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of Engineers®

ENGINEERING AND CONSTRUCTION BULLETIN

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SUBJECT: Deconstruction, Diversion, & Disposal of Debris

CATEGORY: Directive and Guidance

1. References:

- a. Memorandum, ASA(IE&E), 16 Dec 2013, subject: Sustainable Design and Development Policy Update
- b. Department of Defense (DoD) Strategic Sustainability Performance Plan
- c. Unified Facilities Criteria (UFC) 1-200-02, High Performance Sustainable Buildings
- d. Unified Facilities Guide Specifications (UFGS) 01 74 19 Construction Waste Management
- e. Army Regulation (AR) 420-1, Army Facilities Management

2. **Purpose.** To ensure appropriate application of Sustainable Design and Development Policies and Criteria related to the reduction of construction and demolition (C&D) debris disposal by Army construction activity. Specifically, “construction activity” is any activity that designs, builds, assembles, modernizes, or repairs infrastructure including vertical (occupied and non-occupied buildings), horizontal (e.g., roads, parking lots, civil works), and utility systems (e.g., distribution systems and supporting infrastructure). This ECB is effective at its date of issue for Sustainment, Restoration, and Modernization (SRM) projects and all new construction / major renovation projects beginning planning or design in FY2016.

3. **Applicability.** The SDD Policy Update (Ref. a), and the deconstruction and C&D debris disposal policy herein applies to all construction activities on Army installations (including government owned/contractor operated installations and tenant activities) regardless of funding source. This policy also applies to all Army funded construction activities regardless of location; at Joint Installations, the supporting Component guides all construction policy and guidance. For overseas construction activities on permanent basing and in support of contingency operations, this policy will apply to the greatest extent practical considering mission objectives and Host Nation agreements. See Applicability paragraph in the SSD Policy Update (Ref. a.) for details and exception policy information. Although the policy (Ref. a) is intended for Military funded projects, the guidance in this ECB should be applied as best practices for Civil Works projects to the extent practicable.

4. **Background.** The Assistant Secretary of the Army, Installations Energy and Environment (ASA-IE&E) issued a Sustainable Design and Development Policy Update, 16 December 2013 (Reference a.) In addition to updating the minimum required diversion rate from 50% to 60%,

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this Policy Update also requires that deconstruction be evaluated for projects involving building removal, and that deconstruction be implemented where markets exist or are anticipated.

5. Deconstruction Priority Consideration Policy. Project planning and design efforts are to carefully consider and prioritize deconstruction solutions over recycling or other disposal of construction and demolition waste. Projects that involve the removal of existing buildings or structures will evaluate the feasibility of deconstruction and salvage rather than conventional demolition, and will implement deconstruction wherever markets or on-site reuse opportunities exist or are anticipated. The Army's ultimate goal is Net Zero waste disposal in landfills. Strategies that reuse or repurpose materials onsite are preferred as more sustainable than recycling that requires off-site transportation and processing.

6. Waste Reduction Criteria Update. In accordance with Sub-goal 5.3 of the DoD SSPP (Ref. b.), the minimum Construction and Demolition debris to be diverted from non-sustainable waste streams is now 60% for FY2015 and beyond.

7. Implementation. All criteria references for minimum Construction and Demolition debris diversion are to be edited as necessary to ensure that they reflect a minimum of 60% reduction or more in accordance with the DoD and Army policy.

a. When using UFC 1-200-2 (Ref. c), use 60% in lieu of 50% referenced in paragraph 4-7.4 Waste and Materials Management. The UFC is intended to be updated prior to the expiration of this ECB.

b. UFGS 01 74 19 (Ref. d) was changed earlier this year to reflect the new 60% minimum. Current projects specifications based on this UFGS should be checked to ensure this change is reflected.

c. Incorporate text into project contract documents whenever specific candidates for deconstruction and or re-use have been identified to ensure they are identified and handled properly. See the appendices included with this ECB for additional guidance on text to be incorporated into project contract documents.

8. Reporting. In Section 23-15.a, AR 420-1 (Ref. e) requires that Project Managers of new construction, major renovation, facilities reduction or other demolition projects report C&D [Construction & Demolition] waste activities to the designated installation Point of Contact for data entry to SWARWeb (Solid Waste Annual Reporting, Web-based.) This is not a new requirement. However, there are differences in the data that required by SWARWeb and reports typically submitted for LEED points or other submissions. To ensure complete data collection up-front, specific guidance is included in Enclosure C.

9. Documentation. The Project Manager shall ensure documentation that deconstruction was considered first on applicable projects, and that a minimum of 60% of construction and demolition waste was diverted are included in the project files.

