White Paper

Key Design Elements in Fabric Structure Development

A white paper for knowing what design elements to look for when purchasing a fabric structure.

CALHOUN

Visit us at calhounsuperstructure.com

Introduction

Fabric structures have come a long way since the late 20th century. Twenty years ago, no one would have discussed the fabric structure industry as a source of permanent buildings.

Recent technical and material advances have put the fabric structure sector on par with traditional construction. Simply stated, today's fabric structures are built to last, but not all structures are equal to the task of being functionally durable.

Fabric buildings, also known as tensioned fabric membrane structures, consist of a large piece of fabric tensioned over a steel frame structure.

Recent progressive advances in materials and design call for an assessment of where things stand today. Knowing what to look for provides the opportunity to make an informed decision about the options that are available when purchasing a fabric structure.

Custom engineering is required for any building with an expectation of permanence. In this white paper, we look at overall design, engineering, and installation.

Engineering Evaluations that Influence Design

It is absolutely crucial for engineered fabric structures to undergo a review before the design process starts. Details of the structure's purpose, site environment, building enclosure, and local building code are essential to ensure the strength, safety, and longevity of the structure.

Engineered fabric structure manufacturers will look at environmental conditions such as wind speed, snow load, rain load, and seismic load, as well as site conditions including wind exposure, roof exposure, occupancy, dead load, live load, and thermal factors.

Site Condition Evaluation

Both snow and wind effects are impacted by surrounding terrain and structures. For example, engineers will often require heights of adjacent structures if applicable. In practice it is sometimes difficult to make a clear distinction between roofs that will be fully exposed to winds and those that will not. The designer should, in consultation with the owner, weigh the probability of the roof becoming sheltered by an adjacent, taller building, adjacent, taller trees, or by an addition to the building itself. Such changes could cause either snow drift loads or higher average snow loads.

In considering drift loads, even the characteristics of the upwind obstructions are considered in many cases. For example, deciduous trees versus evergreen trees, tree species, and average tree heights all play a role into the upwind obstructions considered. Wind effects in built-up urban environments require detailed review by experienced engineers to ensure they are correctly evaluated.

Seismic loading is also considered for all locations. Seismic loading can be a controlling load condition, particularly on the west coast of North America. The seismic loading parameters are defined in the governing building code for the site.

Building Enclosure Evaluation

The enclosure of a building is also considered. Open-ended structures, fully-closed structures or partially-closed structures all play a significant role in the demand on the structure. The customer's application for the structure will determine which configuration is needed. For example, a bulk storage application will often utilize a one-ended structure with the open end facing away from the prevailing weather. This configuration provides unrestricted access to load and unload the bulk commodity from the building while protecting it from most precipitation.

Building Usage Evaluation

The use of the building is considered for validation of the design. Buildings in low-hazard applications such as bulk-storage of salt are not required to have the same reliability as buildings which are occupied by people. Careful review of the building usage is needed to ensure that the

correct application-related parameters are selected for the design.

While all structures, whether fabric or other, are marked against a hazard category (low, standard, high, or essential), fabric buildings in particular are marked against either low or standard:

Category	Occupancy
Low Hazard	- Low human occupancy where, in the event of collapse, injury is unlikely - Minor storage use
Standard Hazard	- Factory occupancy used for assembly, disassembly, fabricating, finishing, manufacturing, packaging, repair, or processing operations of goods

Almost never will you find you fabric structure marked as a high hazard category.

Calhoun's engineers begin a rigorous site-specific review starting with site condition evaluation which often involves a conversation with the sales team or dealer, as well as the customer, before finalizing site analysis.

Figure 1: VP Series 150 x 310 Fertilizer Production Plant

3D Non-Linear Finite Element Analysis for Calhoun's Engineered Fabric Structures

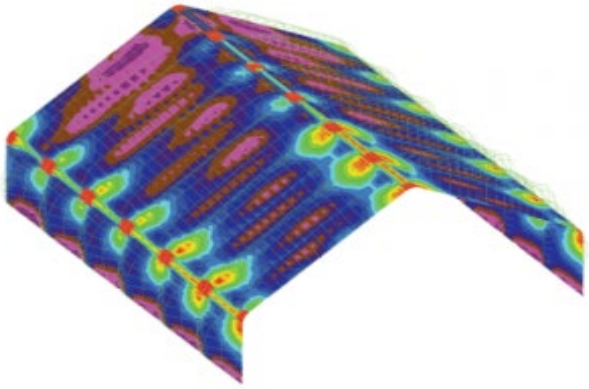
What sets Calhoun apart is the application of our unique engineering process in which we apply a 3D Non-linear Finite Element Analysis (FEA) to every single one of our structures.

3D Non-Linear FEA software is a design tool that allows Calhoun's engineers to determine the stresses and displacements of structure in response to defined loads and constraints. 3D Non-Linear FEA is a more accurate method than using manual mathematical calculations and datasheets.

