ENTRY FORM

DVASE
2010 Excellence in Structural Engineering Awards Program

PROJECT CATEGORY (check one):

New Building under $30M		Other Structures Under $10M	
New Building over $100M	x	Other Structures Over $10M	
New Building $30M - $100M		Free Style	

Approximate construction cost of facility submitted:	$110 Million
Entry Fee:	**FREE**
Name of Project:	C4ISR Campus East – C2CNT east
Location of Project:	Aberdeen Proving Ground, Maryland
Date construction was completed (M/Y):	Anticipated February 2011
Structural Design Firm:	EwingCole
Affiliation:	**All entries must be submitted by DVASE member firms or members.**
Architect:	EwingCole
General Contractor:	Davis Construction

Company Logo (insert .jpg in box below)

EWING COLE

The US Army Corps of Engineers' Team C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance), currently located at Fort Monmouth, New Jersey is being relocated to a new campus at Aberdeen Proving Ground in Maryland. The new campus is comprised of 14 buildings totaling 2.5 million square feet of building area. The C2/CNT East building is approximately 580,000 square feet in area, will house nearly 2,000 occupants, and has an anticipated construction cost of approximately $110 M. Construction documents for C2/CNT East were issued at the beginning of 2009, and construction began in the summer of 2009. The anticipated construction completion date is February 2011.

C2/CNT East includes a primary building of 3 and 4 stories plus penthouses totaling 527,000 SF; and an adjoining high bay structure totaling 53,000 SF. The primary building's angular form is generated by two intersecting Ls, rotated on a 60 degree axis, creating an interior open air landscaped courtyard. The design intent for C2/CNT East focuses on integrating the building into the surrounding campus, using materials and finishes compatible with the architectural palette of the Phase I buildings.

Site conditions introduced several challenges for the design team. The high water table resulting from nearby wetlands required that the site be built up approximately two feet. Poor soil bearing capacity required a ground improvement system of rammed aggregate piers (RAP) under all column and wall foundations in order to achieve an allowable bearing pressure of 5000 psf to support building loads. Collaboration between the structural design team and the RAP specialist was essential in order to develop the system. A 'no dig zone' was established in order to ensure the integrity of the rammed aggregate piers while excavating for the complex arrangement of underground utilities. That effort required extensive coordination between the structural, RAP, and MEP teams. During construction there were several field adjustments made to accommodate unforeseen site conditions, requiring last minute redesign of footings and confirmation of RAP capacities.

In order to create an opportunity for the owner to receive competitive bids from multiple material contractors, two façade systems were explored and documented for this project. The base bid was documented as a foundation supported architectural tilt-up concrete panel façade. The alternative and ultimately chosen material was documented as a foundation supported architectural precast concrete panel façade. The design and documentation of two systems of different wall thicknesses, panelization and lateral support requirements created unique challenges. Additionally, the high bay structure utilized exterior load bearing walls, which were designed in house for the tilt-up option, but became a delegated design for the precast option. Performance criteria and loading information was specified on the contract documents and in the specifications. Although documenting two material options was challenging for the design team, the benefit to the owner translated into an economical system based on current market conditions, without impacting schedule.

Unique structural design challenges on this project resulted from Department of Defense requirements to meet criteria set forth in several UFC documents (Unified Facilities Criteria) related to Antiterrorism and Force Protection (AT/FP) and Progressive Collapse. The building was required to meet appropriate standoff distances from roadways and areas of parking as a first line of defense against a terrorist attack. Additionally, the structure itself was required to incorporate redundancy and ductility in its design. This was achieved by introducing a series of 'ties' throughout the building and designing connections for tie forces prescribed by the Progressive Collapse Requirements in the UFC Guidelines. Channel bracing members were provided to brace the bottom flanges of framing beams in order to meet uplift design requirements of the UFC. Columns were designed for two-story unbraced length, assuming the loss of lateral support at the floor above as required by the UFC. Lastly, all glazing and structural support of glazing elements were designed for blast loads as prescribed in the AT/FP UFC. A blast consultant was brought on board to assist in identifying blast reactions at the varying façade types. Blast reactions were indicated on the contract documents for the glazing, tilt-up and precast contractors. At cold formed metal framing exterior wall conditions, HSS members were introduced to frame windows and eliminate the need for CFMF to resist the blast loads. All connections back to structure were designed for appropriate blast reactions.