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10. **Guidance.** Attached to this ECB are the following guidance documents to assist in complying with this policy:

- a. Enclosure A: Evaluating the Feasibility of Deconstruction
- b. Enclosure B: Implementing Deconstruction
- c. Enclosure C: Solid Waste Annual Reporting (SWARWeb) Support

11. **Funding.** The design effort required for deconstruction consideration and increased waste diversion are to be funded as part of the normal project delivery process with existing resources. Reports indicate that for the past several years the Army has exceeded 70% or more in waste diversion at the current project funding levels.

12. **Update.** All new requirements will be included in the appropriate policy and criteria document update cycle prior the expiration of this ECB.

13. **Point of Contact.** HQ USACE point of contact for this ECB is Eric Mucklow, CECW-CE, (202) 761-0522 or eric.s.mucklow.civ@mail.mil.

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Organization

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ENCLOSURE A
EVALUATING THE FEASIBILITY OF DECONSTRUCTION

1. Purpose.

This Enclosure provides further information relative to the Office of the Assistant Secretary of the Army, Installations Energy and Environment (OASA-IE&E) Sustainable Design and Development (SDD) Policy Update's requirement to evaluate the feasibility of deconstruction for Army projects involving the removal of buildings and structures. This information is directed toward US Army Corps of Engineers (USACE) offices involved with demolition through Military Construction (MILCON), Facility Reduction Program (FRP), and similar facility programs at any Army installations; USACE Districts, Huntsville Engineering and Support Center, and USACE Area and Resident Offices. This guidance will also be useful to installation Directorate of Public Works (DPW) personnel involved in building removal projects under Sustainment, Restoration, and Modernization (SRM) and Operation and Maintenance, Army (OMA) programs.

2. Deconstruction and Demolition.

Deconstructing buildings and structures to recover materials can significantly reduce demolition waste. While deconstruction is one form of demolition, deconstruction and demolition are not synonymous. It is important to recognize that not all buildings can be deconstructed within the Army's cost and schedule parameters. When assessing the feasibility of deconstructing buildings and structures, project personnel must be realistic in how to apply a deconstruction approach. Capitalize on the opportunities to recover materials to the greatest extent possible. Avoid attempting to implement a deconstruction approach where a building or structure is ill-suited for disassembly or the effort to recover materials exceeds the materials' value.

In practical terms, deconstruction means removing the building or structure, and in so doing, recovering the greatest amount of materials, components, and products as practical that are intact and suitable for reuse. Deconstruction can involve disassembling the building or structure in total, which is often referred to as structural deconstruction. Deconstruction can also involve removing materials, components, and other contents for reuse, then demolishing the building using conventional demolition techniques. This is referred to as architectural deconstruction or soft stripping.

When evaluating the feasibility of deconstruction for any building or structure, consider the following.

- The building's or structure's construction type
- Building contents and condition, and their suitability for reuse
- Project scope

- Project schedule
- Markets and industry capabilities

3. Evaluating Construction Type

The building's or structure's construction type must lend itself to disassembly and material recovery. If assembled as individual members or subassemblies, members and subassemblies can be disassembled. If installed to be monolithic, the structure cannot be disassembled. In the latter case, demolition and recycling would be the recommended diversion strategies

a. Wood- and Timber-Framed Buildings

In general, wood- and timber-framed buildings lend themselves very well to deconstruction. These would be primary candidates for deconstruction. Materials and components can be removed and are reusable in different applications and configurations. The building itself is not necessarily reused as originally designed. Some buildings can be moved off site and relocated elsewhere. Look for the following characteristics.

Buildings are of standard designs or otherwise of simple geometry (rectangular or rectilinear) and uniform in construction and detailing. Uniformity in structural configuration expedites disassembly, especially when multiple buildings of similar type will be included in the scope of the contract, and similar techniques can be performed repetitively.

Framing members are solid wood, are readily removable and can be handled with manual labor or lifting equipment; 2x8s -10s and 12s and 3x members or larger are more attractive for reuse; Hardwoods are most the attractive for reuse. Douglas Fir and Heart Pine are also attractive species for reuse. Yellow Pine, Hemlock, and other species are less attractive for reuse, but are still serviceable. Engineered wood components (trusses, composite joists, and similar) can be recovered but are more subject to damage upon removal if lifted and handled in their weak orientation without support. The designation of engineered wood members should be visible so the appropriate parameters for reuse can be identified.

Wood trusses can be supported by lifting equipment, detached and lowered to the ground; the reverse order of their installation. Truss assemblies can be reused, although they would require analysis for damage and for sufficiency for their subsequent application. Disassembling and reusing their members may be more feasible.

Doors and windows can readily be removed with their frames, leaves, sashes, and hardware intact.

Connections of primary structural members (trusses, beams) are bolted or nailed and are detachable. Nailed connections (especially lapped members) can be often be cut without compromising the integrity of the members or losing a usable length. Extensive use of

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construction adhesives inhibits disassembly, although these were rarely used in WWII-era buildings.

