ENGINEERING AND CONSTRUCTION BULLETIN

US Army Corps of Engineers

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SUBJECT: Lessons Learned from SDD Policy Validation Visits (Fort Leonard Wood & Fort Belvoir)

CATEGORY: Guidance and Information

1. **References:**

a. Memorandum, ASA (IE&E), Subject: Sustainable Design and Development Policy Update, 17 January 2017.

b. Memorandum, ASA (IE&E), Subject: Sustainable Design and Development Policy Update, 16 December 2013.

c. Army Regulation (AR) 420-1, Army Facilities Management, dated 12 February 2008; Including Rapid Action No. 2 Issued 24 August 2012.

d. Unified Facilities Criteria 1-200-02, Subject: High Performance and Sustainable Building Requirements, dated 1 December 2016, Change 02, 7 June 2018.

e. Engineer Regulation (ER) 1110-345-100, Design Policy for Military Construction, 15 February 1994.

f. ER 1110-345-700, Design Analysis and Drawings, 30 May 1997.

g. ER 1110-1-8155, Specifications, dated 15 October 2015.

h. ER 1110-1-8173, Energy Modeling and Life Cycle Cost Analysis, 30 December 2017

i. Engineering and Construction Bulletin (ECB) 2016-31, Subject: Verification of Building Performance, 16 November 2016.

j. ECB 2017-13, Subject: Lessons Learned from SDD Policy Validation Visits, 08 June 2017.

k. ECB 2017-23, Subject: USACE Sustainable Acquisition Requirements, 01 December 2017.

2. **Purpose.** The purpose of this Engineering and Construction Bulletin (ECB) is to share lessons learned from recent Sustainable Design and Development (SDD) Site Validation visits, convey substantive process changes that will have a positive and corrective result on future projects and assist in achieving compliance with current Army SDD Policy.

3. **Background.** The Assistant Secretary of the Army (Installations, Energy & Environment) (ASA (IE&E)) issued an Army Sustainable Design and Development (SDD) Policy Update (ref a) establishing the minimum requirements for new military construction (MILCON) and major renovation (SRM) projects to support the Army's mission and resilience goals. The policy also meets the Federal and Department of Defense (DoD) high performance sustainable building (HPSB) requirements, which include the requirements of Unified Facilities Criteria (UFC) 1-200-02 (ref c) and requires certification of projects at the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system Silver level. The USACE Chief of Engineering and Construction issued a memo (*Attachment A*) that outlines the USACE role in response to the memo (*Attachment B*) issued by ASA (IE&E) regarding Validation of SDD Policy. This memo was sent to all Division Commanders directing them to assist in and participate with the SDD validation process. At the direction of ASA (IE&E), ODASA (E&S) along with the Office of the Assistant Chief of Staff for Installation Management (OACSIM), USACE, will "institute a SDD validation process that evaluates a representative sample of project each year for compliance with Army SDD Policy." The intent of the validation visits is to gain valuable insights that can improve our processes and identify where implementation guidance should be strengthened, clarified, or where additional training is needed. As part of this process, the ASA (IE&E) requested best practices and lessons learned be shared throughout USACE.

4. **Continuous Improvement.** Previous Lessons Learned were based on observations from five FY2015 MILCON and five FY2013 SRM projects visited in FY2017. These Lessons Learned were shared and distributed in Engineering and Construction Bulletin (ECB) 2017-13 dated 08 June 2017 (ref j). Observations and recommended corrective actions were made in the following areas: Unified Facilities Guide Specifications; Standard Designs; Whole Building Life-Cycle Cost Analysis (LCCA); Implementation of LCCA in Design; Design Documentation; Design Decisions Requiring Exemptions or Waivers and Unit Costs for Facilities and Systems in DD Form 1391. A link (http://www.wbdg.org/ffc/dod/engineering-and-construction-bulletins-ecb/ecb-2017-13) is provided to review previously disseminated lessons learned.

