DEPARTMENT OF THE ARMY
ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS, ENERGY AND ENVIRONMENT)
110 ARMY PENTAGON
WASHINGTON, DC 20310-0110

JAN 17 2017

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MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Sustainable Design and Development Policy Update

1. References. See Enclosure 1.

2. Purpose. This memorandum updates the sustainable design and development (SDD) policy for Army sustainment, restoration, modernization, and construction activities. This supersedes the previous policy (reference 1).

3. Applicability.

a. This policy applies to all infrastructure planning, design, sustainment, restoration, modernization, and construction activities on Army installations (including government owned/contractor operated installations) regardless of funding source, with the exception of DoD Medical [DoDM] funding and privatization initiatives. This includes Army Reserve, National Guard, and Morale, Welfare, and Recreation (MWR) activities, as well as tenant activities such as commissaries, exchange service facilities (all types for all Services), and local education activity schools. On Joint Installations, this policy applies to all Army-funded projects regardless of location and all supported activities on installations where the Army is the supporting Component. For overseas construction activities at enduring locations, this policy applies except where there are direct conflicts with Host Nation agreements; in those cases, every effort should be made to comply with the substantive requirements of this policy. For overseas construction activities at semi-permanent contingency locations, this policy applies to the greatest extent practicable considering mission objectives. This policy applies immediately for all sustainment and restoration or modernization projects; for new construction projects, this policy will be incorporated to the greatest extent practicable in projects entering the program stage in FY2017, with full compliance for projects entering the program stage in FY2018 and later.

b. Privatization Initiatives. All housing constructed or renovated under existing Residential Communities Initiative (RCI) agreements will meet or exceed the sustainable design and development standards in accordance with their existing privatization agreement. All lodging constructed or renovated under the Army's Privatized Army Lodging (PAL) Program will meet or exceed the sustainable design and development standards as established in the PAL lease. New RCI and PAL agreements will incorporate the requirements of this policy.

c. For purposes of this policy, "sustainment, restoration, modernization, or construction activity" is any activity that designs, builds, assembles, modernizes, repairs, or alters infrastructure including vertical (occupied and non-occupied buildings), horizontal (e.g., roads, parking lots, aprons), and utility systems (e.g., distribution systems and supporting infrastructure).

d. Exceptions to this policy may be considered if the Garrison Commander or equivalent determines that compliance with the policy would adversely affect mission performance or security requirements, health, safety, or welfare. Requests for exception must be submitted through the chain of command to the Deputy Assistant Secretary of the Army for Installations, Housing, and Partnerships (DASA(IHP)) and shall include the reference(s) to the specific conflict, proposed mitigation measures to follow the intent of this policy, and justification for the requested exception. Any approved exception shall only apply to the specific policy requirement(s) in conflict for a singular sustainment, restoration, modernization, or construction activity.

4. Objectives. Resilient installations are essential for a responsive Army force posture. The goal of this policy is to provide sustainable and adaptive facilities and installations that enhance mission effectiveness, reduce the Army's environmental footprint, and achieve levels of energy independence that enhance continuity of mission-essential operations. Guided by federal mandates, the Army will plan, design, build, maintain, and operate facilities to achieve the highest-performing sustainable design that is life-cycle cost-effective within the program amount. The feasibility to include renewable energy will be investigated and documented for each project, starting with installation master planning and project planning and development activities. Construction activities will be planned, programmed, budgeted, designed, built, maintained, and operated to comply with EPAct 2005, EISA 2007, and EO 13693 (references 2 through 5), and conform to the Guiding Principles for Federal Sustainable Buildings (reference 6), as detailed in Section 5 of this policy.

5. Policy. All projects subject to this policy will achieve the following requirements:

a. <u>Planning, Design, and Construction Requirements for New Construction and Major Renovations</u>. All projects will be planned, programmed, budgeted, designed, built, maintained, and reported to meet the requirements of UFC 1-200-02 and UFC 2-100-01 (references 7 and 8) with the following additional requirements. If the requirements as defined below conflict with UFC 1-200-02 or UFC 2-100-01, then the requirements specified below will take precedence. Environmental analysis of the proposed project will be initiated early in the planning process in accordance with reference 9. Similarly, Endangered Species Act and National Historic Preservation Act consultations and Native American Graves Protection and Repatriation Act reviews (references 10 through 12) must be completed before implementing any irretrievable or irreversible commitments of resources.

(1). Siting & Site Development.

(a). Siting. Planners will consider the full lifecycle cost of planning decisions, including the opportunity cost of land, with a focus on return on investment. When developing master plans and siting new construction, preference will be given to brownfields and other previously-developed lands, proximity to existing supporting infrastructure (e.g., utilities), and connectivity to transportation modes/networks where feasible. Compact development, in-fill, mixed use, and multi-story strategies, minimal building footprints and spacing, and greater residential densities will be applied to achieve optimal densities, in accordance with UFC 2-100-01 (reference 8) and UFC 1-200-2 Section 2-2. An inventory and assessment of the project site's natural and cultural resources will be developed prior to the site design and construction documents in accordance with ASHRAE 189.1-2014 Section 5.3.2. Cultural resources will be managed in accordance with reference 13. No site disturbance or development will occur within 150 feet of any fish and wildlife habitat conservation areas in accordance with ASHRAE 189.1-2014 (reference 14) Section 5.3.1 or when permitted under a biological opinion issued by the U.S. Fish and Wildlife Service or National Marine Fisheries Service. Projects will consider the environmental and building performance impacts to thermal, daylight, air quality, and water calculations due to current and future adjacent structures. New construction will not be sited in flood hazard areas or areas subject to sea level rise and storm surges, unless the purpose of the project requires such a location (e.g., flood control, navigation, shipping or pier operations). Sea level rise planning guidance is provided in reference 15. Consideration should also be given to the site-specific sea level rise scenarios developed by OSD for DoD's coastal sites (reference 16). Guidance for inland hydrology is provided in reference 17.

