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# RAPIDSET METAL BUILDINGS


- Designing the Aircraft Hangar
- The Schweiss Door Systems
- A Builder's Experience

# RAPIDSET METAL BUILDINGS

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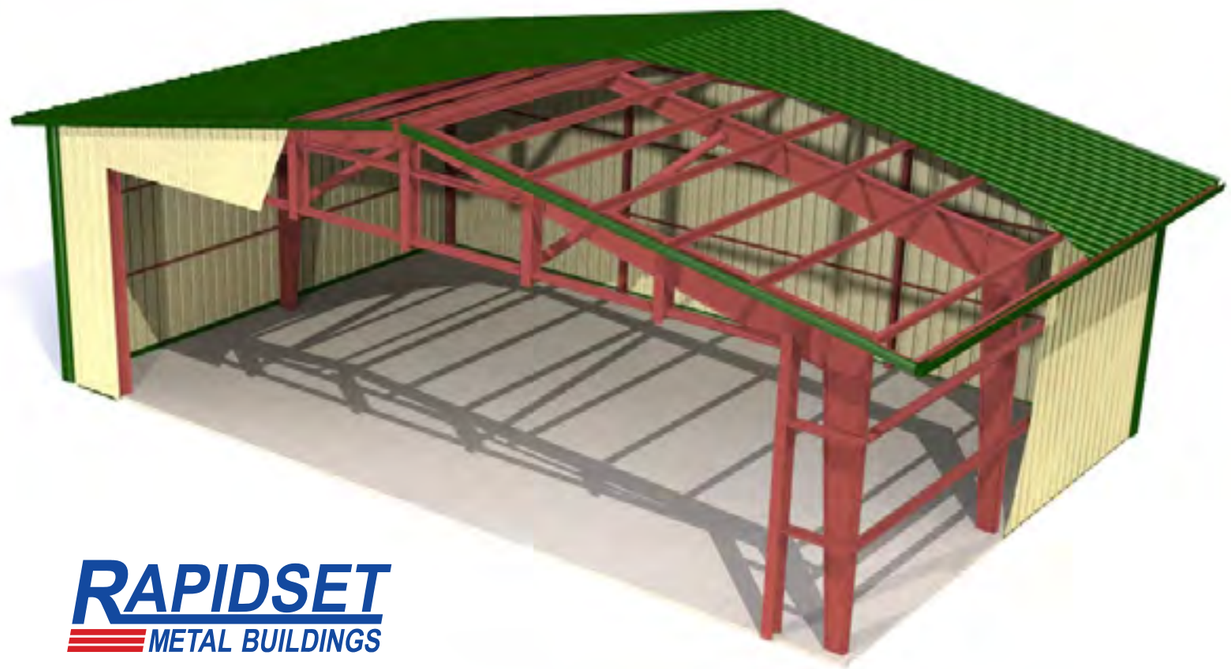

RAPIDSET METAL BUILDINGS

Dear Customer,

Here at Rapidset Buildings, we take great pride in what we do and how we do it, and two particular areas separate us from the competition. The first area is our ability to get it right. Few building suppliers will attempt the export market, leaving us as one of the worlds largest building exporters. We achieved this by getting the building right before sending it to the customer, and not having to send replacement parts later. The second area comes from our ability to engineer steel buildings. This fact is most apparent in our Hangar buildings. We understand the frame load requirements, the forces placed on them by the large hangar doors, and design the building accordingly. Not cutting corners lower building costs, but actually over designing to provide a better building value.

Sincerely,

Steve Carter, Engineering and Sales

# *Designing the Aircraft Hangar*

*By Larry Stevens*

To design a standard building (without a hangar door) coordination is needed to get the local building code and loads on the building for it to be engineered correctly and also coordination is needed to calculate the anchor bolt reactions so that the foundation is formed for the least amount of concrete for the intended use of the building.

For an aircraft hangar all of the above requirements still applies but now 1 or more huge doors need to operate on the building.