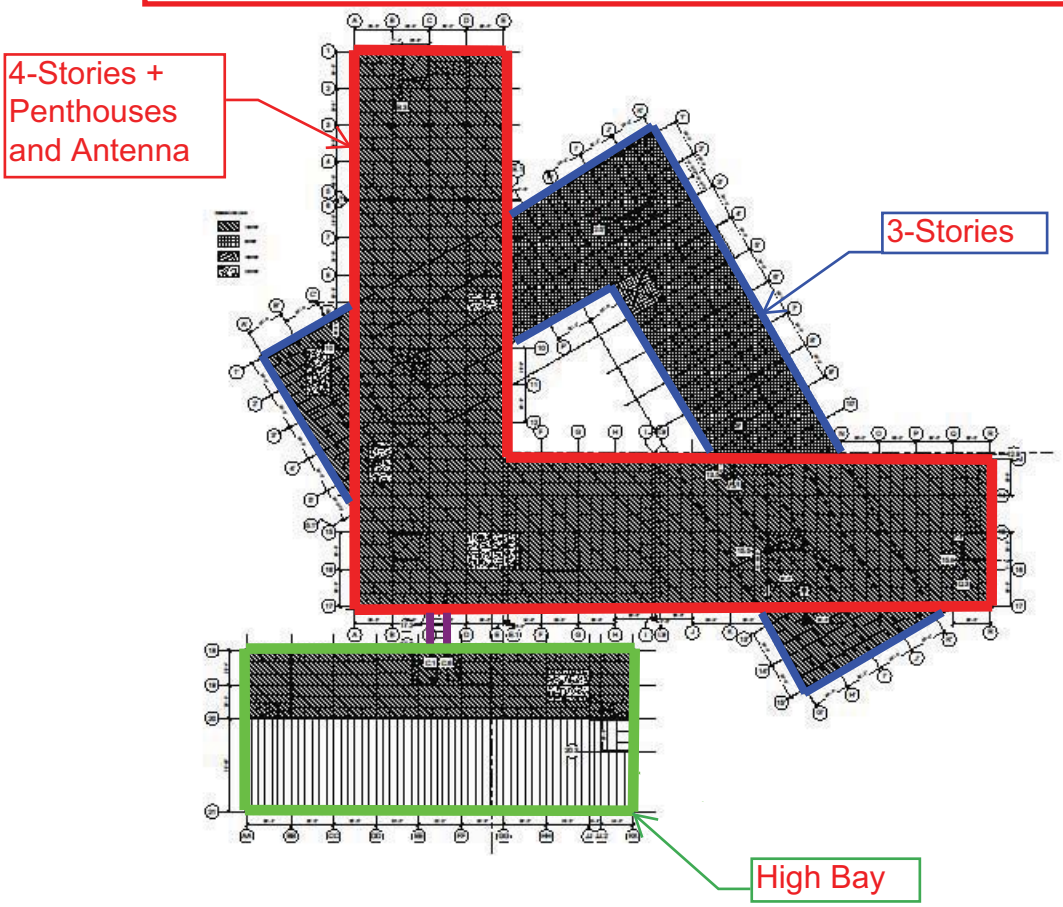
One of the owner requested design considerations was future flexibility in floor plan layout . All floors of the 4 story "L" are designed for a laboratory live load of 125 psf. This will allow office and laboratory spaces to be reconfigured to suit changing user requirements in the future. In addition, a roof top antenna platform was incorporated into the project to allow ultimate flexibility in locating military roof top equipment.

In order to minimize the material required for the exterior skin, the floor to floor height for this building was limited to 14'-0" with the exception of the first floor and the penthouse floor. This created a potential conflict between the structure supporting floors and the main mechanical duct runs located in plenum spaces above the ceilings of the corridors. To solve this issue, the floor framing direction was rotated along the corridors so the ducts would run under the shallow beams and avoid conflicts with the deep girders. The use of BIM (Building Information Modeling) throughout the design phase was also invaluable in early detection of conflicts between disciplines. It helped ensure that all major elements were coordinated before construction began. The BIM model was then made available to the General Contractor at project completion in order to aid him in his coordination efforts during construction as well.