(b). Mitigation of Heat Island Effect. Meet the requirements in ASHRAE 189.1-2014 Section 5.3.5.1 and the Installation Design Guide for site hardscape. For walls and roofs, select and incorporate design strategies for new construction and roof replacements that consider the climatic region and the thermal loads of the building by following the requirements of ASHRAE 189.1-2014 Sections 5.3.5.2 and 5.3.5.3.

(c). Reduction of Light Pollution. To minimize light pollution from exterior lighting systems, all projects will adhere to ASHRAE 90.1-2013 Section 9 (reference 18) and ASHRAE 189.1-2014 Section 5.3.6, except as required by AR 190-13: The Army Physical Security Program.

(d). Storm Water Management. Site development for all projects of 5,000 ft^2 or greater as defined by reference 19 will retain the pre-development site hydrology and comply with the requirements in UFC 3-210-10 (reference 20), and reference 5. These projects must be planned, designed, and constructed to manage any increase in storm water runoff (i.e., the difference between pre- and post-project runoff) within the limit of disturbance. Additionally, storm water management systems will be provided on the building site in accordance with ASHRAE 189.1-2014 Section 5.3.4 or the installation's storm water management plan. Documentation of the project's compliance with EISA

Section 438 and other Army storm water management requirements will be maintained in the project file, entered into the designated reporting database, and will be reported via the Chain-of-Command for annual SSPP reporting. Storm water management guidance and tools are available in reference 21 and at the Design Tools section of: https://mrsi.erdc.dren.mil/sustain/cx/lid/.

(e). Invasive Plants. In accordance with ASHRAE 189.1-2014 Section 5.3.3, invasive plants will not be planted on the project site. Any existing invasive plants will be removed from the project site and managed as specified in the installation's Integrated Natural Resources Management Plan.

(f). Mitigation of Transportation Impacts. Projects will consider transit-oriented development and connectivity to transportation networks. Additionally, projects will comply with the walkway, bicycle parking, and preferred parking requirements in ASHRAE 189.1-2014 Section 5.3.7.

(g). Per reference 5, electric vehicle charging infrastructure for government owned or leased non-tactical fleet vehicles will be considered in the project design when the project scope includes or is relevant to parking provisions of the facility.

(2). Energy Performance and Security.

(a) Energy Efficiency. Energy efficiency is a mission objective to the Army and will compete equally with other mission requirements defined by the project. Project scope deviation to energy requirements will follow the normal approval processes. All projects will meet, at a minimum, the requirements of UFC 1-200-02 Section 2-3.1 and achieve the highest energy efficiency that is life-cycle cost-effective within the program amount. Plug and process loads must be included as part of the energy calculations. The Army's approach to energy efficiency is outcome based and requires that the facility designer, building owner, and occupant (user) collaborate throughout the design and construction phases of the project to ensure that the facility's post-occupancy energy use intensity (EUI) meets or exceeds the facility's original EUI design target. The facility's post-occupancy performance will be based on comparing meter readings to the energy levels of the design target. New facilities and facilities undergoing major renovations will be measured and must achieve an EUI that is not higher than the EUI listed by Category (CAT) Code in Enclosure 1. New facilities and post-2008 facilities undergoing renovation will use EUI Table 1; pre-2008 facilities undergoing major renovations will use EUI Table 2. Deep energy retrofits can be a primary tool to meet or exceed the target EUI. Co-generation should also be considered where life-cycle cost effective. The energy performance after 12 months of operation will be benchmarked against established EUI baselines for the specific building type listed by CAT Code. If the facility Army CAT Code is not listed in Tables 1 or 2, projects will use Table 3 to identify the most similar ASHRAE facility type to use. Table 3 correlates similar Army CAT Codes to assist in determining which ASHRAE facility type to use for Tables 1 and 2. The values in these EUI tables will be periodically updated as more data is received

from the Army's Meter Data Management System (MDMS). Project teams will obtain the most current version of Tables 1 through 3 at: https://www.wbdg.org/ffc/army-coe/policies-and-guidance-army-design-and-construction.

(b). Renewable Energy. Renewable energy systems will be designed to function absent of normal utility power and have the ability to divert power to mission critical assets. All projects will follow UFC 1-200-02 Section 2-3.2 for renewable energy. For domestic water heating, all projects will meet the EISA Section 523 requirement to provide a minimum of 30% of the facility's hot water demand by solar water heating when life-cycle cost effective, and shall achieve higher percentages to the maximum amount that is life-cycle cost-effective (reference 22). If 30% is not life-cycle cost-effective, modify the design of the proposed system to achieve the highest level of solar water heating production that is life-cycle cost-effective.

(c). Exterior Lighting. Where life-cycle cost-effective, all project designs for exterior lighting will use LEDs or other highly-efficient lighting technologies and their associated control systems, in accordance with references 18 and 23.

(d) Cyber Security. Projects with facility-related control systems will comply with the cyber security requirements in reference 24. and DoDI 8500.01 Cybersecurity Instruction. Long-term cybersecurity requirements will be incorporated into the design, with consideration given to the life-cycle cost for the system(s) being implemented and the reoccurring requirements for a renewal or Authorization to Operate on the network.

(3). Water Use. The overall goal is to identify and implement water reuse strategies to use water efficiently (reference 22). Projects will include the installation of dual plumbing to enable the facility to use both potable and alternative water sources (e.g., rainwater, reclaimed water, greywater) where life-cycle cost-effective and in accordance with applicable state and local codes. The non-market benefits of the value of using alternative water in the facility will be incorporated into the life-cycle cost analysis in accordance with OMB Circular A-94 (reference 25) and the current Army Cost Benefit Analysis Guide.

(a). Indoor Water Use. All projects will meet the federal requirements for water efficiency per UFC 1-200-02 Section 2-4.1. Drinking fountains will include water bottle filling stations.