When a call comes in to design a hangar we start with the door. We ask the size and style of the door they would like, meaning "Is it a bi-fold that will fold up to a wedge or hydraulic that tilts up from the front of the building?" Those 2 options are the most common. Other options are a rolling door that would roll on the ground or a rolling door that would hang from tracks?" There are also some exotic tilt types but we rarely see them.

For this example we will use a bi-fold because we mostly design buildings for that type of door, although, hydrolic doors are also available through SchweissDoors.com. The most important thing when designing a hangar is to figure the hangar door opening size carefully. The size of the opening should compensate for any future airplanes you might acquire for the most use. Take for example if we figure a Cessna T210F Turbo. The wing span is 36' 6" (11.13M) and the height is about 9' 8" (2.95M). If you are trying to estimate a door size always figure more not less. I feel for this aircraft a good hangar door size would be about 46' by 12'. You can find aircraft sizes on our web site HangarBuildings.com and the sizes link is at http://www.hangarbuildings.com/sizes.html

Going on with our example, if we figure the width at 46' the math would work out to be 46' – 36' 6" = 9' 6" and if you take the 9' 6" of free space and divide it equally on both sides it would 4' 9" on each side from the wing tips to the building structure. That seems easy. I think if you had to you could easily fit a little larger aircraft in the same hangar although you would need to take more care clearing the wings on each side.

The height is another matter. If you run the straight math it works out to 12' – 9' 8" = 2' 4" which seems easy. But what a lot of people do not think of is that when you pull out your aircraft nose first, if it has a tricycle gear like the Cessna 210, it all depends on the slope of the front apron of concrete right in front of your hangar. If the slope is small for drainage the tail will only swing up a little. If the slope is greater the tail will swing up a lot. It is hard to figure the math until it is built but for designing the hangar we usually recommend plenty of room so that tail of the aircraft you are designing for will easily clear the tail with a standard slope.

Another thing to think about when designing a hangar is the overall height of the building. The FAA has some rules about building close to a runway. They use a sloped line from center line to figure maximum height. You might want to confirm your building works within that height.

For overall building height when designing a building I figure the needed door height + door wedge + 1' of building trim. The door wedge is determined from a table according to width and other factors and if it is a hydraulic style it is only about 9". For our example it would be 12' + 3' 6" wedge (for that door) and 1' building trim to equal 19'6" tall at the sidewalls. The slope of the roof does not matter much although 1/12 is usually the least cost.

*"How Big Do You Need Your Building To Be?"*

Once we have the information of the door size, building code and loads and zip code for delivery we are ready to design. For our example we would start with an overall building size of about 52' (46' opening + 3' on each size for frames) by 40' (our Cessna 210 is 28' or 8.53M long) by 19' 6" tall as explained earlier.

We would then set the frames, girts (wall framing) and purlins (roof framing) like a standard pre-engineered building but then we would add another main frame just behind the left end wall to hold the weight of the door. Then from that frame we would hang stub columns that would hang down to catch the top of the door spaced for the hinge points of the door. Once a hangar door is installed and opened the force (moment force) on the building as it hangs out front is huge. So hangar buildings use back braces. For our back braces we usually use 6" pipe from the second main frame back to the bottom of a couple stub columns. This makes for a very solid design and a good looking building you can be proud of.

It is critical that whoever designs your hangar understands the coordination needed to make sure the door fits together on the building and works correctly once installed. We prefer to work with Schweiss Hangar Doors (SchweissDoors.com), although, we can design for any door.

On our example, from the person that called who needed a hangar for a Cessna 210. We have preliminarily designed the building from our tables of door sizes, wedge sizes and standard door layouts for costing but now the builder or owner is ready to purchase the building. They need to do 2 things, commit to the hangar door supplier and confirm we have loads and codes correct for the design – because they are always changing. Once that happens Schweiss (or your door supplier) would send us the door engineering specs for that exact door that they are building for that hangar at that location. We take that engineering and detail the building to fit that door exactly. We adjust the hinge points, the weight and the exact overall measurements so that the door will roll up and down on our beams correctly.

When you are getting quotes for hangars note if the supplier or designer has included the panels, fasteners and trim for the hangar door also. When the door supplier sends us the engineering for that specific door it also has trim and panel details. So make sure when you note the colors you want on your building that the door panels and door trim are colored as you would like.