3D Non-Linear FEA is an essential engineering tool that provides guidance in the design of *highly reliable* and *economic* foundation systems, as it provides accurate load paths to, and forces at, foundation-resisting elements. Due to the fact that the structure relies primarily on tension-only bracing for stability, the pre-tension in the cables and initial inelastic stretch is critical to the performance of the structure.

The pre-tension requirements and procedure for initial pre-tension and proof loading of the cables are determined through the 3D Non-Linear analysis.

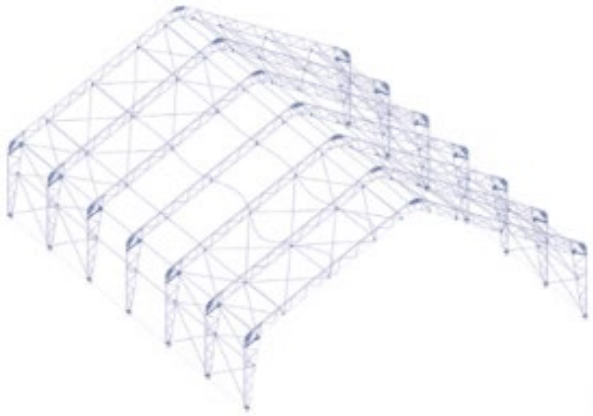
Fabric Stresses and Scaled Displacement



During a nonlinear analysis, the load is discretized and applied in steps. The fabric cladding is modeled using a combination of proprietary shell and cable elements. These elements have been adapted from rigorous nonlinear analysis models created in using high-end aerospace finite element software.

Because the behavior of fabric structures rely substantially on tension in the warp and weft directions of the membrane the pre-tension in the cladding is also important to the long term performance, and must be determined using a comprehensive analytical approach and detailed hand calculations.

Buckling Analysis

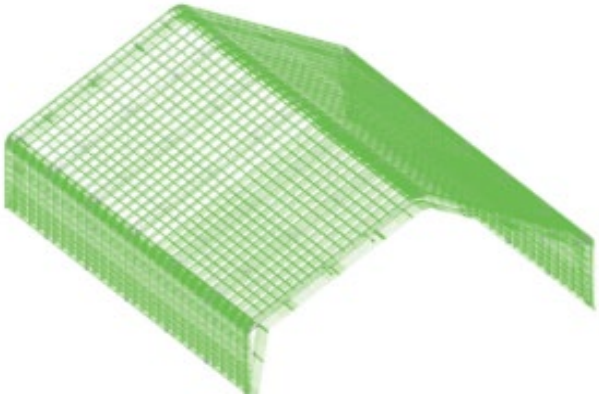


A buckling analysis is completed, at minimum, for each of the controlling load combinations. This analysis goes to ensure that the assumptions for detailed checks are suitable for the actual site-specific conditions, and whether or not second order effects are a consideration in the design.

An elastic buckling analysis determines the multiplier by which the current load effects must be multiplied to initiate buckling. This type of analysis is especially important for large displacement structures with tension-only elements since intermediate values of loads may generate instabilities that would otherwise go unnoticed in a static analysis. This could lead to failures well below the design load if not properly addressed.

The systemic 3D buckling analysis ensures that intermediate instabilities are addressed in the design. Consideration for this type of failure is mandatory under the ASCE 55-10-4.3.5.2.

Detailed Wind and Seismic Activity



For each and every Calhoun site-specific analysis, a comprehensive seismic analysis is completed which includes the modal response

behavior of the building, and the building's actual fundamental period.

This analysis is also used in the wind design to ensure that the period of the structure will not substantially affect the behavior of the structure during a design wind event.

In situations where the natural frequency of the building is a design consideration for along wind response, the provisions of ASCE 7-6.5.8.2 are used to calculate the resonant response coefficients and dependent gust-effect factors.

Other Key Design Elements to Look For

In addition to Calhoun's unique engineering method, 3D Non-linear FEA, there are some other key differences to keep an eye out for when comparing fabric structure manufacturers.

Flat Plate Couplings vs. Compression Couplings

Flat plate couplings are fairly common in fabric structure designs and uses a multitude of fasteners to transfer load between truss sections. The problem with flat plate couplings is the amount of parts and pieces required, causing a potentially more compromised joint and a longer installation completion time. This translates into a higher cost for fabrication. Furthermore, it is a bulkier connection and thus increases material use, also making it a more inefficient design on how it transfers load.

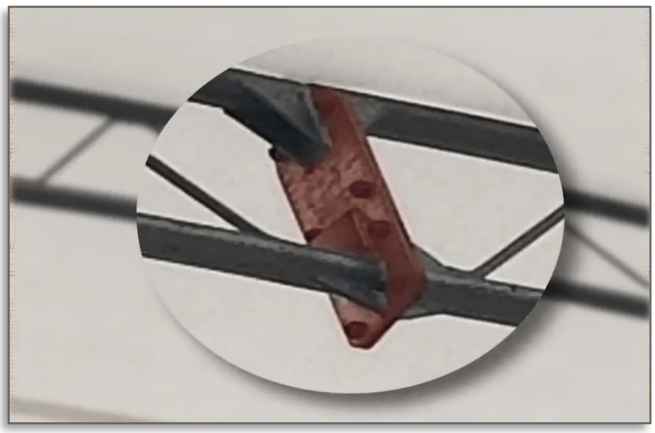


Figure 2: Flat Plate Coupling

Calhoun Super Structure has evolved from using a flat plate coupling to an innovative compression coupling. It is located directly on the center line of the chords and uses two fasteners directly in the load path between the chords.

