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ENGINEERING AND CONSTRUCTION BULLETIN

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SUBJECT: Implementation of Resilience Principles in the Engineering & Construction Community of Practice

CATEGORY: Policy and Guidance

1. Reference(s)

- a. EP 1100-1-2, 2016 USACE Resilience Initiative Roadmap, 16 OCT 17.

2. **Purpose.** This Engineering and Construction Bulletin (ECB) provides the policy and guidance for applying the USACE principles of resilience – Prepare, Absorb, Recover and Adapt (PARA) – to Engineering & Construction (E&C) Community of Practice (CoP) efforts.

3. **Applicability.** This ECB applies to the Military Programs, Civil Works, and International and Interagency programs.

4. Background

a. USACE has regularly provided resilience as an important component of its project delivery. In early 2015, USACE began its Resilience Initiative to address an increasing focus on resilience internally and with its partners and stakeholders. The Initiative was established to clearly articulate (1) how USACE's actions, projects, and/or systems support community resilience, and (2) how USACE might provide increased project and system resilience within its authorities and capabilities. These considerations are sought as a complement to USACE's approach to resilience via risk-informed decision making and in collaboration with partners' and stakeholders' increased focus on resilience. As part of the Initiative, USACE seeks to mainstream "resilience thinking" to more effectively apply established and emerging practices and procedures that lead to increased resilience, such as applying its four principles of resilience – Prepare, Absorb, Recover, and Adapt (PARA) – to USACE activities. In May 2016, the USACE Resilience Initiative Roadmap (Ref. 1.a) encouraged all personnel to use the PARA principles to consistently provide more resilient solutions considering project, system, and community levels.

b. In general, USACE defines resilience as the ability to anticipate, prepare for and adapt to changing conditions; and withstand, respond to and recover from disruptions. This ECB reflects this general definition and supports the application of a more project-specific definition of resilience as the capacity of a component, unit, or system to withstand occasional large overloads (for a definite duration of time) that cause minimal permanent deformation, damage, or cumulative degradation and then essentially recover (within a specified time) its original state and function after the overloading event.

5. **Policy.** As established in the 2016 Resilience Initiative Roadmap, resilience thinking will be implemented USACE-wide through the application of the PARA principles and in support of risk-informed decision making. The E&C CoP and sub-CoPs will reflect resilience thinking in their practices and in new or updated standards and/or criteria.

6. **Guidance.** To apply resilience thinking at the project or system level, an evaluation should be performed using the PARA principles, as described below, during pre-construction designs, engineering during construction designs, and/or during repair/rehabilitation designs as frequently as needed based on engineering judgment and reflective of project complexity and assessed risk. Analyses and outcomes should be formally documented. Where appropriate, interconnections between project components and systems, and their individual and cumulative effect on project performance should be considered. These evaluations will likely result in recommendations for consideration by the project team for measures that improve resilience. These recommendations might be incorporated into the design when they are permitted by project authorities and do not significantly increase total project life cycle cost, including recovery costs. However, in some cases, recommendations that result in significant cost increases may also be considered, but these recommendations must still be appropriately justified.

a. **Prepare.** The *Prepare* principle should be used to consider measures that reduce risks or costs under loading conditions beyond those required by technical standards (USACE, IBC, IEBC, ASCE, ASME, etc.).

b. **Absorb.** The *Absorb* principle should be used to identify cost effective measures to limit damage to, or loss of function of, a project component or system due to both acute and chronic loading conditions, including conditions beyond those used for the design. This principle can also be used as an opportunity to consider adding system component robustness, redundancy, and increased reliability.

c. **Recover.** The *Recover* principle should be used to identify cost effective measures that allow for rapid repair or function restoration of a project component or system.

d. **Adapt.** The *Adapt* principle should be used to identify cost effective modifications to a project component or system that will maintain or improve future performance based on lessons learned from a specific loading condition or loadings associated with changed conditions.

7. **Updates.** New requirements will be included in the appropriate policy document updates. Guidance updated to better include resilience thinking will be highlighted on the Resilience Initiative SharePoint site (<https://team.usace.army.mil/sites/HQ/PDT/Resilience/default.aspx>).

8. **Point of Contact.** The HQUSACE E&C CoP Point of Contact for this ECB is Dr. Kate White, CECW-CE, (202) 761-4163.

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