

554 RED HORSE Builds a Better "Box" by Thinking Outside It

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Constructing PACAF's new Regional Training Center, the 554 RHS used their "Can Do, Will Do" attitude to achieve mission success.

The 554th RED HORSE Squadron arrived home to Andersen Air Force Base, Guam, in April 2013 from a squadron-wide deployment to Operation ENDURING FREEDOM to be met with a huge task — building the new Pacific Air Forces Regional Training Center. The Silver Flag training site was moving to a 2,000-acre compound on Northwest Field at Andersen from its former location at Kadena Air Base, Japan, as part of the "Rebalance the Pacific" strategy. After some well-deserved family time, the squadron reconstituted its tools and equipment and quickly got to work.

There was an extremely aggressive construction timeline. The 554 RHS had to complete 12 projects (10 vertical and two horizontal) in one fiscal year to achieve initial operating capability for the Silver Flag site. The timeline included the herculean task of constructing eight buildings simultaneously, six more than maximum capacity for the 554 RHS. Creative solutions for labor and construction techniques became a requirement for mission success.

Additional manpower came from total force Airmen, sister units and services, including project engineer teams from Andersen's 36 Civil Engineer Squadron and the 35 CES from Misawa AB, Japan. RED HORSE answered the call with teams from the Air National Guard's 254 RHS at Andersen and the 823 RHS (an active duty unit) at Hurlburt Field, Fla. Finally, the main joint partner was the 11th Naval Mobile Construction Battalion from Gulfport, Miss.

But, increasing manpower alone wasn't enough. The engineering team analyzed construction schedules, costs and material availability and determined new building methods also had to be considered.

The 554th's typical construction uses concrete, a material well suited to withstand the strength of Guam's typhoons and seismic activity, and a technique — unique to them — of precast concrete wall panel, tilt-up construction with steel trusses. Concrete wall panels are cast on the ground, then "tilted" up using a crane. Walls are temporarily braced until trusses are placed between them, and additional supports are placed under the roof until the steel and concrete is placed onto it. The average timeline to lift the walls, remove the temporary supports and start interior construction is three weeks.

The lead time for shipping structural steel from the mainland posed the biggest schedule challenge for using the 554 RHS's typical technique. The shipping adds 10-16 weeks to a project's schedule, unacceptable for completing the center's projects by the first quarter of fiscal year 2015. New building methods had to be considered. Key objectives of the new method were reducing the construction equipment and manpower required; producing a facility capable of withstanding the harsh environment; and ensuring the project remained on time and on budget. With designs flying off the printer for fast-turn execution,

the RED HORSE engineers had to find a new way of raising the roof. They did just that.

The 554 RHS turned to pre-cast/pre-stressed double tee beams, in which the reinforcing steel is placed under stress prior to casting in concrete. This allows the beams to span longer distances and carry a greater load. They can also be delivered within 3 weeks from on-island sources. There were other benefits as well: they provided natural corrosion resistance, met the strict seismic engineering requirements, and required less manpower and equipment



Top: Reinforcing steel strands are stressed prior to casting the concrete beams.

Middle: A blanket is rolled over the beams to create a controlled curing environment.

Bottom: With no need for temporary supports, interior framing and final roof construction can occur simultaneously. (U.S. Air Force photos)

to prepare and erect. Best of all, they cost less than a steel truss roof.

The concept of pre-stressed concrete beams has been in use for many years and in various kinds of structures, predominately highway bridges. The process is rooted in placing the reinforcing steel strands under tensile stress, according to the engineer's load calculations, before casting the concrete beam. Once cast and cured, the tension is released and the beams develop an upward deflection, which allows greater strength capacity to counteract the loads placed on the beam and therefore, smaller beams can be used.

Pre-stressed double tee beams consist of a section with two beams under stress and a 2-inch slab decking connecting them together. Sections are cast using 6,500-psi concrete and covered with a curing blanket to create a controlled environment that allows the beams to reach their 28-day strength, at 90 percent of ultimate strength, in just 3 days. The beam is then lifted out of its form using an overhead crane and placed in a staging yard.

With double tee beams the construction process from walls to finished roof is shortened from 3 weeks to 2 days, since the beams have a hardened concrete roof slab. This hardened concrete roof slab allows for construction to occur both on the roof, preparing for the reinforced 3-inch concrete topper, and inside the building, since the beams do not require temporary supports. The 554 RHS could go from exterior building shell into interior construction in record time.

Currently, six of the eight buildings have been erected using double tee beams, with the other two buildings using previously ordered steel trusses. The six projects that utilized double tee beams have estimated cost savings of \$235,090 and construction time savings of 37 weeks.

The success of this pre-stressed/precast double tee beam system has made it the 554 RHS's method of choice for roof systems designed for the 2015 and 2016 facility construction program. For three new troop construction facility projects in fiscal year 2015, the system will result in an estimated cost savings of about \$455,000.

Tasked to build PACAF's Regional Training Center support infrastructure on a compressed timeline, the 554th RED HORSE Squadron went outside the standard issue "box" and came up with a solution that is faster, uses less manpower and meets all engineering requirements. This effort was pivotal to achieving the project's timeline and mission success. The annual pipeline of 1,200 Pacific Air Forces' engineers and Force Support Airmen will commence training in October 2014 as scheduled.

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