In this example I have explained a single stand alone hangar. There are endless possibilities of building hangars into other type buildings like homes, offices, FBO's or long multi unit T-style hangars where the partition walls define hangar spaces and hangar doors would hang from large beams on the sidewalls.

If you need a hangar, let's design one together.
We make it easy!

Larry Stevens

# The Builder's Experience

I was the erector not the GC on this building. I arrived with a slab and an unloaded building ready to go. The GC was in Louisiana and took the prints with him. SteelBuildingSupplier was very helpful in supplying us with new prints for our Rapidset building. We began mid summer and couldn't have picked a better day. 8:00am, 65°, a light breeze, and not a cloud in sight. With the boom forklift we rented we had the Columns up with the girts and cable braces before lunch. As we bolted the rafters together at their eaves and began lifting them into place, the sky began to fill with clouds. It wasn't until we had bolted one side of the second set of rafters that the wind began picking up. The weather worsened and we scrambled to bolt the other side and a couple purlins for support. We watched from another hangar on the property as Mother Nature tested our construction. As the wind picked up our under-supported rafters waved violently. We decided to raise the scissor lift against the underside of one of the rafters for support. Happily, I did not draw the short straw, and enjoyed watching as one of our guys drove a scissor lift at 1mph through the hail and successfully braced our building. The property owner had warned us of the unforecast storms that sneak up in Brighton, CO. I suppose the fact that it happened on Day One should have forewarned me of what was to come..

The next morning we began by bolting the rest of the purlins in that first bay, just in case the weather turned again. It was hot and windy that day but we were glad to see the ground dry up before we fired up the forklift. Day two was without incident and we had the endwall and third bay standing and braced by quitting time.

The home owner, a commercial pilot, was nice enough to allow us use of his house while he was away. He arrived at home that third day to find us sitting in his old hangar watching the rain. To say he was pleased with the work we had done so far was an understatement. The building sat on his property for four months before construction began. He was less than satisfied by the GCs performance, especially because he was told the project would take about two months from start to finish. After reviewing the radar maps of the weather system effecting us and attempting to explain several weather phenomena at work he told us the weather would not be clearing up anytime soon and treated my whole team to lunch, a movie, and dinner in the nearby town.

By the end of the week we had finished the red iron and frame of the hangar door. Admittedly, this was my first hangar. 99% of erecting a hangar is the same as any Rapidset building, but the thought of being responsible for this incredibly heavy door rising above people and hundreds of thousands of dollars worth of aircraft made me very nervous. The frame arrived from Schweiss in two pieces which, after being positioned, took only minutes to assemble. The forklift raised it into place and we bolted in the hinges at the top, simple enough. Given the unpredictable weather, we lashed the sides of the frame to the columns it rides on.

The second week was spent getting the hangar ready for insulation and sheeting. We bolted in the walk doors, framed openings, and the welder came out to weld on the brackets for the "auto closer" for the Schweiss door as well as the hinges.

The insulation and wall sheeting began going up the third week. Intermittent wind made for a particularly slow and frustrating experience. Twice, a gust of wind ripped off our strip of insulation before we could get the sheeting over it. We found that a pair of Vice-Grip clamps worked well at holding the top of the insulation in place. The end of the week arrived with another storm. Once again not forecast and once again catching us off guard. We were on the verge of finishing the sheeting on the main walls when it hit us. The site was pelted with golf ball sized hail and high winds. We watched as a vortex passed overhead. The tornado touched down just a mile away. We watched news reports of the tornado and its destruction. The town nearby received six inches of hail. The news showed people shoveling driveways in shorts and t-shirts. Another nearby town was bombarded with baseball to grapefruit sized hail which resulted in many "Hail Sales" at car dealerships across central Colorado.

Damage at our site was minimal. The insulation we were unable to cover in time was torn loose and relocated to several trees in the neighbor's yard. After the storm passed we hung it from a purlin and it was completely dry a couple days later.

