

C-130 Air Hangar Fast Tracking a Critical Design/Build Project Through Cooperation

The Hercules C-130 is the workhorse of the U.S. Air Force – and considered by many to be the most versatile tactical transport aircraft ever built.

Since its introduction nearly 50 years ago, the turbo-prop, high-wing C-130 "Herc" has accumulated over 20 million flight hours. The aircraft remains in production, performing a wide range of operational missions during both peacetime and war. Ongoing modifications to the Hercules are extending its life well into the 21st century.

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Essential to the C-130's performance is depot maintenance at Hill Air Force Base in Salt Lake City. The base's new C-130 Air Hangar is a prime example of successful collaboration among companies of varying sizes and disciplines, each contributing their design/build expertise to meet an accelerated schedule.

Needham & Associates, which served as structural engineer and designer, coordinated the hangar project with URS Corporation, one of the largest engineering companies in the world. Sure Steel, Inc. of Sandy, Utah provided the steel.

The 52,000-square-foot hangar is a two-bay corrosion control hangar: with one paint-off bay and one paint-on bay. Typically more difficult to design than standard air hangars, it is one of the most complex hangars Needham has ever designed.

"The project was difficult, but working together as a team made the project proceed well," states Todd Hill, Project Manager for Needham. The multi-disciplinary Kansas City-based firm specializes in aircraft facilities for the military and commercial industry.

Airflow is critical to the hangar's design, since air needs to move evenly over the C-130 aircraft during the camouflage painting process. Needham grasped the mechanical and airflow intricacies of the project from the beginning.

The single-slope roof design, sloping towards the back of the hangar, ensures the critical flow of air straight through the structure. Airflow design is vital, aircraft paint hangars are driven by mechanical requirements.



Needham also understood and calculated the weight-bearing load of the equipment and air handlers. Utilizing a box truss across the front of the hangar achieved two objectives: the box truss is more stable and shallower than a single truss. This feature took into account both height and weight-bearing considerations.

Needham's design of the hangar also incorporated effective functional solutions to the challenges of building corrosion hangers.

Exhaust filters are commonly located at the front of a hangar – although this configuration can cause problems with hangar doors. Instead, Needham recommended the use of rear-mounted filters that do not have to be moved when opening the doors. Aircraft are backed into the paint hangar.

cont. on back



Language Choices in Programming

Programmers of Autodesk products have long had several choices in the programming language they are able to use. Among the choices are AutoLISP, VBA, VB, and C++ using ObjectARX. All of the languages are powerful enough to get the job done, but some languages offer a few perks that the others don't. Comparing VB/VBA to ObjectARX, will highlight some of these perks. Processing time and the power of code are two things programmers look for in a language, as well as, "just how fast does the program run?". To test the speed of the languages, 1000 circles and 1000 lines were created in a drawing, the circles were then updated, xdata was added to all of the lines, and lastly, 1000 2d polylines were added. The results: VBA – just under 10 seconds, ObjectARX – under 5 seconds, VB – a little over 90 seconds. As you can see there is a difference in the languages, but each has qualities that make it useful over the others depending on the application. Which is why we use all of the languages, working together, in the software we write.

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The C-130 Air Hangar

The filters then help to maintain a precise humidity level, effectively control paint mists and dust, and remove everything that does not adhere to the aircraft during painting. Through a detailed understanding of the hangar's unique structural requirements and the aircraft painting process, the design/build team was able to more effectively combine its strengths to produce a cost effective project for the Air Force.

If every design/build team were as diligent, responsive and good to work with as the structural steel subcontractor (Sure Steel) and structural designer (Needham & Associates), this construction project would be a cinch," notes Kurt F. Brust, Vice President at URS Corporation and the C-130 Project Manager. "If we ever have another design/build project with a structural steel structure, I would not want to work with anyone else."

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Construction Market Remains Tight and Crazy!

Engineering News Record reported in their First Quarter Cost Report a slowdown in the rate of inflation of all types of construction products and services. In fact, severe competition is more than offsetting the modest increases in inflationary pressures.

Needham and Associates has encountered idealistic and irrational pricing on several recent projects. Division five prices on many large jobs appear to be at essentially cost. Design/Build projects have shown even more competitive deterioration. Most work is near break-even and the designers are making very liberal (real bad) assumptions to keep costs as low as possible.

This type of bidding and negotiating climate is typified by a recent distribution center where the owner told all the design / builders they were qualified and all that mattered was cost. The designers were expected to provide extremely competitive designs, at no up front cost, so that the design firms might obtain an inadequate final design fee. What a recipe for disaster!

2003 will likely remain extremely competitive all year. There is little reason to expect a strong recovery anytime soon. So watch out for the irrational competition. Remember, when you sell below cost, you don't make it up on volume!

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Fire Wall vs. Fire Barrier: What's the difference?

If you think that these are just different terms for the same thing, you might be in for a big surprise when the code inspector shows up at your construction site. Generally speaking a "fire wall" has more restrictive requirements and usually costs more than a "fire barrier" of the same rating. Although there are similarities, they are fundamentally different in concept and it is important not to confuse one with the other.

The main thing about a fire wall is that, as stated in the International Building Code (IBC) section 705.1, "Each portion of a building separated by fire walls . . . shall be considered a separate building." The advantage of this concept is that the area limitations for each occupancy are applied to each building instead of the overall structure. For example, say an owner wishes to build a low-hazard storage facility, of 50,000 square feet. Looking in the code he finds that the maximum allowable floor area for type II-B construction is 26,000 square feet. By dividing his building in two with a fire wall, he can in effect create two separate buildings, each of which will be within the code limitation.

This can be a powerful tool for the designer since it allows the construction of much larger buildings than would be permitted otherwise, but with this freedom come restrictions. IBC Section 705.2 states: "Fire walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall." This usually means that some columns must be added to provide a separate structure. Also fire walls must extend at least 30 inches above the roof and there are additional requirements where a fire wall meets an exterior wall.

Fire barriers, on the other hand, are only required to extend from the floor to the bottom of the roof deck and there is no requirement for structural separation. Fire barriers are typically used for occupancy separation, such as between offices and a factory.

So it is not sufficient to know only the rating of a wall, such as whether it is a "two-hour wall" or a "three-hour wall." In order to construct it properly, one must know whether it is a Fire Wall or a Fire Barrier.

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