Sheathing is wood board or plywood, which is readily removable. Composite-type sheet goods can also be recovered but are more subject to damage upon removal.

Non-load bearing partitions and interior construction are readily removable without destabilizing the building. Load bearing members can be removed in a sequence (top-down and from one end of the building to the other, for example) without destabilizing the structure as a whole. Electrical and plumbing distribution, fixtures, ductwork, applied surfaces, and other interferences can be removed without compromising the wood structural members.

Flashing, soffits & fascia, siding, other exterior materials can be detached without damaging reusable items.

Consider weight, elevation, and dimensions of building components, and how they can be detached and handled. Working with dimensional lumber at elevations of about 20' or less should present no extraordinary problems. Work at about 20' or higher may require work platforms and lifting equipment. Removing heavy members such as timbers, trusses and other built-up spanning members or columns will require support while detaching connections, and lifting equipment to lower components to the ground.

Consider whether construction equipment could be applied to remove the buildings in sections, which can reduce manual labor and expedite deconstruction. Consider the building's geometry and opportunity to cut the building into panels or sub-assemblies. These components can then be removed from the building footprint and disassembled on the ground elsewhere on-site. Consider whether buildings could be removed intact and relocated elsewhere. Wood framed buildings supported by piers or wall foundations can be removed whole or in sections. Consider whether the building or sections can be transported within over-the-road dimensions and relocated elsewhere.

b. Pre-Engineered Metal Building Systems

Pre-engineered metal buildings are also commonly deconstructed. The typical metal building configuration is a rigid frame primary structure on a slab-on-grade with purlins and girts that support roof and wall panels, respectively. Pre-engineered buildings are typically disassembled and reassembled in the same configuration elsewhere. The building itself is the primary product of deconstruction. Look for the following characteristics.

Structural configuration and detailing are relatively uniform. The same columns and spanning members are repeated over the building's length.

Structural components are readily unbolted, disassembled, and reassembled. Lifting equipment will be required to support members as they are being detached and lowered to the ground; the reverse of their assembly process.

Metal wall panels are readily removable and should be reusable. Single-layer and sandwich wall panels are attached with threaded fasteners, which are detachable. Some insulated sandwich panel systems are installed in a sequence, and therefore must be detached in the reverse sequence. Metal roof panels attached with threaded fasteners should be recoverable for reuse. Standing seam metal roof systems will be difficult to remove without deforming the seams beyond reuse.

Interior space division and components, and mechanical, electrical, and plumbing systems, fixtures and equipment are independent of the pre-engineered building system and can be removed for reuse or recycling.

c. Light-gage Metal Framed Buildings

Buildings constructed with cold-formed light-gage steel members, commonly referred to as “steel stud” construction, can be deconstructed. Vertical framing typically consists of galvanized steel “C” shapes, or studs. These are typically screwed into horizontal channels, and can be detached. Steel studs are reusable unless they are damaged when being removed. Floor joists can likewise be detached and reused. Metal trusses can be supported by lifting equipment, detached and lowered to the ground; the reverse order of their installation. Truss assemblies can be reused, although they would require analysis for damage and for sufficiency for their subsequent application. Disassembling and reusing their members may be more feasible.

Windows and doors, exterior materials, Interior materials and components, and mechanical, electrical, and plumbing systems, fixtures and equipment should be removed for reuse or recycling, similar to a wood-framed building.

d. Structural Steel Buildings

Deconstructing structural steel buildings is possible, but rarely practiced. These are not good candidates for full deconstruction. Collateral materials, such as exterior materials, architectural elements, plumbing, mechanical, and electrical systems, fixtures, and equipment would have to be removed to allow access to the structural members. These should be reused or recycled, as appropriate.

Bolted connections can be removed and members lowered to the ground. However, removing welded connections, especially sheet steel components such as decking, will likely damage materials. Light members, such as bar joists, may be more subject to damage from removal and handling

Composite decks would be problematic, as removing the concrete from metal deck and beams will most likely damage the deck and supporting members beyond reusability.

If structural steel members and connections are recovered, they must be analyzed for damage and sufficiency in subsequent applications. Without knowing each member’s designation (grade of steel and weight per linear foot), it would be impossible to determine the member’s structural

properties with a high degree of confidence. Recycling structural steel components is most likely the most economically feasible disposition of these materials.

e. Masonry Buildings

Masonry buildings can be good candidates for deconstruction if roof and floor assemblies are wood or timber framed. Collateral materials, such as exterior materials, architectural elements, plumbing, mechanical, and electrical systems, fixtures, and equipment would have to be removed to allow access to the structural members. These should be reused or recycled, as appropriate.

