



MAGIC FABRIC

Paul Smith, Legacy Building Solutions, USA, presents five dry bulk storage challenges that can be solved with fabric structures.

Getting dry bulk materials from point A to point B usually requires storage for the materials at both points. Keeping material out of the weather is required, but a solution is often needed quickly. Logistically speaking, fabric structures are ideal for bulk storage for at least five reasons:

1. Speed of construction

Fabric buildings typically go up faster than wood, brick, concrete or steel buildings. How much faster? If the weather holds, a crew can install a storage building in days or weeks, not months.

Some fabric buildings are prefabricated, so they just need to be transported and installed. These off-the-shelf structures come in set sizes. Once the buildings are on trucks and rolling to a site, a crew can put them up quickly. These fabric buildings tend to be hoop structures, meaning steel semi-circular frames go up and a covering (usually a single piece of fabric) is stretched over them.

Other tension fabric buildings are different in that they use solid steel frames. Steel frames such as these have a long track record for reliability and proven engineering. They also allow for a wide array of design options. Finally, these rigid structures provide a lot of advantages in terms of corrosion prevention and support for equipment that facilitates loading and unloading.

Factors a building owner should have in place to make the process of constructing a fabric building as smooth as possible include:

- Owning or leasing the land.
- Installing a concrete slab or foundation so crews can begin work immediately upon arrival.
- Finalising the design and resisting last minute changes.

Finally, know what is needed. Going to a fabric building company with a clear idea of the ideal building will save a great deal of time, especially if a custom-designed building is preferred.



Figure 1. LNC Tenaha.



Figure 2. Agriland Woodbine.



Figure 3. McKenzie County.



Figure 4. Gunther salt.

It should also be said that having a customised building does not necessarily mean it will take longer.

2. Loading and unloading

In the world of fabric structures, the word ‘freespan’ is important. The word describes a structure that has a very open floor area with few or no support pillars. This is important because it makes loading and unloading the storage building much easier. When pillars do not have to be avoided, the setup and storage arrangements can be changed based on specific needs. A freespan structure will pay off in the day-to-day operations of dry bulk storage.

As the structural support for fabric buildings evolves, the freespan capabilities have increased. For example, tension fabric structure buildings can be engineered with a freespan space of up to 300 ft wide. For a dry bulk storage owner, that opens up a lot of possibilities. In addition, some tension fabric buildings have straight walls, so materials can be loaded right up to the interior edge of the building.

3. Indoor/outdoor buildings

Fabric structures can be either open air buildings or completely closed, climate controlled, insulated warehouses. Open air structures allow protection from the elements, but still provide plenty of ventilation. In some cases, fabric structures use fabric roof panels that are translucent and allow some sunlight into the building (up to 12%). That means electrical lighting may not be needed and the whole structure can be off the grid. That creates savings up front, but it also adds up over time.

A closed structure can have everything a traditional wood, brick or steel building would have. These buildings can store both dry bulk and packaged goods, but they also give the option of insulation, heating and cooling and office space if required. The versatility of a completely enclosed building is only limited by the imagination.

“One of the first considerations for storage is if the product is weather-sensitive,” said Dave Walker, Project Manager at Consolidated Terminals and Logistics, a division of CGB Graber. “This particular product is a feed that cannot get wet.” CGB ultimately chose a tension fabric structure on a rigid steel frame. The building is 150 ft long, with two separated interior sections – a 60 ft wide building used for bagging and sorting product, and a 40 ft wide building to store pallets of bagged feed and agricultural salt.

4. Corrosion

Although fabric is the operative material in fabric structures, there is still a lot of steel or aluminium involved. The nature of dry bulk materials makes corrosion an issue with materials such as salt, fertilizer, and mining chemicals. Consequently, fabric structure builders spend a lot of time and energy thinking about corrosion prevention.