(b). Outdoor Water Use. All projects will use water-efficient landscape strategies that achieve a minimum 50% water reduction (in UFC 1-200-02 Section 2-4.2), and will comply with ASHRAE 189.1-2014 Sections 6.3.1 and either Section 6.4.1 (prescriptive option) or Section 6.5.1 (performance option). To further reduce outdoor water use, native plant species and dry-scape architectural alternatives will also be considered. Irrigation will not be used except where specifically required by Army policy or during the initial plant establishment phase; projects that require irrigation will use alternative water in place of outdoor potable water in accordance with reference 22.

(4). Metering, Monitoring, and Subsystem Measurement. All new construction and major renovation projects will include building-level monitoring accomplished by advanced meters installed in accordance with Army Directive 2014-10 (reference 26) and UFC 1-200-02 to capture all consumed utilities (e.g., district steam, district hot and chilled water, electricity, natural gas, fuel oil, water, etc.). To ensure meter equipment compatibility with the Army Metering Program, all advanced meters will be installed in compliance with reference 27 and current ACSIM metering program guidance. Additionally, major subsystems in all new construction and major renovations will be measured based on levels identified in ASHRAE 189.1-2014 Section 6.3.3 for Water Consumption and Section 7.3.3 for Energy Consumption by major subsystems where practical. All metering and subsystem measurement data will report electronically to the Army's enterprise MDMS. If subsystem measurement is determined not to be practical at the time of design, major subsystems for energy and water will be designed to allow for future subsystem measurement.

(5). Indoor Environmental Quality.

(a). Projects will comply with the UFC 1-200-02 Section 2-5 requirements for indoor air quality, ventilation and thermal comfort, daylighting, tobacco smoke control, and occupant health and wellness. Radon requirements are found in UFC 3-101-01. Integrated pest management will be employed, consistent with the installation's Integrated Pest Management Plan. Additionally, projects will comply with ASHRAE 189.1-2014 Section 8.3.1 requirements for filtration and air cleaning and building entrances, Section 8.3.5 requirements for interior lighting quality, and Section 8.3.6 requirements for moisture control.

(b). Acoustical Control. In accordance with ASHRAE 189.1-2014 Section 8.3.3, buildings will be designed to address the control of exterior and interior background noise. Projects will also comply with the noise-related land use compatibility requirements in AR 200-1, Chapter 14 (reference 28). Projects in the vicinity of airfields will comply with DoDI 4165.57, Air Installations Compatible Use Zones (AICUZ) (reference 29) and other applicable airfield regulations.

(c). Construction Materials, Finishes, and Furnishings. In accordance with DoDI 4105.72 section 2.4.i (reference 30), all contract actions subject to this policy will include sustainable procurement language, provisions, specifications, and clauses. Contracting offices will ensure all required reporting is executed. In addition, all projects will adhere to UFC 1-200-02 Section 2-6.1 for recycled content, biologically-based products, other green products, and ozone depleting substances, and Section 2-5.3.3 for low-emitting materials. Projects will also comply with applicable requirements for the purchase of water efficient (e.g., WaterSense), Energy Star or FEMP-designated (or an "A" or better European Union Energy Label, EU energy efficiency class), and Electronic Product Environmental Assessment Tool (EPEAT) designated products. In addition, project materials will comply with the requirements in ASHRAE 189.1-2014 Section 9.4.1.2 (Regional Materials). Project requirements packages will clearly outline the applicable sustainable requirements and Statement of Work / Performance Work Statement and

include applicable language as part of the requirement package submissions. Contracting personnel will ensure that all related clauses and other terms and conditions are included as applicable in solicitations and awarded contracts in accordance with Army Federal Acquisition Regulation Supplement (AFARS) part 5123, Defense Federal Acquisition Regulation (DFAR) Part 223, and Federal Acquisition Regulation (FAR) part 23.

(6). Waste & Recyclables Management.

(a). Construction Waste Management. DoD Instruction (DoDI) 4715.23 (reference 31) and the DoD Strategic Sustainability Performance Plan (SSPP) require that at least 60% of construction and demolition debris be diverted from the waste stream. However, it is the Army's intent to manage waste with the goal of Net Zero waste disposal in landfills (reference 32). Therefore, projects that involve the removal of existing buildings or structures will evaluate the feasibility of deconstruction and salvage rather than conventional demolition (reference 33), and will implement deconstruction wherever markets or on-site reuse opportunities exist or are anticipated.

(b). Storage and Collection of Occupants' Recyclables and Reusable Goods. DoDI 4715.23 and the DoD SSPP require that at least 50% of non-hazardous solid waste be diverted from the waste stream. To support this SSPP goal and the Army's Net Zero waste goal, projects will adhere to ASHRAE 189.1-2014 Section 9.3.4 and will provide conveniently located and appropriately sized space for reuse and recycling for building occupants.

(7). New and Underutilized Technologies. Building technologies for energy and water are improving at a rapid rate. All project designs must consider the use of new and underutilized technologies and their associated systems where life-cycle cost effective, regardless of the design agency (e.g., U.S. Army Corps of Engineers, in-house, energy savings performance contracts, utility energy service contracts). Resources to assist in the analysis of new and underutilized technologies are provided in Enclosure 2.

(8). Commissioning & Plans for Operation.

(a). Total Building Commissioning. All new construction and major renovation projects greater than 5,000 gross square feet will fulfill the commissioning requirements in ASHRAE 189.1-2014 Section 10.3.1.2 as prescribed in UFC 1-200-02 Section 2-2.2. Construction projects will use Total Building Commissioning practices to develop the essential documentation, testing, training, and validation required to ensure that the facility meets the design intent and post-construction operational needs, as documented in the project Owner Project Requirements (OPR). The Total Building Commissioning process will focus upon documenting and verifying through the total life of the project that the facility is planned, designed, installed, tested, operated, and maintained to meet the OPR. During the development of the programming document (planning phase), the

appropriate Total Building Commissioning level of rigor will be determined based on the size and complexity of the project. The estimated cost for the services of a qualified and experienced Commissioning Authority (CxA) independent of the design and construction or operating team will be budgeted for in the programming document and the cost will be validated prior to the finalization of the Parametric Design. The use of contracted services or Government personnel as a qualified and experienced CxA should be determined at the start of the design phase. The CxA shall be independent of the team that executes design and construction.