Roof and floor assemblies can be disassembled following the same considerations as discussed with wood framed buildings, above. Multi-story buildings can be deconstructed floor-by-floor by first removing the roof framing and columns, removing the top story masonry walls, remove next level of floor framing and columns, and so forth.

Stone and brick masonry units can be removed with construction equipment. Unbroken units can be recovered for reuse and broken units can be recycled. Concrete masonry units are subject to breakage upon demolition and may not justify a recovery effort.

Structural steel roof and floor construction can be recycled as described above. Precast or prestressed concrete roof and floor decks can be recycled.

f. Reinforced Concrete Buildings

Reinforced concrete buildings cannot be disassembled. Recycling concrete and rebar is the only feasible diversion method for the building's structure and foundation.

4. Building Contents; Reuse and Recycling Potential

Survey the buildings to be removed and assess whether materials, components, and products are in serviceable or operable condition and reusable elsewhere, can be recycled, or must be disposed of as debris. Look for the following characteristics:

The building is or has recently been occupied and is functional.

- If the building is vacant, the roof and exterior closure are in generally intact. There has been no prolonged or severe exposure to environmental degradation.
- The building's roof, floor, and wall assemblies do not exhibit signs of severe deflection, settlement, or structural instability.
- The building's contents are in serviceable condition. They are not damaged, deteriorated, or contaminated to any great degree.

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- Components, products, and equipment are not functionally obsolete. They will still perform the intended function.

Specific materials, products, and components that are potentially reusable include the following.

- Sitework items include:
 - Chain link fencing.
 - Wood fencing, if not deteriorated.
 - Metal structures, corrugated metal pipe, sheet piling and other metal items, if not extensively damaged.
 - Stone and unit pavers.
 - Landscape materials; plants, bushes, vegetation.
 - Brick and stone masonry.
- Metals include:
 - Structural metals.
 - Cold-form metal framing if it can be removed without deforming the flanges.
 - Metal fabrications and ornamental metals.
- Wood materials and components include:
 - Wood framing, decking, and sheathing that is free from mold, rot, splits, checks, and structural deformations.
 - Cabinets, counters, and similar built-in casework that is reasonably clean and undamaged, free from mold, and in good working order.
 - Architectural millwork that is reasonably clean, undamaged, and has not accumulated excessive amounts of paint.
 - Glue-laminated wood members.
 - Engineered wood components, composite joists for example, that are not damaged during removal and handling; catalog or span table designations should be visible on each member to facilitate reuse.

- Architectural woodwork; millwork, cabinets, or rails, for example.
- Moisture and thermal protection materials and components include:
 - Rigid insulation board and batt or blanket insulation, if removed without significant damage and is dry, reasonably clean, not compacted, and free from mold.
 - Roof accessories, vents, access hatches, for example, if removed without damage and functionally serviceable.
 - Metal roofing and siding, if attached with threaded fasteners, and if removed without damage and reasonably free from excessive amounts of paint, corrosion, punctures, and other physical damage.
 - Vents, grills, and louvers are in serviceable condition.
- Windows and doors include:
 - Windows and doors of any material, if they are reasonably clean and undamaged, are in good operable condition, and have not accumulated excessive amounts of paint. Keeping the frames and hardware in-tact increases value.
 - Sashes from windows that are not energy efficient by current standards are often reused for other value-added products.
- Finishes include:
 - Carpet not heavily soiled; carpet tiles are most readily reusable.
 - Acoustical ceiling systems if tiles are not heavily soiled and are removed without serious damage.
 - Paneling, preferably laminated as opposed to a fibrous or composite material.
 - Wood strip flooring unless it is adhered with mastic.
 - Ceramic floor and wall tiles if not broken during removal.
 - Architectural specialties such as visual displays, access flooring, lockers and wardrobes, and other similar built-in or attached items.
- Mechanical components include:

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- Plumbing fixtures and equipment can be reused if recently installed or still functionally suitable; vintage fixtures are more valuable. Note the Reduction of Lead in Drinking Water Act (RLDWA) prevents fixtures that convey potable water and manufactured before January 2014 from being resold.
- Metal pipe, valves and other controls if recently installed and removed without damaging threads and couplings.
- Heating and cooling equipment may be reusable if recently installed or still functionally serviceable.
- Diffusers, fans, grills, louvers and similar products may be reusable.
- Electrical components include:
 - Circuit breaker panels and other electrical distribution components if recently installed or still comply with current electrical codes.
 - Light fixtures if recently installed or still compliant with current electrical code; vintage fixtures are more valuable.

