US Army Corps of Engineers

ENGINEERING AND CONSTRUCTION BULLETIN

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SUBJECT: Promoting Innovative Engineering and Construction

CATEGORY: For Information

1. **References**:

a. DoDD 4270.5 Military Construction, 31 Aug 2018

b. Executive Order (EO) 14255 Immediate expansion of American timber production, 1 MAR 2025.

c. Executive Order (EO) 14154 Unleashing American Energy, 20 Jan 2025.

d. Engineering and Construction Bulletin 2021-5 Interpretation of UFC 1-200-01, Delegation of Building Official/Authority Having Jurisdiction (BO/AHJ) Responsibilities, and Waiver/Exemption/Equivalency Approvals

e. Streamlining Procurement for Effective Execution and Delivery and National Defense Authorization Act for Fiscal Year 2026, Title XXVIII Military Construction General Provisions Items of Special Interest, "Limiting MILCON Bottlenecks Through Use of AI"

f. REPORT TO CONGRESS: Integration of Innovative Construction Materials, May 2025 (https://www.acq.osd.mil/eie/imr/mc/Downloads/2025-Report-to-Congress-on-Integration-of-Innovative-Construction-Material.pdf)

g. Hearing, "Innovative Techniques in Military Construction," 11 March 2025 (https://appropriations.house.gov/schedule/hearings/innovative-techniques-military-construction)

2. **Purpose.** This Engineering and Construction Bulletin (ECB) is for information only.

3. **Background.** We are experiencing a paradigm shift in military construction, one that demands bold innovation, creative thinking, and a commitment to continuous improvement.

Our mission is clear: deliver cost-effective, innovative, resilient, sustainable, efficient, and high-quality building solutions that redefine what's possible. To do that, we must embrace innovation as a daily discipline. That includes embracing bold design approaches, innovative materials, and cutting-edge construction techniques that reduce cost and delivery schedules while achieving the quality and safety standards required for the mission. USACE has shown what's possible through decades of lab research, risk-managed experimentation, and field-tested breakthroughs. We are ready to leverage USACE knowledge and industry innovation, to push our buildings further.

Engineering and Construction leaders must embrace this transformation. Engage innovative efforts on decisions that result in speed, less cost, and mission-focused outcomes. Our objective

is not only success but also learning, evolving, and growing. As a learning organization, we acknowledge that innovation includes risk. Concurrently, we must heed ADP 6-0, *Mission Command*, which guides us to build mutual trust, develop shared understanding, exercise disciplined initiative, and accept prudent risk. HQUSACE is ready to support you. Every pilot project, every innovation, every lesson learned helps strengthen our collective capability.

4. **Applicability.**

This ECB applies to all Army Military Construction (MILCON), Sustainment, Renovation and Modernization (SRM) projects, and Civil Works construction projects.

5. **Implementation.**

Many innovative solutions are ready for project implementation now. USACE must evaluate both the benefits and limitations of these solutions to improve future outcomes. All designers will evaluate and actively consider incorporating innovative solutions during Master Planning 1391 development, and at each design phase. The following are examples of innovative solutions to consider.

a. **Additive Concrete Construction:** This emerging technology allows us to build complex forms and structures through 3D printing with concrete. In comparison with traditional reinforced concrete and masonry construction, it reduces cost, improves precision, reduces waste, and accelerates construction timelines while providing consistency of construction between multiple similar buildings. Most structures today rely on the elastic properties of the technology, however, with proper reinforcement practices the technology can ensure sufficient design strength with improved ductility. Over the past 10 years significant government resources have been dedicated to support research initiative to understand the impact to construction and the material and structural performance of reinforced additively constructed concrete (ACC). Such efforts have led to continuing work within ASTM, ACI, and ICC to develop construction standards.

b. **Mass Timber:** Mass timber and other engineered wood products offer biophilic, aesthetic appeal along with structural ductility and long-term resilience benefits. Wood is a renewable resource with lower supply chain impacts under contested logistics compared to many conventional materials. Design information and case studies are readily available in the Mass Timber Design Manual, the Wood Innovation Network, and defense-oriented webinars developed in coordination with industry consortia. This innovative material supports EO 14255 Immediate expansion of American timber production.

c. **Recycled Steel:** The use of recycled steel supports our environmental goals by minimizing raw material extraction and reducing landfill waste. It maintains structural integrity while being a responsible choice for modern construction. Recycled steel reduces the need for mining new raw materials, which means less energy consumed and fewer environmental impacts. Using this material not only strengthens the manufacturing industry in the United States, promoting growth and innovation but also represents a smart choice for sustainability.

d. **Portland Limestone Cement (PLC) Mixtures:** Portland Limestone Cement is the primary cement produced within the United States, supporting American manufacturers and local

jobs. Its lower clinker content means less energy use and pollution, making it a smarter choice for sustainable building practices. Proper mixture design with these cements can enhance durability, reduce cost, and reduce environmental impact, while supporting American products.

e. **Modular and Offsite Construction:** Modular methodologies reduce on-site construction emissions and generate significantly less material waste. Controlled fabrication enables precision engineering that optimizes resource utilization and minimizes energy-intensive rework. Transportation of modules requires fewer trips and packaging. Additionally, modular builds yield shorter project timelines, mitigating community disruption and decreasing operational energy consumption during construction phases. Structural steel, engineered wood products, gypsum board, mechanical assemblies, and finish materials can be acquired through American suppliers with reduced lead times and improved quality assurance.