5. **FY18 SDD Validation Visits.** The SDD Validation process has continued into the FY18 execution year. The ASA (IE&E) selected various MILCON and SRM projects to conduct sustainable design validation visits to determine compliance with Army SDD Policy. To date, Fort Leonard Wood and Ft Belvoir SDD site visits have been completed. Rather than wait until all projects have been visited in this program year, the findings and documented lessons learned are being shared now, for the benefit of upcoming installation visits at Fort Hood, Joint Base Langley-Eustis, and Fort Yakima.

6. **Fort Leonard Wood SDD Validation Visit.** MILCON Project, Fire Station 3 (PN 75660) and RM Project, Renovate Barrack, BLDG 748 were validated during the site visit. The following observations were noted for each facility:

a. **MILCON Project, Fire Station 3 (PN 75660).** This project was designed in-house by the Kansas City District. Overall siting of the facility achieved optimal densities and proximity of utilities and transportation objectives. Mitigation of the heat island effect was not achieved.

The installation design guide was followed and adaptation of new plant material was made a priority. The following details were observed during validation:

(1) **Energy.** The Life Cycle Cost Analysis (LCCA) calculation did not appear to take into account optimization of the whole building (envelope, HVAC, daylighting, lighting power), but instead was performed on individual systems. The energy model achieved energy consumption savings of 54% when compared to ASHRAE 90.1-2010. Photovoltaic systems for renewable energy was not included in the Life Cycle Cost Analysis Calculation.

(2) **Stormwater Management.** There was no documentation in the Design Analysis that rainfall volume and runoff from the 95th percentile rain event were modeled to manage rainfall on site which is specifically identified as a best management practice, per UFC 3-210-10, Low-Impact Development.

(3) **Water Use.** WaterSense was explicitly documented in the Division 22, Plumbing Specifications. Purple pipe/dual plumbing was determined to not be life cycle cost effective and therefore was not included in the project. No mechanical irrigation was planned; the project is using native plant species.

(4) **LEED.** This project is being rated under the LEEDv4 Rating Tool. A total of 51 Credits are currently being tracked with another six noted as "potential additional" Credits. 50% of design credits have been logged as attempted and documentation uploaded to LEED Online. Credit compliance was captured in the specifications and drawings, but not documented in the project Design Analysis. 12 Points achieved for rainwater management, indoor water use reduction and outdoor water use reduction. Xeriscaping was used in-lieu of mechanical irrigation. The project is expected to achieve 40% reduction in In-door water usage. Building water metering was included in the drawings and specifications.

(5) **Materials and Waste.** Compliance with Federal Acquisition Regulations related to "green" purchasing was noted and documented compliance requirements were included in the specifications. Specifications contain requirements for waste reduction and recycling management plans.

(6) **Other Elements.** Total Building Commissioning was included as a requirement per UFGS 01 91 00.00 40. Recycling containers for building occupant waste was noted. Water and Energy Meters were not included in project requirements. Post Occupancy and warranty inspections were included in specification requirements.

(7) **Acoustical Control.** Exterior acoustical control requirements were not applicable. Measurement and verification was not included in the specifications.

b. **R&M Project, Renovate Basic Training Barracks, BLDG. 748:** This project was designed by an AE Firm (GLMV Architecture) and managed by the Kansas City District. The project achieved mitigation of the heat island effect by incorporating a roof that was high reflective, SRI>29; some pavement replaced, remaining pavement washed and new white gravel

to achieve high reflectively (SRI>29) was achieved. Reduction of light pollution was achieved with zero up-lighting/pollution. The following details were observed during validation:

(1) **Energy.** The overall strategy to reduce energy use and improve energy performance was documented with the following features: All interior lights are LEDs; occupancy sensors were incorporated in hallways, classrooms, showers and latrines; offices and classrooms perimeters have daylight sensors; and offices have occupancy controlled receptacles. Additionally, Energy Star/FEMP rated equipment was required per EPACT 2005. Energy Consumption savings calculations show a 40% energy savings over ASHRAE Standard 90.1-2010 baseline.

(2) **Stormwater Management.** Pre-development site hydrology was maintained. Opportunities to create bio-swales between buildings existed.

