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ASCE HAWAII SECTION

2006 OUTSTANDING CIVIL ENGINEERING ACHIEVEMENT (OCEA) AWARD

Winning Project: Design-Build AEF FOL Aircraft Maintenance Hangar

The Design/Build AEF-FOL Aircraft Maintenance Hangar is a $32.8M contract with the US Air Force to design and build an earthquake and typhoon resistant, air-conditioned aircraft maintenance facility. It will serve as the primary maintenance site and shelter for aircraft crucial to the operations of the U.S. Air Force. This innovative hanger project provides reliable shelter and an air conditioned environment for B-2 and B-52 air craft maintenance. This hangar is also designed to support "hard broke" B-1B, B-2, B-52, KC-135, F-22 aircrafts that cannot be flown off island prior to a typhoon.

The hangar encompasses some of the most sophisticated concrete construction, electrical and mechanical design systems. Several special mission requirements were incorporated into the project design. Firstly, the structure was required to be of concrete construction. The structure was designed to resist sustained winds of 170mph, and seismic zone 4 earthquake forces. Another requirement being that the air conditioning system had to be capable of cooling down two "heat soaked" B-2 aircrafts from 118º to 75º either individually or concurrently within 8 hours. The hangar has a B-52 "tow–through" capability in either direction. Bridge cranes, service and breathing air systems, fall arrest, fuel cell and spot ventilation maintenance support equipment for the B-2 and B-52 aircrafts were also a part of the specifications.

To meet these design requirements, BCC's design-build team elected to design and construct a 20m high, 4,700sm arch shaped concrete hangar comprised of precast folded plate arch segments with cast in place segment connections and diaphragm beams. Bi-parting hangar and tail doors installed at each end of the hangar and a vertical lift fabric door mounted in the center of the hangar allow direct tow through of B-52 aircrafts. Tow ways entering the hangar from both the east and the west were designed to ensure proper wing and tail clearances into and out of the hangar in either direction for all designated aircraft. In the closed position, the vertical lift fabric door divides the hangar into two separate bays large enough to accommodate one B-2 aircraft per bay.

Eight 60 ton air conditioning units and four 60,000 CFM fans were installed for independent and joint cooling and ventilation capability. The hangar has both sprinkler and high expansion foam fire extinguishing systems linked to infrared smoke detectors and fire alarm system. The hangar's new fire extinguishing system is tied to the base's existing water supply, consisting of a new 300mm fire main. A new 200,000L fire water tank supplements the existing fire supply system's reserve capacity. Specialized maintenance equipment installed in the hangar included a 400hz power system, preconditioned ventilation units for fuel cell maintenance, spot ventilation systems, compressed breathing and service air, and two 7.5T and one 0.5 T bridge cranes. Additional support systems installed include high hangar bay lighting, trench drains, dual walled effluent collection piping, 400,000L concrete process tank, security, and PBX systems, 650KW standby generator, and package sewage lift station. The precast design of the hangar's arch segment shell makes it ideally suited for fast track, "assembly line" construction of wide span, concrete hangars for large aircrafts such as the B-52 within a short time frame.

The hangar's mechanical/electrical design successfully integrates, for the first time, high capacity HVAC equipment, ductwork, and specialized aircraft maintenance equipment needed to maintain B-52 and B-2 aircraft within a large, arch shaped, concrete hangar.

The aesthetic value of the project is prevalent in the new hangar's folded plate arch design very similar in appearance to the existing corrosion control hangar also located in Andersen AFB which was constructed in the late 1970's. The new hangar is located approximately 500m west of the existing hangar. The new hangar is painted with the same "antique linen", "tobacco brown" and "mission red" color scheme used throughout Andersen AFB.

The design/build team for this challenging project, which was delivered safely, on time, and within budget, included Black Construction Corporation, Burns & McDonnell, Applied Technology Corporation, and SS Dannaway & Associates.

Runner-up Project: Ford Island 46kV Subtransmission Line

The Ford Island 46kV Subtransmission Line is

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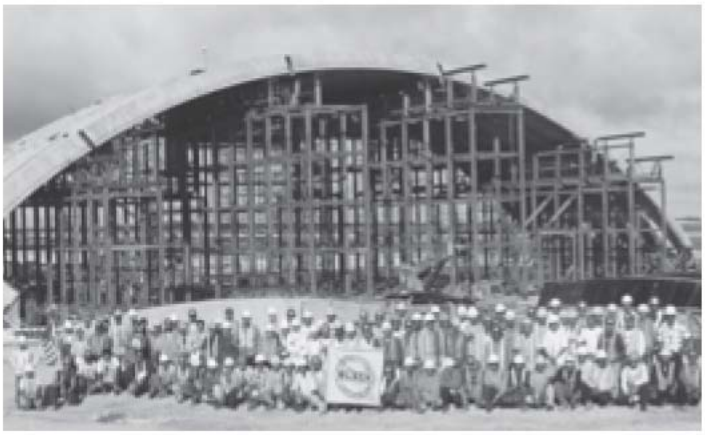
OCEA Award Winning Project: Design-Build AEF FOL Aircraft Maintenance Hangar, Andersen Air Force Base, Guam.

Accepting the 2006 OCEA Award for the Design-Build AEF FOL Aircraft Maintenance Hangar Project are members of Black Construction Corporation's design/built team (left to right: Ben Zhou, Alfred Yee, Brenda Balbin)



OCEA Award Winning Project: Design-Build AEF FOL Aircraft Maintenance Hangar, Andersen Air Force Base, Guam.

OCEA Runner-up Project: Ford Island 46kV Subtransmission Line, Pearl Harbor, Hawaii.

ASCE OCEA, *from page 1*

a two-mile, double circuit 46kV cross linked polyethylene (XLPE) line extending from mainland Oahu to an electrical substation on Ford Island. Approximately one mile of the line runs parallel to the Admiral Clarey Bridge and is installed below the Pearl Harbor channel floor. For the first time in Hawaii, horizontal directional drilling (HDD), a technique normally utilized to install civil utilities, was used to install underground subtransmission electrical cables. HDD is a technique that involves drilling a pilot hole underground, enlarging the drilled hole with a reamer, lubricating and clearing the reamed hole with a swab, and specifically for this project, finally pulling a steel casing through. In the Ford Island project, two 36-inch diameter tunnels were created 65 feet under the Pearl Harbor channel floor.

Through each tunnel, a 24-inch diameter steel casing containing six high-density polyethylene ducts (3 for XLPE cable, 1 for spare, 1 for fiber optics, and 1 for ground wire) was pulled back using a 750,000-pound drill rig. The project took nearly four months to construct and is the longest continuous underground 46kV installation in Hawaii and possibly one of the longest in the world.

The Subtransmission Line was installed as part of a $22 million electrical upgrade completed by Hawaiian Electric Company. The upgrade was required to meet future electricity demands to support the U.S. Navy's plans to renovate and modernize Ford Island. The upgraded system will provide 40 MVA of capacity to Ford Island, home of a Navy-Marine Corps Intranet nerve center.

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