f. **Magnesium Oxide Structural Insulated Panels:** The implementation of magnesium oxide structural insulated panels advances sustainability objectives by offering superior fire resistance, moisture resistance, and durability compared to traditional foam materials. These panels provide exceptional thermal performance, significantly reducing energy consumption for heating and cooling throughout a building's lifecycle. Magnesium oxide panels are naturally mold and pest resistant, creating healthier indoor environments while eliminating the need for chemical treatments. Their lightweight yet robust composition streamlines construction processes, reducing labor costs and installation time while maintaining structural integrity even in extreme weather conditions.

g. **Tension Fabric Structures:** Tension fabric structures align with environmental goals by utilizing lightweight materials that reduce the need for heavy construction components and minimize resource consumption. The use of advanced fabric materials and efficient framing systems reduces transportation energy and installation time, lowering overall environmental impact. Additionally, their ability to incorporate natural light reduces reliance on artificial lighting, promoting energy efficiency. These lightweight, durable systems use high-performance fabrics and minimal steel framing, many of which are sourced from U.S.-based suppliers. That means every project helps support American jobs and businesses.

h. **Air-Supported Structures:** Air-supported structures provide an innovative and sustainable solution for creating large, enclosed spaces with minimal material usage. These structures rely on internal air pressure to maintain their shape, eliminating the need for heavy steel or concrete frameworks. The lightweight design reduces transportation and installation costs, while the use of durable, flexible membranes ensures long-term performance and adaptability. Air-supported structures are highly energy-efficient, as their insulation properties help regulate indoor temperatures, reducing heating and cooling demands. Additionally, they can be quickly assembled and disassembled, making them ideal for temporary or seasonal applications such as sports facilities, event venues, and agricultural storage.

i. **Pultruded Fiber-Reinforced Polymer Structural Sections:** Glass Fiber-Reinforced Polymers (FRP) are lightweight, express high elasticity, do not corrode, require little maintenance, and are electrical insulators. Pultrusion is an efficient manufacturing process that continuously produces FRP structural members with a constant cross-section at 20-ft. to 100-ft. lengths. The result is resilient and energy absorbent foundation and framing materials to support

critical infrastructure, especially in challenging environments of sea spray, high wind loads, or extreme seismic events. The American Society of Civil Engineers, in direct coordination with the American Composite Manufacturers Association, recently published the 74-23 Standard, "Load and Resistance Factor Design for Pultruded FRP Structures," enabling all practicing Professional Engineers to select, design with, and sign off on this innovative material solution. Leading American manufacturers stock hundreds of feet of common profiles in order to compress supply timelines for large, critical construction projects traditionally made with steel framing, such as data centers and pedestrian bridges. Case Studies are provided in Appendix F of UFC 3-301-01, "Structural Engineering."

j. **Pre-Engineered Metal Buildings:** Pre-engineered metal buildings (PEMBs) offer a cost-effective, durable, and sustainable solution for a wide range of construction needs. These structures are designed and fabricated off-site, allowing for faster assembly and reduced construction timelines. The use of high-strength steel ensures structural integrity while minimizing material waste, as components are precisely manufactured to fit together seamlessly. PEMBs are highly versatile, accommodating various applications such as warehouses, industrial facilities, retail spaces, and even residential projects. Their energy efficiency can be enhanced with insulation systems and reflective roofing materials, reducing heating and cooling costs. Additionally, the recyclability of steel makes PEMBs an environmentally responsible choice, supporting sustainability goals by reducing landfill waste and promoting the reuse of materials. With their adaptability, durability, and efficiency, pre-engineered metal buildings are a smart choice for modern construction projects.

k. **Phase Change Materials:** Phase change materials (PCMs) are an innovative solution for enhancing energy efficiency in modern construction. These materials absorb, store, and release thermal energy as they transition between solid and liquid states, helping to regulate indoor temperatures and reduce reliance on heating and cooling systems. By storing excess heat during the day and releasing it at night, PCMs can significantly lower energy consumption and improve occupant comfort for a limited range of latitudes and seasons. They can be integrated into building components such as walls, ceilings, and flooring, or used in insulation systems to optimize thermal performance. In addition to their energy-saving benefits, PCMs contribute to sustainability by promoting HVAC efficiency.

l. **Non-Corrosive Mold and Mildew Mitigation:** The development of mold a mildew is a consequence of operating in nonideal environments. Typical mitigation includes the use of harsh chemicals, such as bleach, posing a health risk to the user and deterioration of the treated substrate. A technology developed by the Navy (Navclean) for mitigating mold and mildew on aircraft and in vessels has been evaluated by the ERDC to be an effective mitigation for the growth on infrastructure substrates, such as concrete.

Ensure that these materials and techniques are evaluated and integrated thoughtfully in your designs, balancing innovation with life safety, functionality, maintainability, cost-efficiency, and client requirements. Collaboration between Project Delivery Team (PDT) members early in the master planning phase is key to ensure the right innovations are applied in the right project context.

When preparing 1391 requests, master plans, and requests for proposals, include an analysis of how one or more of these innovative solutions can contribute to the project's success whether

through cost savings, resiliency or sustainability. Designers should explore all viable solutions to stakeholder requirements, including commissioning time. Use existing authorities to interpret the intent of criteria and apply equivalencies where an innovative solution provides a better outcome for the Army and other stakeholders. Designers need only seek a waiver or exemption to explicit UFC and policy requirements in the pursuit of those solutions. Approach USACE Community of Practice Leaders for support in these decisions. Refer to ref. d, for an explanation of existing authorities and for the waiver and exemption process.

USACE leadership is committed to supporting you with resources, training, and information on new technologies and materials to help you stay informed. We will continue to enable innovative ideas while maintaining our commitment to lower costs, increase quality, reduced schedules, and improved safety.

6. **Update.** No additional policy updates are necessary because of these new requirements.

7. **Point of Contact.** HQUSACE point of contact for this ECB is Edward Citzler, CEEC-EC, (817) 876-2294.

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