(b). Construction projects 5,000 gross square feet or less will follow ASHRAE 189.1-2014 Section 10.3.1.1 (Building Acceptance Testing).

(c). Plans for Operations. Projects will follow the requirements in ASHRAE 189.1-2014 Section 10.3.2, including development of a green cleaning plan. Benchmarking will be accomplished using MDMS in lieu of Energy Star® Portfolio Manager.

b. Planning, Design, and Construction Requirements for Minor Renovations. All other building renovation projects regardless of funding source, including improvements funded through Energy Savings Performance Contracts, Utility Energy Service Contracts, base maintenance contracts, and similar funding mechanisms, will incorporate the requirements specified in paragraph 5.a as applicable to the portions of the building or building systems that are being renovated. Commissioning/ recommissioning and/or acceptance testing of the affected facility/systems based on gross square foot of area renovated is required. LEED certification is not required for minor renovations, but documentation shall be retained by the installation for at least 5 years to facilitate future building certification as a high performance sustainable building.

c. Validation Requirements. The Army standard for high-performance sustainable building/project rating and certification is the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system. Other rating systems may be approved if equivalency is demonstrated and a project-specific waiver has been granted. Waiver requests for use of a demonstrated equivalent rating system may be submitted per paragraph 3.d.

(1). New Construction/Major Renovation. All new construction vertical projects and comprehensive building renovations meeting the thresholds in UFC 1-200-02 Table 1-1 will be certified at the LEED for Building Design and Construction (LEED-BD+C) Silver level at a minimum. For purposes of this policy, comprehensive building renovations are defined as changes to a building's envelope, infrastructure, equipment, and systems that provide significant opportunities for substantial improvement in the sustainable design elements of the building, including energy and water efficiency. Project teams will follow the rating system selection guidance (http://www.usgbc.org/discoverleed/) in deciding which LEED rating system is best for a given project. Vertical construction and minor renovations not meeting the UFC

thresholds will be designed and built to incorporate the applicable LEED sustainable design features available at the site, but do not require LEED certification.

(2). Family Housing. All design starts of Army Family Housing (AFH) new or replacement construction will be certified at the LEED for Homes (LEED-H) Silver level with at least 15 LEED energy points. AFH repair and renovation of existing residential housing are exempt from the certification requirements in this policy.

(3). Privatized Housing and Lodging. For new privatization agreements, new construction and major renovations will be certified at the Silver level of the applicable LEED rating system (e.g., LEED-BD+C, LEED-H, LEED-Neighborhood Development). For existing privatization agreements, out-year development activities and renovation of existing facilities will incorporate LEED sustainable design features in accordance with the privatization agreement.

(4). All horizontal construction projects, other vertical construction not meeting the UFC thresholds (e.g., communication huts, small storage facilities, recreation fields), utility systems, and any interest in land must achieve the applicable LEED credit for sites, water, energy, materials and resources, and meet the requirements in UFC 1-200-02, UFC 2-100-01, and UFC 3-210-10. While LEED certification is not required, documentation on which credits were achieved will be maintained by the installation.

6. The Army's commitment to sustainable design and development extends beyond the construction/renovation phase. Performance monitoring, re-commissioning and analysis will be conducted throughout the life-cycle of the facility/infrastructure to ensure that performance problems are identified and corrected in a timely manner. When undertaking maintenance actions, improving operational processes, or procuring new service contracts, installations are expected to do so in a manner that moves the installation closer to this goal. Operation and maintenance procedures, including janitorial services, will be adjusted as necessary to meet the DoD and Army sustainability policies and objectives. Training for building users and operators is essential to ensure proper building systems operation and maintenance, use of sustainable cleaning products, and overall occupant comfort and security.

7. Summary. This policy builds upon the Army's long-standing energy efficiency and sustainability practices with the goal of increasing the resiliency of our facilities and installations. The Army must continue to develop and implement strategies for our facilities, infrastructure, and installations to provide greater energy and water security, increase operating flexibility, and maintain an effective readiness posture.

8. My points of contact for this policy are Mr. Jae Kim (jae.j.kim2.civ@mail.mil or 703-693-9919) and Mr. Paul Volkman (paul.m.volkman.civ@mail.mil or 703-697-3765).

Enclosures

Katherine Hammack

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Enclosure 1 – References

1. Memorandum, ASA(IE&E), 16 Dec 2013, Subject: Sustainable Design and Development Policy Update (superseded).

2. Energy Policy Act of 2005 (EPAct 05), 8 Aug 2005.

3. Energy Independence and Security Act of 2007 (EISA 2007), 19 Dec 2007.

4. Executive Order (EO) 13693, Planning for Federal Sustainability in the Next Decade, 19 Mar 2015).

5. Office of the Assistant Secretary of Defense (Energy, Installations and Environment), March 2016, Guidance for Executive Order 13693: Planning for Federal Sustainability in the Next Decade.

6. Guiding Principles for Sustainable Federal Buildings and Associated Instructions, the Council on Environmental Quality, Feb 2016.

7. Unified Facilities Criteria (UFC) 1-200-02 High Performance and Sustainable Buildings Requirements, 1 Dec 2016.

8. UFC 2-100-01: Installation Master Planning, 15 May 2012.

9. 32 Code of Federal Regulations (CFR) Part 651: Environmental Analysis of Army Actions.

10. Endangered Species Act of 1973 (16 U.S.C. §1531-1544, 87 Stat. 884, as amended).

11. 36 CFR Part 800, Protection of Historic Properties.