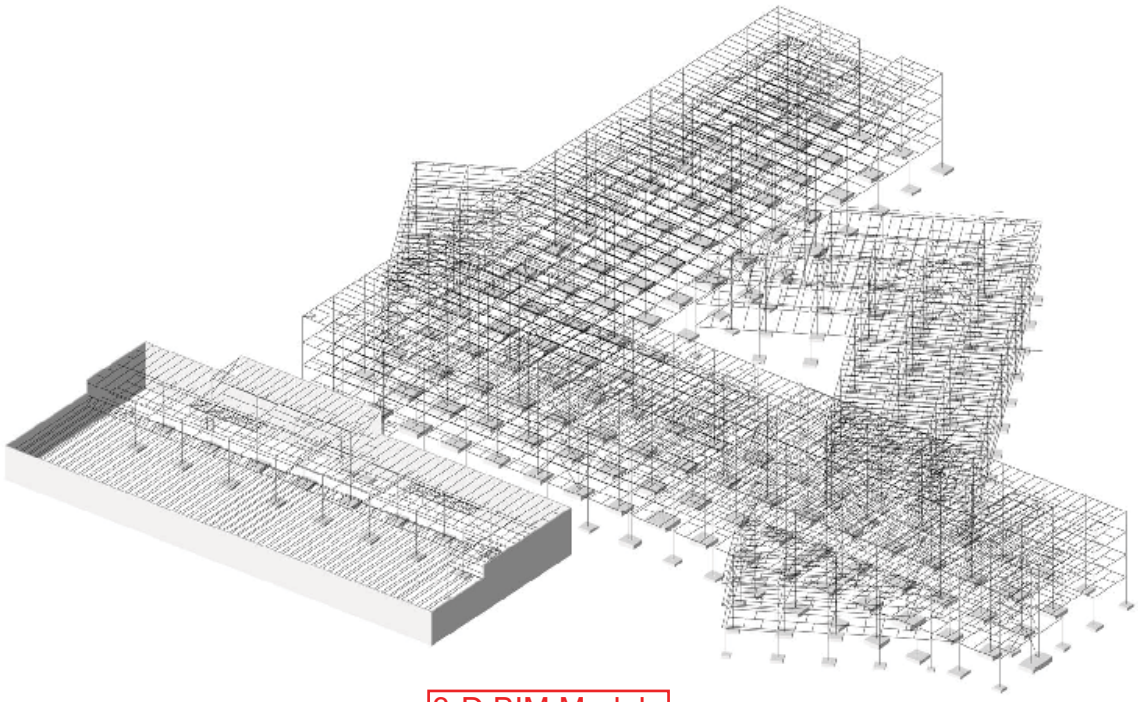
The structural goal for the C2/CNT East project was to meet client needs while assuring the most cost effective systems were used to solve challenges introduced by site conditions and D.O.D. design requirements. The success of the project demanded an innovative approach to tackle some complex design challenges. Extensive coordination between engineering disciplines was required to avoid potential conflicts, and the collaborative effort continues into the construction phase, where the structural team coordinates daily with the contractor to solve field issues quickly and efficiently. The end goal is to be part of a team that delivers an economical, flexible, safe structure that exceeds client expectations.