(3) **Water Use.** WaterSense per Division 22, Plumbing Specifications was not utilized.

(4) **LEED.** Project was able to document (4) LEED 2009 Credits awarded for water efficient landscaping via xeriscaping and no irrigation. Also, the project was able to document (5) LEED 2009 Credits for water reduction. Total reduction of 46% of water use.

(5) **Materials and Waste.** 30% of materials have recycled content. Construction Waste Management, per specifications 01 74 19, 95% waste diversion documented.

(6) **Other Elements.** Minimum ventilation rates of ASHRAE 62.1 were met. Thermal Comfort requirements for ASHRAE 55-2010 for temperature set points and relative humidity.

7. **Fort Belvoir SDD Validation Visit.** MILCON Project, Secure Admin/Operations Facility (PN 86285) and R&M Project, Repair Building 1189, Main Exchange were validated during the site visit. The following observations were noted for each facility:

a. **MILCON Project, Secure Admin/Operations Facility (PN 86285).** This project was a Design-Bid-Build project managed by the Baltimore District. The project design was performed by Benham, and construction was executed by Manhattan Construction. The project follows the previously established area development plan. The overall siting plan is compatible with adjacent structures and activities in a training campus setting. Designated bicycle parking with showers within 200 yards was achieved to meet connectivity to transport modes. Effective siting achieved Daylighting optimization in common areas. The following details were observed during validation:

(1) **Energy.** The energy model documented energy consumption savings of 36% when compared to ASHRAE 90.1-2007. LEED Energy Cost Saving was noted to be 23%. The Design Analysis states “The design is in full compliance with the mandatory provisions for the Energy Cost Budget Method of ASHRAE Standard 90.1-2007, however because the process loads must be included in the overall energy consumption calculation, the goal of 40% reduction in energy consumption below the 90.1 minimums was not achievable. LCCA was performed in February 2005 (before project phasing). Energy conservation measures were documented.

(2) **Stormwater Management:** Original Stormwater management plan was developed for Phase 1. The plan was updated to include Phases 2, 3, and 4. Total site area is 33.1 acres. Rainwater harvesting and porous pavement included in project, but not considered in the runoff volume control calculations. Poor infiltration soils coupled with limited space available on the site for the installation of identified Best Stormwater Management Practices, makes achieving the EISA Section 438, Low Impact Development requirements unfeasible.

(3) **Water Use.** Indoor water use, water reducing features and reduction baseline requirements were documented the Design Analysis and specifications. Outdoor water use was addressed by climate tolerant plants and the use of high-efficiency irrigation strategies that incorporate rainwater harvesting and moisture and rain sensors. Rainwater irrigation system tied to municipal potable water infrastructure; potable water will be used to provide appropriate water levels to the system when needed.

(4) **LEED.** This project is being rated under the LEED 2009 for New Construction and Major Renovation Tool. On target to achieve LEED Silver. Enough points are being tracked to achieve LEED GOLD if all credits are accepted. Credits in all LEED Categories of Low Emitting Materials are being pursued. Low VOCs specified. No high emitting/VOC materials were observed.

(5) **Materials and Waste.** One required FAR clause was included in the procurement documents/contract specifications. "EPA" designated "Recycled/Recovered/ Bio-based Materials" were required by procurement documents and contract specifications. Evidence of green purchasing was noted for documented compliance in the following areas: ceiling tiles, insulation, adhesives, paints, coatings, LED lights, etc. Specifications contain requirements for waste reduction and recycling management plans. 75% percent of construction and demolition debris will be diverted from landfills.

(6) **Other Elements.** Some elements of Total Building Commissioning was included as per requirements in UFGS 01 08 00; 23 08 00; 26 08 20. Recycling containers for building occupant waste was noted. Energy Meters were not included in the project requirements.

b. **RM Project, Repair Building 1189, Main Exchange.** This project was designed by an AE Firm (AECOM) and managed by the Baltimore District. The project documentation did not make mention of any attempts to mitigate the heat island effect as there may have been no opportunity to do. The following details were observed during validation:

(1) **Energy.** The Design Analysis indicated the U-Values for the Roof, Wall and Window, although the thermal properties for glazing was not specified in the RFP or the specifications. RFP indicated all interior lights will be LEDs with timers, motion detection and two-level switching. Additionally, Energy Star water heaters were heaters were specified in the Mechanical specs. New mechanical systems for each individual tenant. No documentation was included to identify this feature as being the lowest life cycle cost option. There was no Energy Model or LCCA documentation. Measurement and Verification were not included in the project.