12. 25 U.S.C. §3001 et seq., Native American Graves Protection and Repatriation Act.

13. Department of Defense (DoD) Instruction (DoDI) 4715.16, Cultural Resources Management, 18 Sep 2008.

14. ANSI/ASHRAE/USGBC/IES Standard 189.1-2014 (ASHRAE 189.1-2014), Standard for the Design of High-Performance Green Buildings (Except Low-Rise Residential Buildings), American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and U.S. Green Building Council, 2014.

15. USACE Engineer Regulation 1100-2-8162: Incorporating Sea Level Change in Civil Works Programs, 31 Dec 2013 and Engineer Technical Letter 1100-2-1:

Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation, 30 Jun 2014.

16. DoD Strategic Environmental Research and Development Program (SERDP), Regional Sea Level Scenarios for Coastal Risk Management: Managing the Uncertainty of Future Sea Level Change and Extreme Water Levels for Department of Defense Coastal Sites Worldwide, April 2011 and corresponding DoD Sea Level Rise Calculator for coastal/tidal DoD sites.

17. Engineering Construction Bulletin 2016-25: Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects.

18. ANSI/ASHRAE/IESNA Standard 90.1-2013 (ASHRAE 90.1-2013), Energy Standards for Buildings Except Low-Rise Residential Buildings, 2013.

19. Memorandum, Office of the Under Secretary of Defense, 19 Jan 2010, subject: DoD Implementation of Storm Water Requirements under Section 438 of the Energy Independence and Security Act.

20. UFC 3-210-10: Low Impact Development, 1 Feb 2016.

21. Memorandum, Assistant Chief of Staff for Installation Management (ACSIM), 21 Sep 2015, Subject: Army Storm Management Using Low Impact Development.

22. Memorandum, ASA(IE&E), 13 Jan 2017, Subject: Energy and Water Goal Attainment Responsibility Policy for Installations.

23. UFC 3-530-01: Interior and Exterior Lighting Systems and Controls, 1 Jun 2016.

24. UFC 4-010-06: Cybersecurity of Facility-Related Control Systems, 19 Sep 2016.

25. Office of Management and Budget (OMB) Circular A-94: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, Revised Nov 2015.

26. Army Directive 2014-10, Advanced Metering of Utilities, 4 Jun 2014.

27. U.S. Army Engineering and Support Center, Huntsville Utility Monitoring and Control System Mandatory Center of Expertise (UMCS-MCX), Army Metering Program Guidance for Advance Meters, Revision 8, 26 May 2016

28. Army Regulation (AR) 200-1: Environmental Protection and Enhancement, 13 Dec 2007.

29. DoDI 4165.57, Air Installation Compatible Use Zones, 2 May 2011 (Incorporating Change 1, Effective 12 Mar 2015).

30. DoDI 4105.72, Procurement of Sustainable Goods and Services, 7 Sep 2016.

31. DoDI 4715.23, Integrated Recycling and Solid Waste Management, 24 Oct 2016.

32. Army Directive 2014-02, Net Zero Installations Policy, 28 Jan 2014.

33. Engineering Construction Bulletin 2015-19: Deconstruction, Diversion, and Disposal of Debris, 20 Oct 2015.

Enclosure 2 – Energy Use Intensity (EUI) Tables

Table 1 – EUI Targets for New & Post-2008 Facilities

Table 2 – EUI Targets for Existing (Pre-2008)Facilities Undergoing Major Renovation

Table 3 – Army CAT Codes to ASHRAE 100-2015

Note: The most current versions of these tables are maintained on the Whole Building Design Guide website at: https://www.wbdg.org/ffc/army-coe/policies-and-guidance-army-design-and-construction

Table 1 – Energy Use Intensity (EUI) Targets for New & Existing Facilities (Post-2008)

10% reduction below pre-2008 for DFAC and UEPH (Dining & Lodging); 20% reduction for all other building types

EUIs by Building Type by Climate Zone (kBtu/ft2-yr)																			
ASHRAE 100 #	Commercial Building Type	Army Building Type	ASHRAE Climate Zone																
			1A	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
1	Admin/professional office		31	32	31	34	26	31	26	37	32	32	38	34	31	43	38	46	65
1A	Company Operations Facility	14185	28	31	29	33	22	29	23	41	32	33	47	34	35	57	48	63	76
3	Government Office		39	40	39	42	33	38	34	46	39	40	48	42	39	54	47	58	81
3A	Brigade Headquarters	14182	59	58	55	57	50	54	50	61	55	53	66	58	53	74	65	79	90
3B	Battalion Headquarters	14183	36	37	36	38	30	35	31	42	36	37	44	38	36	50	44	53	76
5	Mixed-use office		36	37	36	38	30	36	31	42	37	38	45	38	36	50	44	54	75
6	Other Office		30	31	30	32	26	30	26	35	30	31	38	32	30	42	37	45	62
7	Laboratory		142	141	137	140	118	132	127	155	138	143	167	150	145	186	169	199	265
8	Distribution / shipping center		10	13	13	16	9	14	11	22	18	18	29	24	19	39	32	48	90
9	Non-refrigerated warehouse		5	6	6	8	4	7	6	10	9	9	14	11	10	19	15	23	43
29	Other classroom education		20	20	20	20	14	19	17	23	20	21	26	22	22	30	26	32	48
30	Fast Food		235	241	237	249	213	239	228	275	252	256	299	271	266	328	300	354	447
30A	Dining Facility	72210	351	361	351	362	311	350	321	384	361	354	410	365	362	452	417	492	571
31	Restaurant/cafeteria		127	131	127	135	113	129	123	149	136	140	161	147	149	176	163	192	241
32	Other food services		69	71	69	74	62	70	68	82	75	77	88	80	82	96	89	104	131
34	Dormitory/fraternity/sorority		36	39	38	42	28	39	36	52	43	49	59	50	47	68	59	77	107
35A	Unaccompanied Enlisted Personnel Housing	72111	59	61	63	61	48	58	49	61	56	52	65	62	53	74	67	80	97
36	Hotel		45	46	43	47	42	44	43	50	47	47	51	50	48	55	53	59	68
37	Motel or inn		50	48	47	46	43	45	41	47	45	43	48	45	44	50	47	51	62
38	Other lodging		48	45	45	44	41	43	40	44	43	41	45	43	42	48	45	50	59
46	Other Service		48	48	46	47	40	45	43	52	47	48	57	50	49	62	57	67	90
46A	Tactical Equipment Maintenance Facility	21410	37	41	44	64	37	54	39	92	68	74	119	99	79	158	128	180	239
43	Repair shop		22	22	22	22	18	21	20	25	22	22	26	24	23	30	27	32	42
44	Vehicle service/repair shop		26	26	26	26	22	25	23	29	26	26	31	28	26	34	31	37	49
45	Vehicle storage/maintenance		11	11	11	11	10	10	10	13	11	11	14	12	12	15	14	16	22
50	Single family, detached		22	24	24	26	18	24	22	32	27	30	37	30	29	42	37	48	66
51	Single family, attached		26	27	27	30	20	28	26	37	31	34	42	35	34	48	42	54	77
52	Apartment, 2-4 units		38	40	40	45	30	41	38	54	46	51	62	52	49	71	62	81	112
53	Apartment, 5 or more units		26	27	27	30	20	28	26	37	31	34	42	35	34	48	42	54	77