C2/CNT East Rendering of the Northeast Elevation

C2/CNT East - (2) intersecting "L's" at 60 degrees plus High Bay



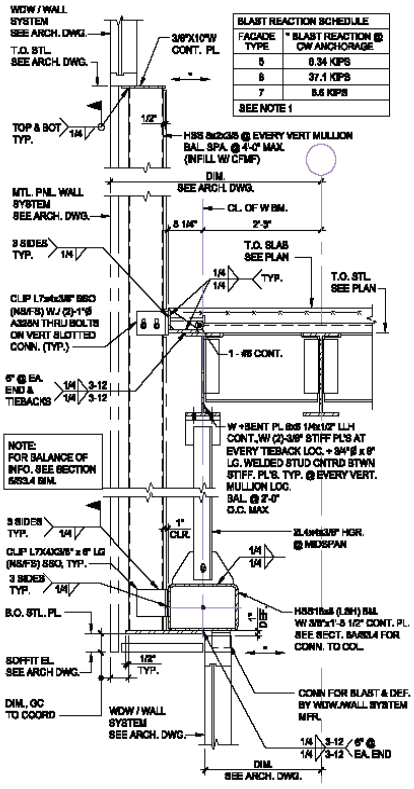
Typical Floor Plan

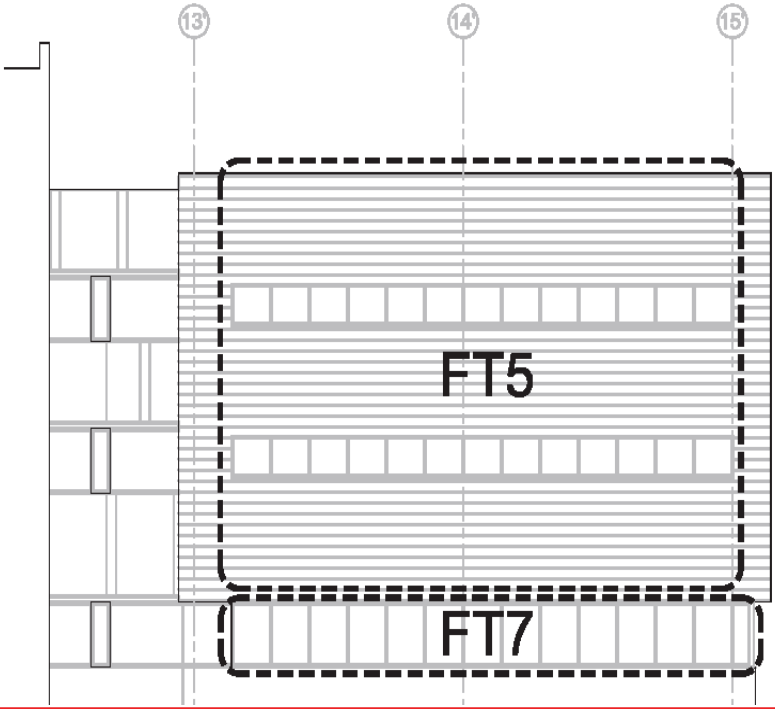


3-D BIM Model

DOD Criteria for Antiterrorism/Force Protection required in-depth Blast Analysis and detailing

Curtain wall facade partially erected.
Vertical HSS members in place.



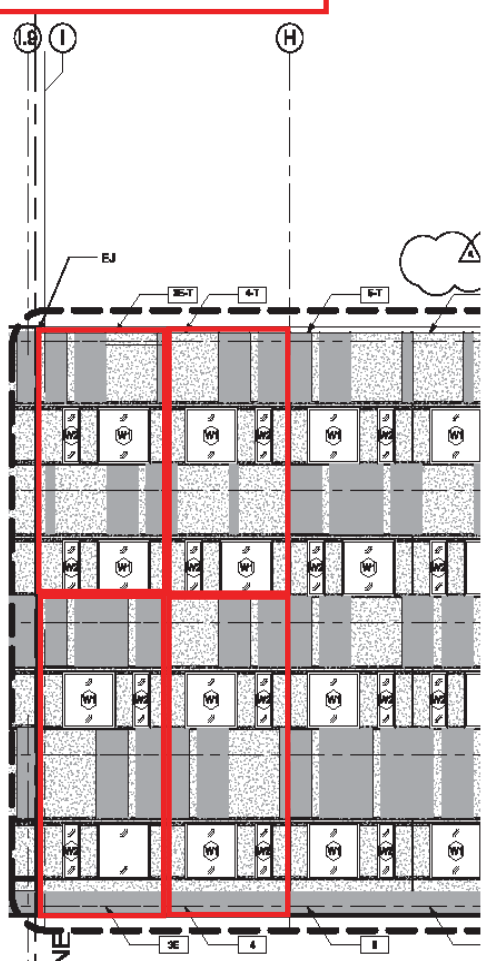


Structural section cut at curtain wall facade. "Facade Type" schedule gives required blast load reactions for curtain wall attachment.

Excerpt from Contract Documents indicating facade type. "Facade Type" is used in conjunction with Structural Sections to identify blast load reactions for curtain wall attachment.