Calhoun's innovative compression coupling very efficiently transfers the load between the chords of adjacent sections, providing a systematic transfer of load of the truss.

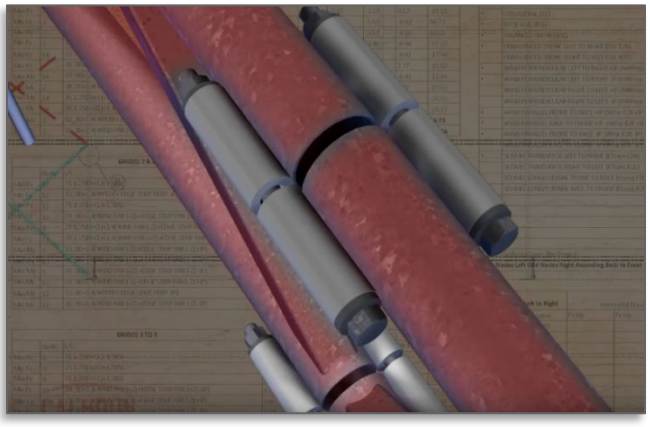


Figure 3: Calhoun's Innovative Compression Coupling

Calhoun's compression couplings take less time to install because they use fewer fasteners.

In-House Engineers vs. External Third-Party Engineers

To avoid company bias and ensure strict objectivity of the design work, a fabric structure company should use external, third-party engineers to review all structures. While this may have slight implications on overall project completion, using external, third-party engineers ensures the engineers are not pressured to 'hurry up' and meet deadlines.

Calhoun's site-specific reviews for standard configurations are completed by external, third-party engineers, and are typically completed within 1-2 weeks.

If the site-specific review identifies that changes are required, these are discussed with the customer before the drawings are finalized. The customer is then supplied with engineered stamped drawings for their structure.

Structural Frames

Fabric structures are not only about fabric. The engineering strategies that go into frame and truss designs hold innovations equal to any developments in the fabric sector alone, of which there have been many over recent years.

The engineering that goes into all aspects of production, together with the fabric material, create the strength and durability required for industrial, commercial, agricultural, recreational, retail use, and much more.

Innovative frame designs allow support of additional loads on fabric structures, such as conveyors and cranes, while exceeding local building codes related to wind, snow, and seismic activity.

The market supports many different types of frame design, from simple and inexpensive, to custom-engineered solutions. The diverse availability of frame options offers many different configurations to suit the customers requirements.

Choosing a building can be confusing to prospective owners. Different manufacturers use different framing techniques, each with its own advantages and disadvantages.

Single Tube Framing

For convenience, single tube arch structures most often serve as temporary structures. As the name implies, individual tubes run the shape of a traditional hoop structure or arch. These structures are typically sold commercially in retail kits aimed at consumer and retail markets.

Figure 4: Single Tube Frame

Advantages

Inexpensive and easy to install, these types of frame building kits slide together using a small number of fasteners and can be constructed in a matter of hours. Disassembly is simple, and parts condense well for easy transportation and storage.

Disadvantages

The downside to single tube structures is that they are typically for temporary use, and fastened to the ground using anchors or tied to cement blocks. They are not engineered, and typically do not span wider than 30', thus are not built for strength and are not able to be customized. They will typically not meet building code requirements for permanent structures

Aluminum Extruded Frames

Aluminum extrusion frames use aluminum alloy material with a cross-sectional profile for a wide range of uses.

Buildings utilizing aluminum extruded frames are a step toward permanence from single tube frames. They remain in the class of easy-to-assemble buildings and are reasonably portable.

Figure 5: Aluminum Extruded Frame

Advantages

From its particular blend of strength and conductivity, to its non-magnetic properties and ability to be recycled repeatedly without loss of integrity. All of these capabilities make aluminum extrusion a viable and adaptable solution for a growing number of manufacturing needs.

Disadvantages

Size is one of the limits as aluminum frames cannot provide the strength needed across long spans. Hence, standard designs are the way these buildings are usually sold. Customizing them is difficult and expensive.

Rigid Steel Frames

Rigid steel frames entered the industry about a decade ago. These frames use solid steel 3-plate built up section. The 3-plate built up sections allow for easier customization and eliminate the possibility of corrosion inside the frame.

Advantages

Various architectural niceties can be easily implemented like overhangs, canopies, and lean-tos. The overall usable ground area inside the structure is generally greater. Rigid steel frame structures should be reserved for those situations that require a large span and significant customizations.

Disadvantages

Industry studies have shown that rigid steel frames do not guarantee a “better” build, and can cost more than other truss designs for the same structural integrity.

