly, thus helping to ensure that all the necessary design parameters are being accounted for from the start.

### In-House Design Team

There is a definitive advantage to contracting with a building manufacturer with its own in-house engineering and design team. At Legacy, we use computer-aided design principles to customize each structure to meet the project specifications, but perhaps more importantly, we fully understand the constructability of different designs and features for a specific application. Our thorough experience in design, manufacturing and installation provides us with a unique perspective to ensure a project's success.

### Complete Constructability Review

A complete constructability review is a great tool for identifying potential pitfalls or obstacles before getting too far down the road of designing and constructing a facility. An experienced building manufacturer should be capable of reviewing the intended project phases from start to finish and offer a definitive opinion on whether the design plan is sound, or whether other ideas or adjustments should be considered.

The goal is to ensure that every partner involved in the project can easily understand and execute their tasks, and to avoid any clear problems on the front end that are bound to surface later if not addressed.

### Integrated Construction

The ability of a fabric building manufacturer to self-perform work contributes greatly to saving time and money on a project. Integrated construction companies have the field experience to know exactly what is required to build a project efficiently, safely and correctly. By utilizing their own crews to handle significant portions of the job, there are simply fewer surprises as a building is erected and a greater likelihood that the overall project that will stay on schedule and on budget.

### Installation Efficiency

Most fabric building companies subcontract installation, or they require the customer to contract labor with one supervisor from the manufacturer for the job. But even a very good contracting crew will struggle to install a fabric structure as efficiently as professionals who do it all the time. From an efficiency and quality standpoint, it is critical that structures be installed by experienced professionals.

That's why Legacy structures are installed by our own in-house crews who are employees of the company. These are building experts who are specifically trained to erect tension fabric buildings. We send our crews anywhere in the world - wherever it's safe to travel, our crews go there and make sure the building is installed correctly and quickly.

The lighter weight of structural fabric means that less product is shipped to the jobsite, reducing shipping costs – particularly in remote locations.

### Safety

When discussing speed in construction, safety has to be part of the conversation. If you look at what's required to sheet a metal building, installers have to spend significant time on the roof, which is typically the highest safety risk time on a jobsite.

There are also some critical differences within fabric building construction from one manufacturer to the next. The beauty of Legacy's building design is that it truly creates a safer installation process than other solutions in the market. During construction, only a little time is spent on the roof sealing the roof seams. All members of the in-house crew are OSHA certified, they know the safety program, and they work together to create a safe environment.



## Natural Light

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A unique benefit of fabric buildings is that they provide an interior environment with abundant natural light. Fabric roofs offer up to 12-percent translucency to allow sunlight to permeate a structure. Direct sunlight offers about 10,000 foot-candles of illumination, so even at 5-percent translucency a fabric roof will let approximately 500 foot-candles into a building on a sunny day - well above the recommended 75 to 100 foot-candle guidelines for inside tasks.

Many facilities will still need artificial lights for nighttime work, and to provide adequate illumination on stormy or overcast days. But during normal daylight hours, fabric roofs effectively eliminate the need for artificial lighting, making a building more energy efficient and creating a more pleasant, shadow-free working environment.

## Alternative Energy Sources

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Fabric is already an energy-efficient material that can keep the interior of a building 10 degrees warmer in the winter and 20 degrees cooler in the summer. Temperatures can be further moderated with liners and insulation, and various ventilation methods can enhance the operating environment inside and assist in reducing energy consumption.

Buildings can also be designed to incorporate alternative power, such as solar panels, and become essentially self-sufficient. Traditional panels can be used, but an emerging trend is the use of thin-film solar cells that can be adhered directly to a structure's fabric roof. A fabric structure can also be set up to collect rain runoff into cisterns for water management.

## Relocatable

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Fabric buildings are engineered and constructed as permanent structures, but when companies need to move a facility to a different location, these buildings can be relocated as needed. Different foundation types are available to help expedite a structure's relocation at a later date.

A typical, standard fabric structure can be dismantled in .015 man-hours per square foot, allowing for a very quick dismantle. With the exception of splice plate bolts, all the materials in a Legacy building may be re-used at the new site. This includes the lightweight architectural fabric panels, which can be shipped at a lower cost than conventional systems.

## Life Cycle Costs

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The use of fabric also helps reduce the life cycle costs of a building. Fabric structures are naturally resistant to corrosion, so they're the ideal choice for corrosive environments and storing corrosive materials. Adding a fabric liner is the ultimate in corrosion protection, and will reduce the life cycle cost even more.

Legacy buildings are designed to eliminate any weak points or holes where corrosion can originate. We use hot dip galvanizing to protect the steel beams from the elements, and we also offer interior fabric liners to keep corrosive matter and dust from ever coming in direct contact with the steel frame. By contrast, all steel buildings have exterior screw or nail holes that may leak moisture and are vulnerable to corrosion, which weakens the structure over time. There's no easy fix - and certainly no inexpensive fix - once corrosion takes its grip.

What about building maintenance? It's minimal with a Legacy fabric building. There's no painting, no replacing the roof membrane, no loose siding to repair or replace. No special tools are needed. Even the roof is self-cleaning, so everything can be done from the ground.