(2) **Stormwater Management.** Pre-development site hydrology was maintained. This was not applicable as the renovation efforts were completely interior to the building.

(3) **Water Use.** WaterSense per Division 22, Plumbing Specifications was incorporated in the specification requirements. No irrigation was used on the project. The Value Engineering Study suggested assessing rain water harvesting for greywater use, but the roof could not support the storage tank load.

(4) **LEED.** LEED credits were not sought on the project. No water use reduction credits or documents could be identified. LEED Silver compliance and certification was not required in the RFP. Many sustainable features were included in the project but no effort was made to clearly document the sustainable features.

(5) **Materials and Waste.** Construction Waste Management, per specifications 01 74 19, were included in the submittal register. DOD 60% diversion could not be confirmed.

(6) **Other Elements.** Total Building Commissioning (TBC) were included for some elements of the HVAC. The RFP requirements for TBC were ambiguous.

8. **Lessons Learned from FY18 Program SDD Validation Visits.**

a. **Whole Building Life-Cycle Cost Analysis (LCCA), Lessons Learned**. Life-Cycle Cost Analysis prepared in support of design decisions continue to be lacking in sufficient documentation to clearly track design decisions that have been made with appropriate supporting documentation from the LCCA. **Corrective Action:** Continue to reinforce adherence to ECB 2015-07, which was superseded by ER 1110-1-8173 (ref. h) issued on 30 December 2017, and included documentation requirements in the Design Analysis for design decisions which result from the LCCA.

b. **Measurement and Verification, Lessons Learned.** Measurement and Verification requirements in the RFP and specifications was not sufficiently documented to provide a baseline for improved M&V during future Post-Occupancy visits. **Corrective Action:** Re-visit M&V protocols and seek to implement minimum standard requirements that can be utilized on all facility types. Potentially identify standard M&V requirement in the DD 1391 for mandatory inclusion in the RFP which have been properly coordinated and agreed to by the Installation DPW prior to project award.

c. **LEED: Materials and Waste, Lessons Learned.** Compliance with Federal Acquisition Regulations (FAR) “Green Purchasing” mandates are being included in the project’s technical specifications. Green purchasing includes Bio-based Materials/and Certification and Recovered Materials/and Certification. **Corrective Action:** Corrective actions are needed in the area of contract acquisition, specifically FAR Clauses related to Sustainable Acquisition Requirements should be included in the Contract (see FAR Clauses 52-223-2; 52-223-3; 52-223-4; 52-223-9; 52-223-15 and 52-223-17). Refer to ECB 2017-23 for the full list of sustainable acquisition requirements which apply to all contracts by contract type.

d. **LEED: Construction Waste Management, Lessons Learned.** Compliance with construction waste diversion being implemented on the projects validated. Construction and Demolition Waste requirement documented in the Division 01 specification section 01 74 19 which was cited on all projects validated. Most projects met the DOD goal of 60% diversion. **Corrective action:** Corrective actions are needed in the area of contract acquisition, specifically FAR Clauses related to Sustainable Acquisition Requirements should be included in the Contract (see FAR Clause 52-223-10). Refer to ECB 2017-23 for the full list of sustainable acquisition requirements.

9. **Points of Contact:** HQUSACE points of contact for this ECB are George Lea, CECW-EC, 202-761-7775 or Zenovia Wilcox, CECW-EC, 202-761-4829.

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Attachment A: Memorandum, CECW-EC, Subject: Validation of Sustainable Design and Development Policy Compliance, 20 March 2018

Attachment B: Memorandum, ASA (IE&E), Subject: Sustainable Design and Development Policy Update, 17 January 2017.