With more steel mass in a rigid steel frame, the natural light from the fabric membrane is diminished and tends to create a shadowed interior, thus, may require a need for artificial lighting. This can impact desired savings on utility costs, long-term.

Aesthetically, some may also find the rigid frame look ‘chunky’ and unappealing

Figure 6: Rigid Steel Frame

Open Web Trusses

Open web trusses are the mainstay of durability in the fabric structure industry. Open web trusses are a system of steel tubes anchored in place by angled tubes placed intermittently. The frame acts as a web-like substructure for the fabric cover.

Advantages

An open web truss design can push the envelope on a clearspan space, providing options to add extra height with custom end walls and sidewalls. HVAC and electrical services can be installed much more quickly with an open web truss design, allowing for a more seamless install which could save you time and money. Open web trusses are typically more economical than rigid steel frames, and all the surfaces are readily available to be thoroughly hot-dip galvanized.

Disadvantages

Untreated open web trusses are susceptible to corrosion inside the hollow tubing if it goes undetected, limiting the life of the structure, or causing ongoing expenses in replacement and repair of truss parts.

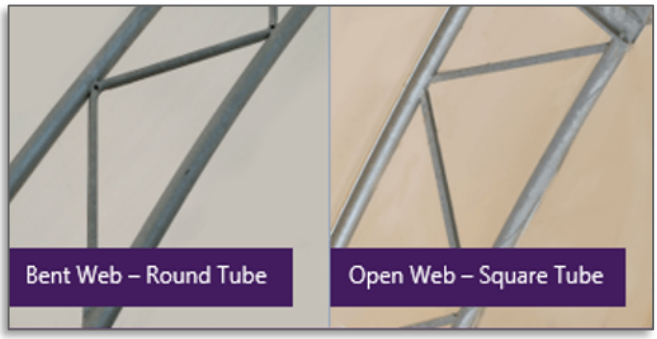
In Calhoun’s fabric structures, our hot dip galvanization process ensures that all surfaces, including the interior of the tubes, are protected from corrosion.

Calhoun’s fabric buildings are built using open web trusses with a U-channel webbing that creates a robust connection into the chord; a more effective way of transferring the load between the chords and the web.

Figure 7: Open Web Truss Frame

Look for Open Web Trusses with Square Tubing

Bent web trusses are likely to poor weld connections to the chord. Additionally, the hot dip galvanizing liquid is unable to penetrate and coat the inside of the web causing poor protection from corrosion.



Over time, corrosion from the inside of the bent web steel trusses result in a weaker overall fabric building.

Calhoun specifically aerates the corners of our welds to ensure our open web trusses are 100% protected from corrosion, inside and out, and won't ever corrode or buckle from the inside. Our hot dip galvanized open web trusses result in a more reliable fabric structure compared to other fabric structure companies in the market.

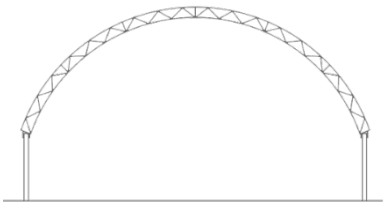
Calhoun's Frame Designs

Calhoun Super Structure offers one of the largest product series in the fabric structure industry. We offer custom-engineered fabric buildings as small as 16' wide to as large as 250' wide and for any length.

We also encourage custom projects. Our fabric buildings are used in various industries for every application, and are engineered to last generations.

All of our building series come standard with hot dip galvanized (HDG) steel frames and HDG hardware, as well as 12 oz. high density polyethylene (HDPE) fabric.

CC Series

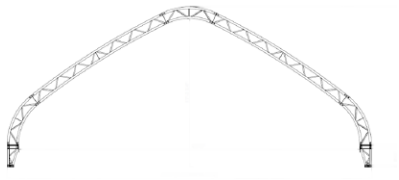


Unlike competitor flat-plate gusset, our compression coupler is built to adapt with a design that efficiently transfer load through the

chords. This design allows you to achieve greater capacity over the flat plate gusset design.

The CC Series comes standard with a one-piece bag cover with optional mount styles and PVC fabric.

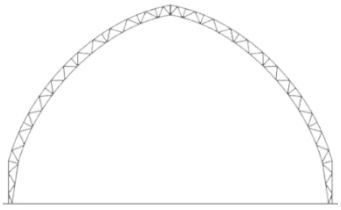
GB Series



Our most versatile design, the GB Series, is our 'all-in-one' product. With standard 10' high side walls combined with an aesthetically pleasing look, make this the building that can meet a wide variety of needs. The cost-efficient price is excellent too. The gable-style arch design further enhances the building's visual profile.

The GB Series comes standard with a one-piece bag cover and 10’ leg height. Options on the GB Series include PVC fabric and 2’, 4’, 6’, or 8’ leg heights.