The next week's weather was hot and humid. The problems that week were courtesy of the boom lift we had rented to help with the sheeting. When the first boom lift arrived on site it never even left the truck. The rental company couldn't get it started so they promptly delivered another one to the site. A few days later this lift started to die. We had a couple guys suspended twenty feet in the air and the engine stopped and the boom controls didn't function even in battery mode. The rental company told us the problem was probably due to an overheating hydraulic pump and to put a sprinkler in the engine compartment and let that slowly run as we worked. Skeptically I did just that and it seemed to do the trick because it died less frequently and took less time to get it going again when it did die.

We had a string of still and dry days leading up to working on the roof. So we made the poor decision to roll out the first two rolls of insulation over the roof before sheeting it. It wasn't thirty seconds after we unrolled the second roll of insulation over the roof that a gust of wind came. I swear it was the only wind all day and it came just to blow our insulation to the ground. We continued on only rolling out the insulation we could immediately cover and the rest of the roof sheeting went smoothly. The owner was afraid the insulation would begin to sag in the years to come and had us install steel strapping over the purlins every two feet. Although it was incredibly tedious and probably decreased the R value of the insulation, it made for a very smooth looking finish inside.

I began assembling the rest of the components on the Schweiss Bi-fold door while the rest of the guys worked on. The most complicated part of finishing the door was fixing the damage done by the GC when he unloaded it. A piece of tubing in the center was badly bent and took quite a bit of work to bend back into place. The straps were easy to install and properly tension. The motor bolted up perfectly, wiring it into the control box was straight forward. I'm pretty sure I didn't breath the first time I hit the button to raise the door. My heart stopped when the roller on the door bounced over a weld, but all went as it should and I ground down that weld as soon as door was back down. The wind brace didn't fully pull in the door the first time but after adding a bit more tension it worked wonderfully. Positioning the limit switches in the motor control box was very simple also... Raise the door to the height you want it to stop at and set that one, lower the door until the "auto-lock" engages and set the bottom one. Shortly after we were hit by the final storm on the job. Everyone but me had left for lunch when the site was hit by a micro-burst. Pieces of sheeting where violently thrown around the site. One sheet, right through the fiberglass door of an old hangar. The winds damaged many houses and hangars in the airpark but the Rapidset Hangar was unscathed.

The owner moved his planes in while we trimmed out the building and installed the windows. The electrician still had not run the conduit for the lights and door so I advised him to wait but in the end no damage was done to the planes. We finished the trim out late one night and so stayed one final night in the owners home. The next morning he woke all of us at 6:00am to celebrate his new hangar with a flight through the mountains just west of Denver. The perfect way to finish this job wrought with troubles... on a high note.

-Eric Erb

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## ASK YOURSELF THESE QUESTIONS

This will help pick your next hydraulic door supplier

| | | |
|---|---|---|
| Do I want a C-channel Door Frame | Yes____ | No ✓ |
| Do I want Tec screws | Yes____ | No ✓ |
| Do I want my Door without Cylinders | Yes____ | No ✓ |
| Do I want a Late Delivery | Yes____ | No ✓ |
| Do I want to pay more for freight | Yes____ | No ✓ |
| Do I want the grand total sale price raised *because the sales tax was not included* | Yes____ | No ✓ |
| Do I want to pay more than 25% down | Yes____ | No ✓ |

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- Less Down Payment
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- Better Delivery
- We're in for the Long Haul...
- Brand-X... *Not an option at this point*

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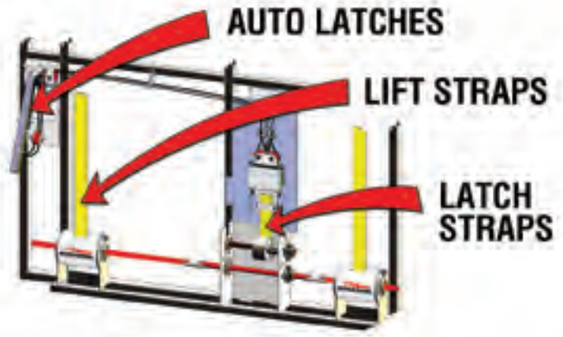
*with Lift-Straps and Latch-Straps*

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