(2) Facade Materials were evaluated and documented

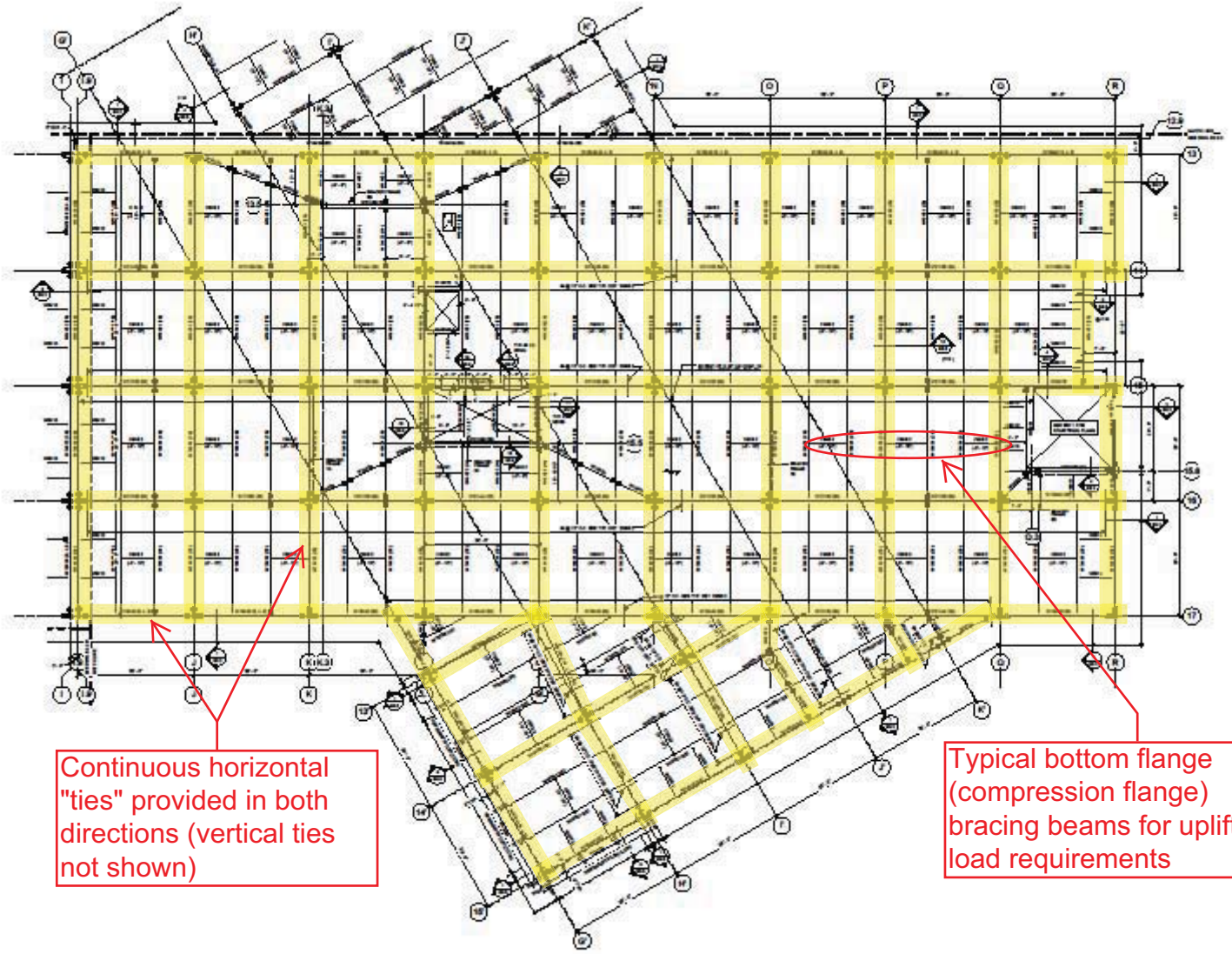
Tilt-Up Concrete Panel Base Bid
10 1/2" thick panels - 2 per bay



Precast Panel Alternate
8 1/2" thick panels - 4 per bay

Erected Precast Panel facade in Courtyard

DOD Requirements for Progressive Collapse



Typical erected "tie" beams

By signing, signatory agrees to the following and represents that he or she is authorized to sign for the structural design firm of record:

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