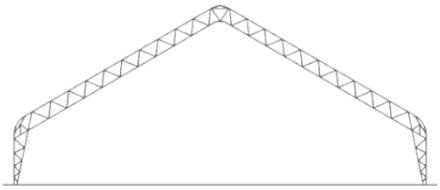
HT Series



This design uses the same compression coupler as the CC Series but utilizes larger top and bottom cords and a deeper truss depth. The extra height and free span space make unloading large trucks easy and worry free. The HT design also makes it a “tank” in heavy snow load areas.

The HT Series comes standard with our Keder Panel System. Options on the HT Series include PVC fabric and 2’, 4’, 6’, 8’, or 10’ leg heights.

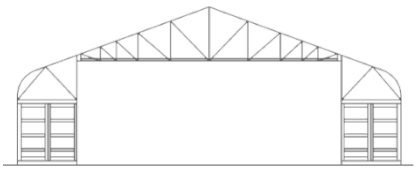
VP Series



The versatile design of the VP Series allows the interchange of different trusses so we can quickly engineer any size building for any application, in any environment, anywhere in the world. The building is attractive with a cathedral-style arch and 24" eave finished in wood or steel. The rounded shoulder design offers a more economical alternative than similarly engineered structures.

The VP Series comes standard with our Keder Panel System, with optional 8‘ or 14’ leg heights, 2-5’ eave bunker covers, and PVC fabric.

CL Series



Our CL Series is the first-ever line of fabric structures that were designed and engineered

exclusively for container use. Structures in this series are engineered site-specific for any location in North America. They can serve as temporary or permanent structures, easily deployable and portable.

The CL Series comes standard with our Keder Panel System, with optional door sizes and PVC fabric.

Figure 8: Primer Paint Coated Frame

Frame Protection

No matter the durability of the fabric material, consideration must be given to protecting the frame. There are numerous coating options available.

Primer Paint

Primer paint was the most commonly used material to protect steel.

Over time, primer paint will need to be re-coated due to chipping, thereby increasing maintenance time and cost. The time needed to re-coat is affected by environmental conditions.

Primer paint does not prevent the formation of rust due to corrosion.

Powder Coat Paint

Powder coating is a finishing process in which a coating is applied electrostatically to a surface as a free-floating, dry powder before heat is used to finalize the coating.

Powder coating yields a thick, hard finish that is tougher than conventional paints. This kind of paint is more expensive than primer paint, and breaks down if exposed to UV rays. It is also very difficult, if not impossible to powder coat interior surfaces of tubes.

Inline or Pre-Galvanization

Zinc galvanized tubes are first bent or welded together then the “black” areas are treated with a special paint to prevent corrosion. This process is used by several fabric building manufacturers and the main benefit is a reduced cost.

The weld points in pre-galvanization usually start to rust and the result is a limited lifespan and unsightly appearance. This method offers only 0.9 mils of zinc coating with no interior protection.

Hot Dip Galvanization

Hot dip galvanizing results in a zinc coating, 3.9 mil thick. The dipping process covers the framing materials down to the smallest crevices that go unnoticed by many assemblers. This step helps to maximize structural integrity and creates a tough barrier against corrosive materials.

This process protects against corrosion better than any other method. The complete framework is built of welded black steel and then hot-dip galvanized to provide a consistent zinc coating over the entire structure.

While many fabric structure manufactures have started employing hot dip galvanizing into their practice, Calhoun was the very first fabric structure manufacturer to use hot dip galvanized steel as an industry *standard* on every building.

Figure 9: Hot Dip Galvanized Frame

Fabric

Today's fabrics are continuously innovated to enhance longevity, maintenance, and translucency to give fabric buildings better usability. Fabric can be fully customized in ways that compete with traditional construction.

High Density Polyethylene (HDPE) Fabric

HDPE is known for its high strength-to-density ratio ranging from 930 to 970 kg/m3 and corrosion resistance. With its strong intermolecular force and tensile strength, HDPE can withstand high winds and temperatures. HDPE offers lower lifecycle costs due to its low friction surface and UV-resistance.

Calhoun's fabric covers are made of engineered high-density polyethylene (HDPE) fabric which is 12 oz per square yard in weight, and 24 mil thick.

Figure 10: HDPE Fabric

Clear High Density Polyethylene (HDPE) Fabric

Calhoun also offers clear HDPE specifically for greenhouse use. It is a lightweight 6.0 oz. woven coated clear scrim fabric with enhanced UV protection, yet strong enough to handle northern winters.

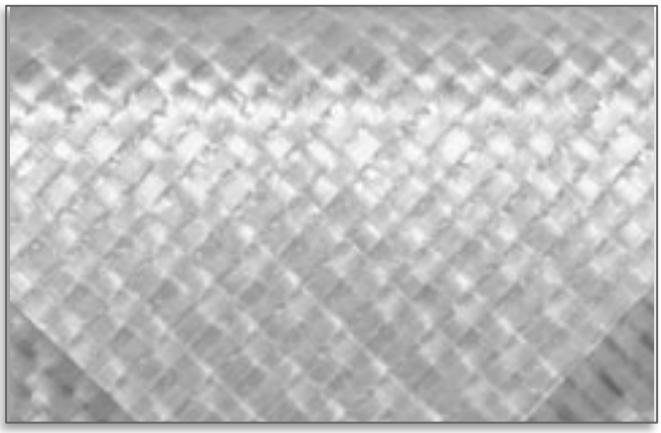


Figure 11: Clear HDPE Fabric

Polyvinyl Chloride (PVC) Fabric

Stronger than other options, properly maintained PVC lasts for a quarter-century in most environments due to its durability, versatility and chemical resistance.