Table 2 – Energy Use Intensity (EUI) Targets for Existing (Pre-2008) Buildings Undergoing Major Renovation

Calibrated Baseline or ASHRAE STD 100 (Table 7-2 Building Activity Energy Targets)

EUIs by Building Type by Climate Zone (kBtu/ft2-yr)																			
ASHRAE 100 #	Commercial/Army Building Type	Army Category Code	ASHRAE Climate Zone																
			1A	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
1	Admin/professional office		39	40	39	42	33	39	33	46	40	40	48	42	39	54	47	58	81
1A	Company Operations Facility	14185	35	39	36	41	27	36	28	51	40	42	59	42	44	71	60	79	95
3	Government Office		49	50	49	52	41	48	42	57	49	50	60	52	49	67	59	72	101
3A	Brigade Headquarters	14182	74	72	69	71	63	68	63	76	69	66	82	73	66	93	82	99	112
3B	Battalion Headquarters	14183	45	46	45	48	37	44	39	52	45	46	55	48	45	62	55	67	94
5	Mixed-use office		45	46	45	48	38	45	39	53	46	47	56	48	45	62	55	67	94
6	Other Office		38	39	38	40	32	37	32	44	38	39	47	40	38	52	46	56	78
7	Laboratory		178	176	171	175	147	165	159	194	173	179	209	187	181	232	211	249	331
8	Distribution / shipping center		12	16	16	20	11	18	14	27	23	22	36	30	24	49	40	60	113
9	Non-refrigerated warehouse		6	8	8	10	5	9	7	13	11	11	17	14	12	24	19	29	54
29	Other classroom education		25	25	25	25	18	24	21	29	25	26	32	27	27	37	32	40	60
30	Fast Food		261	268	263	277	237	266	253	305	280	284	332	301	295	364	333	393	497
30A	Dining Facility	72210	390	401	390	402	346	388	356	427	401	393	456	405	403	502	463	547	635
31	Restaurant/cafeteria		141	145	141	150	126	143	137	166	151	156	179	163	166	195	181	213	268
32	Other food services		77	79	77	82	69	78	75	91	83	85	98	89	91	107	99	116	146
35	Dormitory/fraternity/sorority		40	43	42	47	31	43	40	58	48	54	65	55	52	75	66	85	119
35A	Unaccompanied Enlisted Personnel Housing	72111	65	67	70	68	53	65	54	68	62	57	73	69	58	83	74	89	107
36	Hotel		50	51	48	52	47	49	48	55	52	52	57	55	53	61	59	65	75
37	Motel or inn		55	53	52	51	48	50	46	52	50	48	53	50	49	56	52	57	69
38	Other lodging		53	50	50	49	46	48	44	49	48	46	50	48	47	53	50	55	66
46	Other Service		60	60	58	59	50	56	54	65	59	60	71	63	61	78	71	84	112
46A	Tactical Equipment Maintenance Facility	21410	47	52	55	80	46	67	49	116	85	92	149	124	99	197	160	225	299
43	Repair shop		28	28	27	28	23	26	25	31	28	28	33	30	29	37	34	40	53
44	Vehicle service/repair shop		33	33	32	32	27	31	29	36	32	33	39	35	33	43	39	46	61
45	Vehicle storage/maintenance		14	14	14	14	12	13	13	16	14	14	17	15	15	19	17	20	27
50	Single family, detached		28	30	30	33	22	30	28	40	34	38	46	38	36	52	46	60	83
51	Single family, attached		32	34	34	38	25	35	32	46	39	43	53	44	42	60	53	68	96
52	Apartment, 2-4 units		47	50	50	56	37	51	47	68	57	64	77	65	61	89	78	101	140
53	Apartment, 5 or more units		32	34	34	38	25	35	32	46	39	43	53	44	42	60	53	68	96

Table 3 – Army CAT Codes to ASHRAE Standard 100 Facility Type (ID #)