5. On-Post Reuse Opportunities

Survey DPW shops and identify construction materials, equipment, spare parts, and other items useful to them for repair and maintenance. Reuse applications may include the following:

- Replacement in facilities that are of approximately the same age and occupancy as those being demolished.
- Use in facilities that may be converted or repurposed for other missions in the near future.
- Repair or replacement in facilities scheduled for removal in the foreseeable future, but are still occupied; interim repair or replacement in lieu of new components which may otherwise be discarded and wasted while still serviceable.

Canvass commands, troop units, and other installation tenants to identify materials which may be useful to them for training, self-help projects, and other similar applications. Engineer units can frequently use concrete and masonry materials for equipment training. While a deconstruction contractor may not want to donate a significant quantity of material, donating scrap and marginally valuable materials can reduce the waste stream.

Consult with the Qualified Recycling Program (QRP) / recycling center about potential opportunities to recycle materials generated by construction and demolition activities. The QRP / recycling center is typically more familiar with the local and regional recycling infrastructure

than construction and demolition contractors. Materials may include those already being recycled by the QRP, such as corrugated cardboard, beverage containers, metal scrap, or plastics. It may also provide an outlet for materials that are recyclable, but not typically recycled by construction and demolition contractors. The contractor is vested title to C&D materials and is at their liberty to sell recyclable materials on the commercial market. However, the contractor may not wish to invest research, time, or transportation cost for small quantities or materials that are less profitable to them. In this case, the QRP / recycling center can serve as a more convenient disposal site than a commercial recycler, while still contributing to their waste diversion requirement. Care must be taken to avoid conflicts with sources of funding applied to QRP activities.

Publicize deconstruction projects on-post. Both soldiers and civilian employees provide potential markets for recovered materials. Information sources may include the Public Affairs Office, post newspaper, social media posts, site banners, and similar media outlets.

6. Evaluating Project Scope.

The scope of the project, considering building square footage, contract amount, and quantity of reusable materials must be sufficient to attract participation by the industry and justify efforts to which demolition contractors may not be accustomed. What constitutes sufficient scope is extremely variable and depends on the construction type, estimated deconstruction effort, materials available in the buildings, market demand, and available industry resources. Too small a project will not attract sufficient participation, and therefore insufficient competition. Too large a project may discourage otherwise capable resources from participating. A project scope of 50,000 to 100,000 square feet of WWII-era wood buildings should be sufficient for a conventional demolition-type contract. A considerably smaller scope will be sufficient if a non-traditional approach is taken, such as selling buildings to the public. In this case, any single buyer may wish to purchase only one or two small buildings; 5,000 to 10,000 square feet in total. However, several buyers could perform a significantly larger project in total.

The fiscal capacity of contractors must also be considered. For multi-hundred thousand dollar projects, commercial demolition contractors should possess the bonding capacity to undertake such a project. Small deconstruction contractors may not. The traditional demolition contractor would, in this case, assume the prime contract and the deconstruction contractor could participate as a subcontractor.

Surveying the industry and marketplace should help determine what project scope will be appropriate for the location and specific building removal requirements. Performing outreach and assessing market capabilities is discussed below and in Enclosure B.

7. Evaluating Project Schedule.

Sufficient time must be available to remove the building while recovering building materials for reuse. The duration of a deconstruction project can be longer than conventional wrecking. However, the industry is adopting practices that can dramatically decreased deconstruction time.

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Consider pressure on the site. If new construction will not commence or the site will not be otherwise occupied immediately following the building's removal, the project schedule should not inhibit deconstruction. If an exceptionally aggressive building removal schedule is required, the scope of deconstruction can be established to maximize waste diversion within the available time.

It is critical to avoid setting an unnecessarily short building removal milestone or project deadline.

If considered early in the planning process, deconstruction should be able to be accommodated into the project schedule without adverse consequences. Avoid applying a conventional demolition schedule into a deconstruction project as a default without considering the site's utilization and requirements of the installation. It is counterproductive to inhibit material recovery with an unnecessarily short project duration when the site will be unoccupied for the foreseeable future.

8. Evaluating Industry and Market Capabilities.

USACE and DPW personnel should familiarize themselves with the resources and services available that can participate with a demolition contractor and assist the contractor in achieving the project's contract requirements. Traditional demolition contractors typically do not include deconstructing buildings, recovering materials, and marketing used building materials in their business models. Other businesses capable of performing the required services must be available, can operate at the installation, and be willing to participate in the project.

While these services exist throughout the United States, they typically do not participate in governmental projects and are therefore not as visible to USACE and installation offices as traditional contractors. They are typically smaller businesses and are less likely to assume a prime demolition-type contract. They are more likely to serve as subcontractor or service to a traditional demolition or environmental contractor. Such businesses may include the following:

- Deconstruction contractors or demolition contractors who also perform deconstruction services.
- Lumber salvagers many of whom maintain their own deconstruction crews.
- Used building material brokers.
- Used building material resale outlets.
- Deconstruction consultants who perform training or on-site consultation.