“Anytime the company is doing any type of fertilizer product it avoids steel,” said Walker. “The building will have a lot of indirect contact with fertilizer and dust, and fabric is used because of the longer lifespan when dealing with corrosive materials.”

The traditional method of corrosion protection was to hot-dip galvanise the steel. That was effective to a point, but

the zinc in the galvanising process only slows down corrosion, it does not create a barrier. That means eventually the corrosion will get to the steel.

Some fabric structure builders are evolving to the new corrosion protection: epoxy coatings. Epoxy paint and coatings can actually interrupt the corrosion process, not merely slow it down.

In addition to the corrosion protection gained from the exterior fabric, many buildings have an interior liner as well. Some are insulated between the liner and the exterior walls. Others are not. This adds an extra level of protection from corrosive materials inside the building.

5. Versatility

Fabric structures do not just present another option for dry bulk storage. In the past, fabric buildings were prefabricated and standardised – the closest fit was identified and ordered that off the rack. Now, buildings with custom designs that fit exact requirements are becoming more common. Ordering a custom designed structure is not necessarily slower. Builders can often get a drawing made quite quickly using industry standard software.

Tension fabric structures that use solid steel frames increase one's options. Because the frames are so strong, cranes, conveyor belts, HVAC systems and fire suppression equipment can be hung from the roof beams.

"The whole design is very efficient for operations. Flexibility is key, especially when the building is a 'first of its kind' for the industry," said Mike Miller of Source Energy Services in Wembley, Alberta (Canada). "There was one design change after the whole plan was in place, to widen the trapeze in the structure that supports the conveyor, and [the builder] was able to make that change without any problem. The conveyor system fits and operates just as it was designed."

In some cases, a fabric building allows the owner to avoid limitations created by the environment. "Because of the soil issues, the company simply could not afford to construct a more traditional building," said Joe Bitter, General Manager of Alliant Energy/IEI Barge Services in East Dubuque, Illinois (US). "The lightweight design of the [tension fabric] building allowed a compromise between soil conditions and cost to be reached," he said.

Case study: CGB Graber

CGB Enterprises is a global grain and transportation company that serves the agriculture industry. When business growth led to the expansion of its facility in Naples, Illinois, it needed a building solution that would accommodate both bulk salt and bagged product for distribution to corporate and individual clients. Because the product is a feed that cannot get wet, CGB has to take this into consideration when considering their storage options.

As a result, the company chose a fabric structure on a rigid steel frame which had advantages in addition to design flexibility. The 150 ft long building has two separated interior sections – a larger one that is used for bagging and sorting product, and the smaller building which stores pallets of bagged feed and agricultural salt.

Once corrosion starts, it allows leaks and moisture into the building – damaging the feed and saleable goods inside the building, ultimately causing lost profit. All aspects of the building – including the frame, cladding and secondary supports – are designed to withstand constant exposure to corrosive elements.

The finished building uses Legacy's exclusive ExxoTec Elite 27 oz. PVC fabric on the walls and roof. The fabric has non-corrosive properties and a lifespan of up to 30 years in the corrosive fertilizer environment. The structure also relies on corrosion-resistant solid steel bracing rods as secondary support, rather than the cables used in many buildings.

All building frames and secondary supports are hot dip galvanised steel I-beams. Unlike the open web trusses used for many fabric structures, the steel beams have no hollow interior spaces where corrosion may start undetected. Hot dip galvanising applies a uniform layer of protective zinc to the building frame, ultimately extending the life of the steel.

"Longevity is always critical," said Brandon Schafer, Project Manager at Graber Construction. Based on the specifications provided by CGB, Graber recommended Legacy to design and install the fertilizer building.

Crew members have noticed the building's resistance to 30 - 40 mph winds and noted the natural light inside as a significant benefit. The ExxoTec Elite fabric used on the building has 12% translucency, which allows daylight into the building – saving on electricity costs and creating a bright, pleasant environment in all corners of the building. **DB**