When you consider the longevity of the building, maintenance and repair, and the initial cost paid, fabric buildings, and Legacy buildings in particular, simply carry lower life cycle costs.

## Full Service Post Completion

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There are a wide range of differences among fabric building manufacturers, and this is particularly true in the level of service that each



provides, or is capable of providing. Legacy prides itself on full service after the building is completed. With our best-in-the-business warranty, never do our customers tighten fabric themselves. If any problems are observed with the fabric tension, Legacy will assess the problem and make any necessary adjustments.

If a fabric building is damaged, it can be repaired at a fraction of the cost of a steel building. Even other brands of fabric structures can often be repaired by Legacy's professional crews.

## How Legacy's New Design Changed the Game

The key turning point in fabric building design came in 2010 when Legacy Building Solutions introduced the application of fabric to a rigid steel frame. This brought the proven engineering of conventional construction to fabric structures, and forever changed the industry.

### New Technology

This new technology was made possible with the introduction of Legacy's innovative, patented keder attachment system. The roof panels, typically 20 feet wide, individually attach to the structural steel frame. This method of attachment creates the most secure, weather-tight attachment and longest-lasting fabric.

Panels should be tensioned horizontally and vertically. Kedered panels are the best practice for attachment, so they are attached to every frame. For optimal results, tension is applied to the width of the panel. To optimize biaxial stretch, it is then mechanically tensioned vertically. Properly installed tensioned fabric does not ever need to be re-tensioned. Installing fabric structures is very specialized and is best done by an experienced crew.

With the keder system, it is easy to add insulation up to R-30 to the building frame. Adding insulation allows for full climate control inside the building, particularly useful in areas with harsh weather.

### Liners for Corrosion Prevention

Particularly in solid steel frame fabric buildings, a fabric liner can be easily and affordably attached to the underside of the steel frame to add protection against corrosion, creating a maintenance-free system. Legacy liners seal the building from the inside out to prevent any corrosive materials from contacting any part of the steel framework. In fact, some building manufacturers will extend their warranty when this is installed as part of a new building.

### Ventilation

Reducing moisture and humidity inside the building is critical for preventing corrosion and enhancing the lifespan of the building. Gravity ventilation, easily achieved by adding peak vents and mesh soffits, keeps a constant flow of fresh air in the building and dramatically reduces humidity and moisture levels.

### How We Differ

The most critical differentiation between Legacy and other fabric building manufacturers is our rigid frame engineering concept. Where our frames are made of solid plate steel, many other manufacturers still use an open web truss made of HSS chords and webs that was the industry norm for decades. Rigid frames are typically designed and proven by complex software with manual quality checks. This software allows for complete design customizability and timely estimates, proposals and solutions.

The engineering behind open web trusses tends to be very subjective from one structure to the next, and engineers disagree about how structurally sound these buildings really are. On the other hand, there is a complete consensus in the engineering community about the durability and longevity of rigid frame design, through decades of proven results in conventional construction.



## Environmental Loads

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Legacy's steel beam design is easily adapted to any climate. Buildings can be easily modified in the design phase to accommodate high snow loads, extreme wind loads and seismic forces required by local building codes, ensuring every Legacy structure will provide sufficient stability in even the harshest weather conditions.

## Customization

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The strength of the structural steel frame in Legacy's building design provides several engineering advantages, most notably the ability to customize buildings to the exact width, length and height required, down to the inch. This enhanced customization marks a dramatic difference from manufacturers who offer only the standard sizes they have in stock. Additionally, this conventional building structure includes sidewalls that are straight instead of curved, which maximizes the usable area.

Customization goes beyond just length, width and height. Countless special features can be incorporated in the building structure, including jack beams, which can support a steel frame to allow for the inclusion of longer spans or wider doors in a building design.

Legacy buildings can be uniquely shaped to fit creative designs and odd-sized lots and footprints. This includes offset peaks, varying height columns, sidewall dormers, lean-tos and mono-slope roofs.

## Foundations

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Legacy fabric buildings can use a variety of foundations, which makes them easier to relocate. Some foundation choices include cast-in-place concrete, screw piles, micropiles, earth anchors and precast concrete.

## Custom Doors

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The solid steel frame and straight sidewalls allow any number and type of door to be placed anywhere on the building. Wide portals and jack beams support roll-up doors, overhead doors and other large doors necessary to allow access for heavy equipment.

## Overhead Cranes

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Mounting an overhead crane to the superstructure keeps the crane accessible without wasting valuable floor space. Each building is custom engineered to support hanging loads, including live loads such as cranes, catwalks and conveyors.

## Additional Loads and Design Features

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Our rigid steel frames use proven engineering to handle collateral and hanging loads. Our engineered tension fabric structures are flexible enough for this type of addition because they are always designed to safely support any added weight.

## Conclusion

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In the current volatile economy, companies must maximize their capital investments. With reduced installation time, flexible design options and lower life cycle costs, Legacy buildings are leading the way for permanent and temporary buildings worldwide.