In what geographic area these capabilities must be present is extremely variable. This will depend on the quantity and value of materials. Surveying the state in which the installation is located and each neighboring state is recommended. Once USACE and installation personnel

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become familiar with these businesses, the market surveys can contract or expand in geographical coverage as needed.

Consult state, regional, and solid waste agencies to identify services that can potentially contribute to a deconstruction project. While not under the same mandates as USACE and Army installations, their missions are similar to the Army's with regard to solid waste reduction. State directories, exchange services, industry networks, and similar resources and information should prove useful to USACE and installation personnel.

Further guidance for performing outreach activities is provided in Enclosure B.

**ENCLOSURE B
IMPLEMENTING DECONSTRUCTION**

1. Purpose.

This Enclosure provides guidance on implementing a deconstruction approach for removing buildings from Army installations, once US Army Corps of Engineers (USACE) or installation Directorate of Public Works (DPW) personnel have determined deconstruction is feasible.

2. General.

Implementing deconstruction (contracting for deconstruction services) is essentially the same as implementing conventional demolition from the Army's perspective. The project's scope will likely include abatement, utility termination, pavement and foundation removal, site restoration and other conventional demolition tasks. The primary difference is the method employed for the building's removal; dismantling it and recovering materials for reuse instead of wrecking and disposing of debris. Not all materials will be reusable. Recycling and landfill disposal will be required in any case.

Some adjustments in the project's development and execution will be necessary by the Army (both USACE and installation) and the contractor. Do not assume a standard demolition contracting process will achieve the desired results. Direct the project's execution toward recovery and reuse. Cost and schedule are not the only parameters of project success.

This Engineering and Construction Bulletin is directed toward USACE construction and demolition programs. While Operations and Maintenance, Army/Sustainment, Restoration, and Modernization (OMA/SRM) projects are not administered by USACE, this information should also be equally useful to installation DPW personnel.

- Address the following when implementing a deconstruction approach.
- Consider alternative project delivery methods.
- Perform outreach to the industry.
- Consider qualifications in the acquisition process.
- Ensure contract provision will enable a deconstruction approach.
- Ensure technical provisions are consistent with a deconstruction approach.

3. Alternative Project Delivery Methods.

Consider alternatives to conventional competitive bidding where they may better achieve the project's objectives. Paying a fair and reasonable cost for services is always a factor. However, complying with the Army's mandates to reduce construction and demolition (C&D) waste is also required. These are not conflicting objectives; both can be achieved if the project is developed and executed in the appropriate fashion.

a. Competitive Bidding

Competitive bidding is typically the most effective project delivery method for demolition. It is relatively simple and well understood by USACE, DPWs, and the industry. However, this process emphasizes the lowest price for complying with the minimum contract requirements. There is no incentive to the contractor to exceed minimum diversion requirements, even if advantageous to USACE or the installation.

For competitive bidding to be successful, the minimum 60% diversion required by the Army must be explicit. If achieving a higher diversion rate is desired, a higher rate must be specified. If recovering materials for reuse is required, reuse must be specified in an explicit and unambiguous fashion. Avoid unenforceable terms such as "the contractor is encouraged to ..." or "reuse is preferred over recycling ..." Conversely, contract requirements must not be so limiting as to direct the contractor's means, methods, techniques, procedures and sequences. The challenge with competitive bidding is to require reuse as preference to recycling in a definitive and enforceable terms without over-specifying and imposing unreasonable requirements.

Establishing minimum contractor qualifications in the bidding requirements will help ensure the contractor will apply the appropriate skills and resources and execute the project in an efficient and economical fashion. See the discussion of contractor qualifications below.

Requiring the contractor to submit a C&D Waste Management / Waste Reduction Plan provides USACE or installation project personnel an opportunity to review the contractor's diversion and reuse intentions as a prerequisite to issuing a Notice to Proceed (NTP). If the contractor indicates they will utilize the reuse and recycling resources necessary to conform to the contract requirements, approve the plan and enforce it throughout the project. If not, return the plan for improvement.

Requiring a Work Plan to describe deconstruction and material recovery methods should confirm the contractor will approach the project in a logical, competent fashion and is likely to achieve the project's objectives. It may also reveal any features of the process that may suggest unsatisfactory results. The contracting activity must not attempt to direct the contractor's means, methods, and techniques, but can identify to the contractor any issues of concern. This information can be included along with safety, environmental control, and other information typically required in demolition Work Plans,

b. Best Value Source Selection

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Best Value Source Selection can be utilized to acknowledge factors other than lowest initial cost in the contract or task award process. This approach may be applied to an open completion, or contractors competing under a Multiple Award Task Order Contract (MATOC) or similar Indefinite Delivery Indefinite Quantity (IDIQ) task. Factors may include the following:

- Diversion rate beyond minimums; quantities of materials expected to be reused, recycled, and landfilled.
- Contractor qualifications and demonstrated successful project experience.
- Efficiency of the proposed deconstruction and material recovery processes; experience in marketing recovered materials.
- Safety record.
- Price.
- Completion schedule.
- Other performance beneficial to the installation.