Because of its amorphous structure which contains halogens like chlorine and fluorine, PVC is known for its chemical stability allowing the PVC fabric cover to resist chemicals and oil.

Because of its extreme durability it tends to provide less translucency, though some manufacturers have made headway in creating PVC that provides more natural light.

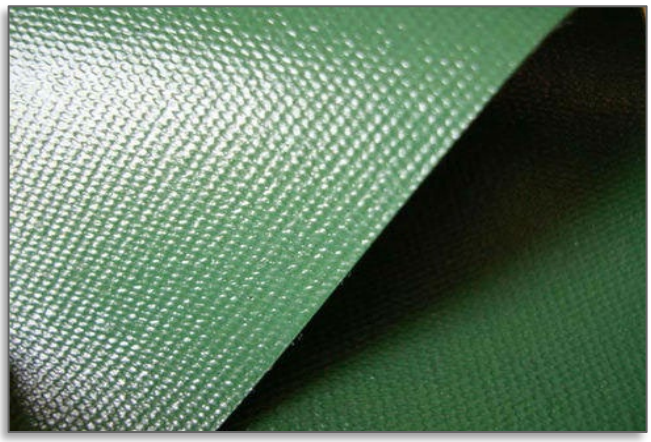


Figure 12: PVC Fabric

Poly Tetrafluoroethylene (PTFE) Fabric

PTFE is a TEFLON™-coated woven fiberglass membrane that is extremely durable and tolerant in the most extreme weather elements. The woven fiberglass gives PTFE coated glass fiber its mechanical strength, providing the membrane with maximum flexibility.

PTFE fabric, however, can be mildly toxic and does not provide the same resistance to deterioration as other fabric options.

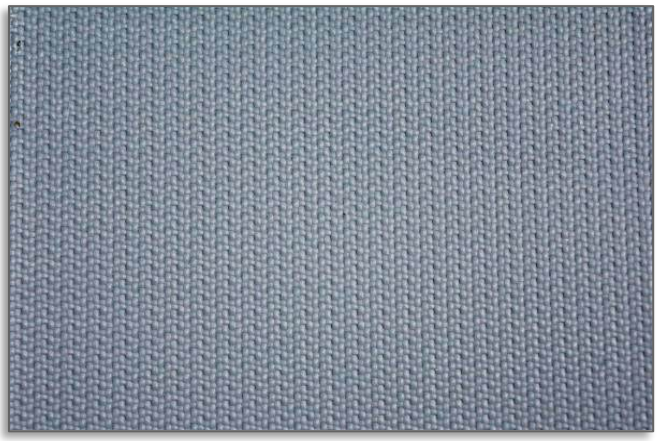


Figure 13: PTFE Fabric

Ethylene Tetrafluoroethylene (ETFE) Film

ETFE is a highly transparent extruded film applied either as a single layer membrane or multilayer pneumatically inflated cushion. The material has good UV stability, as well as chemical and heat resistance, and provides the greatest translucency of any material up to 80-percent.

ETFE's expense keeps it from being more widely used, and it transmits more sound vs. other sound-dampening fabric options.

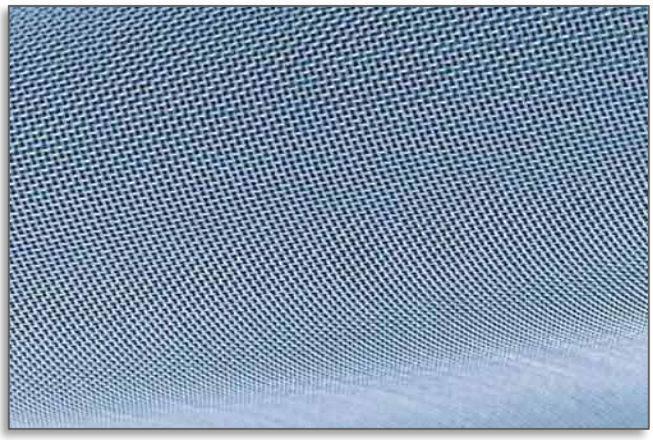


Figure 14: ETFE Fabric

Fabric Installation

The different ways in which the fabric is attached to the frames can dramatically impact the success of the building, both in terms of everyday efficiency and the longevity of the building.

Two main fabric installation methods are present in the fabric structure industry.

Single Covers

Single covers, also referred to as mono-covers or bag covers, is one long piece of fabric that stretches over the entire frame.

The critical benefit is the quick installation as the one-piece cover is pulled over the entire structure in one swift step. It is more affordable than other fabric cover systems, and stays on tighter on smaller structures

Calhoun's bag cover system is ideal for smaller structures and comes standard with the CC Series and GB Series.