Army CAT Code	CAT Code Description	Army Mapping Building Type	ASHRAE Std 100 Facility type	ASHRAE Std 100 ID #
14113	ACCESS CONTROL FAC		Other office	6
14133	SHIP/RECV FAC		Distribution/shipping center	8
14140	CARE/PRESS SHOP		Vehicle storage/maintenance	45
14160	BLOCK/BAND FAC		Distribution/shipping center	8
14182	BDE HQ BLDG	BDEHQ	<-- Use this Facility Type	3A
14183	BN HQ BLDG	BnHQ	<-- Use this Facility Type	3B
14185	CO HQ BLDG	COF	<-- Use this Facility Type	1A
14190	EAB C2F		Government office	3
17120	GEN INST BLDG		Other classroom education	29
17140	USAR CENTER		Mixed-use office	5
17141	ARM FORCE CTR		Mixed-use office	5
17142	ARNG/USAR CTR		Mixed-use office	5
17180	ARNG ARMORY		Mixed-use office	5
21110	AC MAINT HGR		Repair shop	43
21113	AC PARTS STR		Nonrefrigerated warehouse	9
21116	HGR SHOP SPACE		Repair shop	43
21117	AVION MNT SHP I		Vehicle service/repair	44
21120	AC COMP MAINT		Vehicle service/repair	44
21130	AC PAINT SHOP		Repair shop	43
21140	AC ENG TST FAC		Vehicle service/repair	44
21210	GM MNT FAC DEP		Vehicle service/repair	44
21220	GM LCH EQ DEP		Vehicle service/repair	44
21407	ARNG VEH MAINT	TEMF	<-- Use this Facility Type	46A
21408	COMPT CLNG FAC		Vehicle service/repair	44
21409	USAR VEH MAINT	TEMF	<-- Use this Facility Type	46A
21410	VEH MAINT SHOP	TEMF	<-- Use this Facility Type	46A
21413	ADMIN / SHOP CONT		Mixed-use office	5
21414	GEN ITEM REPAIR		Vehicle service/repair	44
21415	COMP ITEM REP		Vehicle service/repair	44
21416	MSL MAINT FAC		Vehicle service/repair	44
21417	VEH PNT/PREP SH		Vehicle service/repair	44
21418	AMSA / ECS		Vehicle service/repair	44
21419	CSMS/MATES	TEMF	<-- Use this Facility Type	46A
21435	MAJ END ITM REB	TEMF	<-- Use this Facility Type	46A
21440	COMP REB DEPOT	TEMF	<-- Use this Facility Type	46A
21441	VEH MNT FAC DEP	TEMF	<-- Use this Facility Type	46A
21445	T/A PTS STR DEP		Vehicle storage/maintenance	45
21458	STM CLN BLD DEP		Vehicle service/repair	
21462	STM CLN FAC DEP		Vehicle service/repair	44
21465	DRUM RECON PLT		Vehicle service/repair	44
21470	OIL STR BLDG		Vehicle storage/maintenance	45
21510	SM ARMS REP DEP		Repair shop	43
21512	WEAP DEMIL DEP		Repair shop	43

Army CAT Code	CAT Code Description	Army Mapping Building Type	ASHRAE Std 100 Facility type	ASHRAE Std 100 ID #
21520	LT GUN DEPOT		Repair shop	43
21522	WPN QA / CAL DEP		Repair shop	43
21530	HVY GUN DEPOT		Repair shop	43
21540	SP WEAP DEPOT		Repair shop	43
21545	WPNS REPAIR FAC		Repair shop	43
21610	AMMO RENO DEPOT		Repair shop	43
21612	AMMO SURV DEP		Repair shop	43
21620	RKT OHUAL DEPOT		Repair shop	43
21622	EXP REC / SER DEP		Repair shop	43
21630	AMMO DEMIL DEP		Repair shop	43
21640	DUN BLDG DEPOT		Repair shop	43
21642	COMP CLEAN DEP		Repair shop	43
21650	AMMO QA/CAL DEP		Repair shop	43
21660	AMMO MNT FAC		Repair shop	43
21670	AMMO REPAIR, IN		Repair shop	43
21710	ELE MAINT DEPOT		Other service	46
21712	C-E QA / CAL DEP		Other service	46
21722	C-E COMP CN DEP		Other service	46
21730	RDR MAINT DEPOT		Other service	46
21740	AVION MAINT DEP		Other service	46
21840	RR EQ / EN MAINT		Other service	46
21845	ADMIN / SHOP DOL		Repair shop	43
21850	BATTERY SHOP		Repair shop	43
21855	VEH PNT / PREP DL		Vehicle service/repair	44
21865	OIL STR BLD DOL		Vehicle storage/maintenance	45
21870	MNT STORAGE DOL		Repair shop	43
21872	QA / CAL GEN PURP		Repair shop	43
21879	PROC MAINT FAC		Repair shop	43
21881	ABN EQ / PARA REP		Repair shop	43
21882	GEN ITM REP DOL		Repair shop	43
21885	MNT GEN PURPOSE		Repair shop	43
21887	COM ITM REP DOL		Repair shop	43
21910	ENG/HOUSING MNT		Repair shop	43
21922	ENTOMOLOGY FAC		Other service	46
21925	ENGR MAINT FAC		Other service	46
31010	CHEMISTRY LAB		Laboratory	7
31015	GREENHOUSE R&D		Laboratory	7
31020	METALLURGY LAB		Laboratory	7
31030	NUC PHY/CHM LAB		Laboratory	7
31040	PHYSICS LAB		Laboratory	7
31050	HUMAN ENG LAB		Laboratory	7
31060	MED RES LAB		Laboratory	7
31061	MED LAB AN SHLT		Laboratory	7
31062	DENTAL RESEARCH		Laboratory	7
31063	WILDLIFE OBS BD		Laboratory	7
31065	CLIMATIC CHAMBR		Laboratory	7