The contracting activity must avoid over-specifying or establishing unrealistically high diversion performance. Doing so risks increasing cost to the contractor without a commensurate value, and therefore inflating the proposal price. Rather, the contracting activity solicits proposals. Each offeror is responsible for determining what materials will be recovered and recycled, by what methods, in what quantities, and at what price. In this way, the most efficient and economical process is allowed to emerge, as opposed to dictating one single technical solution. The proposal evaluated to provide the best overall value, not the lowest possible contract cost, is awarded the task or contract. There is an incentive to the offeror to exceeding minimum requirements where advantageous to USACE or the installation.

The solicitation must be consistent in the solicitation criteria (the Request for Proposal, RFP), the required contents of the proposals, and the evaluation factors by which the best value will be determined. Every evaluation factor must be accompanied by corresponding information in the offeror's proposal, which in turn must be based on a contract requirement.

Note that soliciting, developing, and evaluating a Best Value proposal requires greater effort than inviting and opening a bid. Therefore, the scope of the project and opportunity to increase diversion and reuse must be sufficient to justify this effort by both the contracting activity and the offerors.

c. Building Sale to the Public

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Obsolete buildings can be sold to the public as real property through USACE. This approach has proven to be an effective method of removing WWII-era wood framed buildings, former Family Housing units, and pre-engineered metal buildings. Small contractors, individuals, and informal groups such as charitable or community organizations commonly participate in these projects. The sale transaction can be conducted through either a sealed bid or by live auction. The highest bidder is awarded a firm-fixed contract in the amount of their bid. The objective for the Army is to remove buildings, not necessarily to generate income. While the sale price is likely to be modest, it is still preferred to paying for contracted demolition services.

USACE develops the contract documents on behalf of the installation. Contract requirements include scope, minimum diversion requirements, quality control requirements, safety requirements, deadlines or schedule requirements, site access and security measures, work times, use of the site, debris disposal requirements, and other conditions important to the installation. The contractor's compensation is the value of the materials.

Develop the project's scope to be realistic for the type of bidders likely to participate in the sale. This should typically include the building only. Abatement, utilities removal, paving and foundation removal, and site restoration are usually beyond the capabilities of this type of contractor. Thus, selling the buildings is not a no-cost arrangement for the Army. However, the remaining demolition effort and cost will be greatly reduced.

Previous experience has shown it takes several cycles of building sales to generate interest by the local market. However, once this process has been established, building sales have become well received within the community. Outreach and publicizing building sales unity are advised to stimulate participation until the practice becomes routine.

d. Separating the Demolition Task from a Construction or Design-Build Contract

When removing buildings is required for a construction or design-build project, consider separating the demolition task from the larger contract scope. Doing so has been advantageous to USACE and the installation. Building removal becomes the primary task in and of itself. Both the Army and the contractor will devote greater attention to diversion and reuse performance, as this task represents the total contract value, not just one or two percent of a larger contract amount. Issuing an independent contract also allows the buildings to be removed in advance of the awarding the construction or design-build contract, thus enabling the new construction project to commence upon contract award. The acquisition method for an independent building removal contract need not be the same as the larger construction or design-build contract. It can be applied to MILCON projects or IDIQ tasks.

Awarding an independent contract for building removal is an additional contract action, and therefore an additional effort and expense to USACE or the installation. Therefore, the potential to increase the recovery of building material for reuse must be considered.

e. Performance-Based Contracting

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Performance based contracting focuses on results rather than methods. It provides opportunity to offer incentives to contractors for performance above the minimum requirements. Increased diversion rate can be rewarded, as can recovering materials for reuse in lieu of recycling.

Express the objectives for deconstruction and material reuse in the Performance Work Statement and performance evaluation factors. Cite explicit standards, diversion performance metrics, documentation of diversion rates, and similar criteria in the Task Order Performance Work Statement and reference them in the Performance Requirements Summary. Cite the Army's C&D waste reduction and Net Zero Waste directives. Avoid ambiguous statements such as "meets acceptable standards" or "with no regulatory deviation."