Individual Panels

Individual panels, or what many in the industry refer to as Keder track, does not allow the fabric to touch the structure's frame, and helps to create a quieter, more secure environment with no risk of wear points on the cover, adding years of life to your structure. Calhoun's Keder Panel System is standard on all buildings over 60' wide.

The critical benefit is allowing each individual panel to connect to every truss location for higher durability in high wind load conditions. Individual panels also allow for quick replacement of the panel if damaged, rather than removing the entire fabric cover which could be costly and time consuming on larger structures.

Calhoun Super Structure's Proprietary Keder Panel System

Calhoun's proprietary system provides three layers of protection to reduce corrosion and prevent weather elements from entering the building. The system includes a seal that acts as a barrier between the Keder extrusion and the truss chord. In addition, it provides a third layer of protection to ensure no water enters the building.

Calhoun is the only company that offers this level of detail and protection. Calhoun's Keder Panel System comes standard with the HT Series, VP Series, and CL Series.

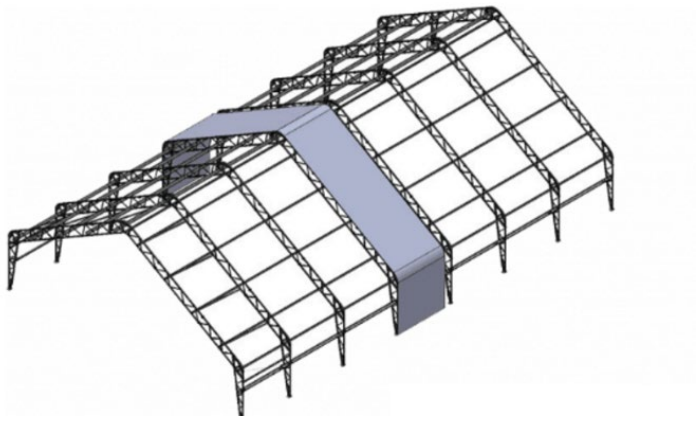


Figure 15: Rendering of Calhoun's Keder Panel Application

Structure Installation

Whether looking for full turn-key solutions or wish to install the structure yourself, Calhoun offers installation options to meet your needs.

Turn-Key Installation Services

Calhoun and Calhoun's network of dealers have collectively installed millions of square feet of fabric structures across North America and overseas. Our experienced field crews will travel to your project site and install your fabric structure from start to finish. Rest assured we provide knowledgeable and professional installation crews on your site to deliver your final product.

This option is best for those installing a fabric structure for home, small-business, or large-organization use.

Figure 16: Installation of a VP Series 140 x 700 Calhoun Structure by Calhoun's New York Dealer

Project Representative

In some instances, our customers have, or wish to source, their own installation crew to erect the fabric building. Calhoun or Calhoun's dealer partner will provide you with a complete set of plans and guidance for local contractors to do the install. If you wish to install the fabric building completely yourself, Calhoun representatives will work with you.

This option is best for businesses with their own installation crew, or for those who have an existing relationship with a construction crew.

In addition to having the skill and equipment required to install – or assist in installing - fabric buildings, our network of field crews have the expertise to offer you complete project management. Additionally, our network of installation crews have the required certifications and training to do a job on any site from First Aid/CPR to CSTS to fork lift training and LSE training.

Mount Options

Throughout the fabric structure industry, there are common mount options that the framework of your structure can be mounted to.

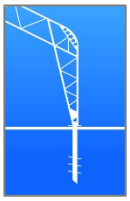
Wood Posts

Wood post mounts are often used in the agricultural and equestrian industries. The most common post sizes are 8”x 8” laminated posts, installed 4’- 6’ in the ground and stand 4’- 8’ above grade.

Wood post foundations can be installed with minimal resources and manpower, with a low overall cost. Calhoun’s engineered wood posts are available for CC Series structures and 32’, 42’, 52’ GB Series structures.

Figure 17: Wood Posts on CC Series 32 x 410 Aquaculture Structure

Steel Legs



Steel legs are typically used in corrosive environments such as salt or fertilizer industries when all parts of the structure need to be hot dip galvanized to resist corrosion. Steel legs are also beneficial when custom height variances are necessary.

Calhoun’s standard steel web leg mounts start at 2’ and are available in denominations of 2’ up to 14’ heights.

Calhoun also offers a Hollow Structural Steel (HSS) leg option which offers more economy by way of a cleaner, or straighter, finish. The HSS leg option is useful in commercial warehousing or agricultural applications when its necessary to have as much usable space as possible. The straight leg allows assets or building accessories to line up straight against the wall.

Figure 18: HSS Leg on a CC Series 52 x 108 Hay Storage Structure

Concrete

Concrete mounts are often seen in commercial or industrial applications, particularly when a retaining wall is required. Concrete mounts come in a variety of options and are typically chosen based on available budget and application of building use, the most common being poured walls or piers due to their versatility and strength.