Army CAT Code	CAT Code Description	Army Mapping Building Type	ASHRAE Std 100 Facility type	ASHRAE Std 100 ID #
31066	BIO LAB LEVEL 3		Laboratory	7
31067	BIO LAB LEVEL 4		Laboratory	7
31071	ENGINEER R&D		Laboratory	7
31210	ASTRO/GEO BLDG		Laboratory	7
31220	GM BLDG		Other services	46
31610	CHM EQ/MAT BLDG		Laboratory	7
31620	AMMO/EXPL/TX BD		Laboratory	7
31710	COMMO EQ BLDG		Laboratory	7
31720	DETECT EQ BLDG		Laboratory	7
31730	ELECTL EQ BLDG		Laboratory	7
31740	ELCTRN EQ BLDG		Laboratory	7
31810	NUC PROP BLDG		Laboratory	7
31820	PROPUL SYS BLDG		Laboratory	7
31910	NONMTL MAT FAC		Laboratory	7
31920	LAB/TST BLDG GP		Other services	46
31930	VIB TEST LAB		Laboratory	7
32110	PREC MACH SHOP		Repair shop	43
42120	HE MAG DEPOT		Non-refrigerated warehouse	9
42180	IGLOO STR DEPOT		Non-refrigerated warehouse	9
42280	IGLOO STR INST		Non-refrigerated warehouse	9
43210	COLD STR DEPOT		Refrigerated Warehouse	18
43211	COLD STR INST		Refrigerated Warehouse	18
44110	STORAGE GP DEP		Non-refrigerated warehouse	9
44130	CONT HUM WH DEP		Refrigerated Warehouse	18
44220	STORAGE GP INST		Non-refrigerated warehouse	9
44224	ORG STR BLDG		Non-refrigerated warehouse	9
44230	CONTR HUM WH IN		Refrigerated Warehouse	18
44288	INST STR OTHER		Non-refrigerated warehouse	9
51010	MED CTR/HOSP		Hospital/inpatient health	33
55010	HEALTH CLINIC		Clinic other/outpatient health	17
61001	MEPS		Other office	6
61002	RECRUITING STA		Other office	6
61050	ADMIN GEN PURP		Admin	1
61055	WAITING AREA		Other public assembly	24
61065	TECH LIBRARY		Library	21
61070	RED CROSS BLDG		Other office	6
61075	COURTROOM		Government office	3
71112	FH COL		Apartment (2-4)	52
71113	FH LTC/MAJ		Apartment (2-4)	52
71114	FH CO/W0		Apartment (2-4)	52
71115	FH SR NCO		Apartment (2-4)	52
71116	FH JR NCO/ENL		Apartment (2-4)	52
72010	ARMY LODGING		Apartment (2-4)	52
72111	ENLISTED UPH	UEPH	<-- Use this Facility Type	35A
72114	TT ENL BARRACKS	UEPH	Apartment (+5)	53
72121	TRANS UPH AIT	UEPH	Apartment (+5)	53

Army CAT Code	CAT Code Description	Army Mapping Building Type	ASHRAE Std 100 Facility type	ASHRAE Std 100 ID #
72122	TRANS UPH AST	UEPH	Apartment (+5)	53
72181	TRAINEE BKS	UEPH	Apartment (+5)	53
72210	DINING FACILITY	DFAC	<-- Use this Facility Type	30A
72410	UOQ MILITARY		Apartment (2-4)	52
73010	FIRE STATION		Fire/police station	14
73011	DET FIRE STATION SPT		Fire/police station	14
73046	DEPENDENT SCH		Elementary School	26
74017	CDC UNDER 6 YRS		Preschool/daycare	28
74021	COMMISSARY		Grocery/food market	12
74028	PHYS FIT CTR		Recreation	22
74053	EXCH MAIN STORE		Retail store	40

Enclosure 3 – New and Underutilized Technology Resources

1. DOE EERE FEMP Technology Deployment Program Technology Matrix:
   http://www1.eere.energy.gov/femp/docs/tech_deployment_matrix.xlsx

   The technology matrix is an effective tool to assist Federal agencies to identify newer and underused energy savings technologies to help meet energy reduction goals, to save research time, and provide better direction in making ECM decisions.

2. DOE EERE FEMP Covered Product Categories:
   http://energy.gov/eere/femp/find-product-categories-covered-efficiency-programs and http://energy.gov/eere/femp/energy-and-water-efficient-products

   The summary of covered product categories was developed to help Federal purchases meet Federal requirements for high efficiency. Each product category is either covered by FEMP-designated or ENERGY STAR®. Some office equipment and electronics are also covered by EPEAT or low standby power requirements.

3. DOE EERE FEMP Energy and Cost Calculators for Energy Efficient Products

   The energy and cost calculators were developed as a resource to allow Federal agencies to enter their own input values (e.g., utility rates, hours of use) to estimate energy and cost savings for energy-efficient products. Some are Web-based tools; others are Excel spreadsheets provided by ENERGY STAR® for download.

4. DOE EERE FEMP Water Efficiency website:
   http://energy.gov/eere/femp/water-efficiency-federal-buildings-and-campuses

   The water efficiency website provides an overview of Federal water efficiency requirements as well as guidance surrounding Federal water management.

5. DOE Water Best Management Practices website:
   http://energy.gov/eere/femp/best-management-practices-water-efficiency

   This website provides an overview of best management practices for water efficiency.

6. DOE EERE FEMP Renewable Energy Technology website:
   http://energy.gov/eere/femp/federal-renewable-energy-projects-and-technologies

   The Renewable Energy Resource and Technology website provides resources to help Federal agencies meet their renewable energy goals.

7. EPA ENERGY STAR® Program: http://www.energystar.gov

   EPA Energy Star provides information about their qualified products.

8. EPA WaterSense: https://www3.epa.gov/watersense

   The EPA WaterSense website provides consumers with easy ways to save water, as both a label for products and an information resource to help use water more efficiently.

9. DOE Building Technology Office Commercial Better Building Alliances (BBA) technology specification website: https://buildingdata.energy.gov/cbrd/

   The DOE Building Technology Office website provides specifications that can be customized and used to obtain quotes for high-efficiency products and services. Collective BBA support of these product and performance specifications demonstrates a market need to manufacturers and leads to greater product availability, higher quality, and more competitive pricing.

10. Whole Building Design Guide: www.wbdg.org

    The Whole Building Design Guide website is the gateway to up-to-date information on integrated whole building design techniques and technologies.