Concrete options can be:

- Poured Walls
- Grade Beams
- Piers
- Eco-Blocks
- T-Panels

For smaller structures, or structures that will be relocated, eco-blocks or T-panels are useful due to their portability and affordability whilst keeping the structure in place.

Shipping Containers

Shipping container foundations allow maximum utilization of the foundation for employee housing, change rooms, washrooms, and storage. The fabric structure's steel framework and fabric cover can be stored in the shipping containers for easy deployment and transportation.

Shipping container mounts come standard with Calhoun's CL Series but have also been used with CC Series and HT Series structures.

Calhoun encourages custom projects and that includes custom, or hybrid, mounts to suit your needs.

Hybrid Steel Leg + I-Beam Extension

A standard web leg with I-beam extension allows for added height on Calhoun's VP Series standard 14' steel leg.

Figure 19: Hybrid Steel Leg + I-Beam Extension on VP Series 100 x 264 Structure

Hybrid Shipping Container + Concrete Wall

A shipping container / concrete hybrid mount offers versatility by way of additional storage and greater economy.

Figure 20: Hybrid Shipping Containers + Concrete on CC Series 40 x 60 Structure

Quality Certifications

Reputable fabric structure manufacturers ensure they meet quality standards and obtain the necessary certifications. However, not all steel building manufacturers are certified CSA-A660 in Canada, and it's easy to confuse ISO (and their certifications for quality management) with CSA-A660. The two certifications are not the same.

ISO certification only verifies that a company can manufacture a product consistently and does not satisfy standard CSA-A660 requirements. The audit and certification requirements of CSA-A660 ensures that the manufacturer is complying with the applicable building codes and design standards, and that the purchaser is protected. You should always make sure that the fabric building manufacturer you choose is CSA-A660 certified in Canada and AWS certified in the United States.

Calhoun Super Structure is both certified CSA-A660 in Canada and AWS certified in the United States.

CSA-A660 Certified

From the Canadian Welding Bureau (CWB), the CSA-A660 Standard was developed at the request of the Canadian steel building system manufacturers, and provides assistance to code enforcement officials in the process of reviewing building permit submissions incorporating a steel building system, ensuring the purchasers obtain a quality building.

All aspects of the manufacturer's process go through a meticulous audit including engineering design methods and personnel, materials control, fabrication, warehousing, packaging, shipping, erection documentation, and quality assurance.

Because the manufacturer of these buildings is often remote from the building site, and local code enforcement officials may lack the capability to check the structural analysis of a building, problems may occur in determining the acceptability of such structures. It is the intent of CSA-A660 certification program to alleviate such

problems. Calhoun Super Structure is CSA-A660 certified.

AWS Certified

In the United States, the AWS (American Welding Society) certifications set industry standards which help meet and maintain compliance for many project regulations. Certifications are built around the processes for different weld-types, and welders are then certified on those unique processes.

Welders who have passed these certifications will have uniform outcomes, are knowledgeable about what can go wrong and why, and have proven that they have the skills to ensure good, secure welds. You can maximize confidence in the quality of your fabric structure project by working with fabrication shops who employ welders that are certified to the standards put forth by the AWS. Calhoun Super Structure is an AWS certified welding fabricator.

Warranty

Reputable fabric structure companies will offer a sound warranty, in line with industry norms.

When you purchase a fabric structure by Calhoun Super Structure, your structure is backed by a proprietary industry-leading warranty customized to your individual needs, and valid for any application.

In most cases, our steel framework lasts generations. For fabric repairs or replacements, we offer a 15-year warranty in line with industry norms. Our coverage is pro-rated with 100% coverage for the first year. Increase in coverage is available.

We offer an easy online warranty submission service which you can submit yourself. Alternatively, your local Calhoun representative can submit all warranty photos and information for you.

About Calhoun Super Structure

Thanks to almost 30 years of experience, Calhoun Super Structure understands our customers' needs and prides ourselves on the loyalty we show them.

The core of our business is providing peace of mind through our innovative safety standards and engineering practices. That's why more businesses, households, Public Works professionals, and wholesalers across North America trust Calhoun Super Structure to deliver solutions that will help them meet their needs.

Calhoun's vision and subsequent mission is to be the safest, most reliable fabric structure manufacturer leveraging decades of engineering excellence.

Our success depends on our core values of accountability, collaboration, quality, customer-centricity, and continuous improvement from each team member. At Calhoun Super Structure, our commitment to these core values has ensured success within our business, as well as within the companies with whom we work.

Through our extensive dealer network, Calhoun has successfully installed hundreds of thousands of square feet of fabric across Canada, the United States, Japan, Mexico, parts of Europe and beyond.

CONTACT US
1-833-63-COVER
(1-833-632-6837)

BRITISH COLUMBIA

Suite 301
1321 Blanshard Street
Victoria BC V8W OB6
Canada

ALBERTA

612 - 500 Country Hills Boulevard
NE, Suite 160
Calgary, Alberta
T3K 5K3

Ontario

307 Bruce Rd 10
Tara, ON N0H 2N0