Ideally, performance incentives will be monetary, or at least some other tangible benefit to the contractor. Without such an incentive a Performance Work Statement can become a "loose" specification, lacking in detail and of limited enforceability.

f. MATOC and Similar IDIQ Contracts

MATOCs and similar IDIQ contracts provide an effective and convenient instrument for developing and awarding tasks to remove buildings. Initiating and executing a task should not differ fundamentally from a conventional demolition task. However, it is critical to ensure the competing MATOC contractors are qualified in deconstruction and material recovery, in addition to traditional demolition skills. If these skills are not present within the MATOC contractors' organizations, they will have to obtain the necessary capabilities from outside their organizations. While it is the contractor's responsibility to apply the necessary skills to a project, USACE or the DPW can facilitate the introduction of deconstruction and material recovery resources to the MATOC contractors. Further arrangements are the responsibility of the contractors and services. See the discussion of industry / market outreach, below.

If the MATOC task is awarded on a competitive bid basis, ensure Scope of Work articulates Government's requirements precisely and unambiguously. If the task will be awarded on a Best Value basis, ensure the task's requirements, proposal content, and evaluation factors are consistent and directed toward improving diversion and material recovery performance.

Project delivery strategies are discussed further in Public Works Technical Bulletin 200-1-23 Guidance for the Reduction of Demolition Waste through Reuse and Recycling.

4. Industry / Market Outreach

Perform outreach to the industry to stimulate interest and competition in Army deconstruction projects and to ensure the necessary skills are applied to these projects. This is recommended at least until the deconstruction process becomes routine at the installation.

Traditional demolition contractors can deconstruct buildings. However, doing it efficiently and economically requires skills beyond traditional wrecking practices. If the required experience and capabilities are not present in-house, they must be acquired elsewhere. Deconstruction-

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related businesses and services are typically not conversant in public acquisition processes and are not aware of Army demolition projects. They often do not provide full demolition services. Their primary interest and capabilities are in removing a building's contents and superstructure. USACE or the DPW should provide a forum whereby each type of business can collaborate and provide all services required by the Army. The motivation is to supplement, not displace conventional demolition practitioners.

The purpose of performing outreach is to inform the industry of deconstruction project opportunities, inform industry of the Army's preference for materials recovery and reuse, and expand the pool of capable services. Outreach is recommended for both open competition and IDIQ procurements.

Businesses that can potentially participate in Army deconstruction project may include the following:

- Demolition contractors who also engage in deconstruction or building dismantlement.
- Lumber salvagers.
- C&D recyclers.
- Used metal building sales brokers and outlets.
- Used building material retailers.
- Used building material brokers.
- Consultants and trainers.

Sources of information may include the following:

- State and regional solid waste management agencies.
- State and regional trade and professional organizations such as the American Institute of Architects, U.S. Green Building Council, and American Society of Interior Designers chapters and the local and state Homebuilder Associations.
- Directories published by the Construction and Demolition Recycling Association (CDRA), Building Material Reuse Association (BMRA), and National Demolition Association (NDA).
- Internet browsing within the state in which the project is located and neighboring states; search for *deconstruction contractors*, *lumber salvage*, *lumber reuse*, *reclaimed lumber*, *used building materials*, *used metal buildings*, and similar search terms.

Convene workshops to facilitate introductions among deconstruction-related businesses and traditional demolition contractors. These can either be general information sessions not related to a specific project, or project-specific events such as pre-bid or pre-proposals. Consult the Contracting Officer.

During the workshop, describe the Army's policy regarding C&D waste reduction and deconstruction, and how this policy will apply to Army building removal projects. Describe the scope of services required, and the relationship between deconstruction and material recovery tasks and traditional demolition tasks. If the workshop is conducted in the context of a pre-bid or pre-proposal meeting and site visit, describe the building's construction and materials available for recovery. Clarify C&D waste diversion criteria and the preference for reuse. Describe any on-post recycling or reuse opportunities the installation can make available to contractors. Prior to examining the buildings, remove finishes in selected locations to reveal structural materials and details. Most importantly, encourage the traditional demolition contractors to collaborate with the deconstruction, salvage, reuse, and recycling businesses about their participation in the project. Administer inquiries and responses in a similar fashion to any traditional construction or demolition project.

5. Contractor Qualifications

The importance of engaging contractors with the necessary deconstruction and material recovery skills cannot be overemphasized. Contractor qualifications specific to deconstruction should include the following.

- Demonstrated capabilities and experience with deconstructing buildings. Such qualifications may include length of time in the business, numbers and types of projects, successful collaborations among other demolition- and deconstruction-related businesses, client referrals, and other similar factors.
- Demonstrated successful experience with buildings of similar construction type and scope to the subject buildings.
- Resources available to perform the required Work.
- Qualifications of site supervisory personnel.
- Demonstrated capabilities in material management and logistics.
- Knowledge of the recovered material markets, values, and reuse infrastructure, including structural and architectural materials and building contents.

Required deconstruction/salvage services may be in-house within the contractor's organization, or may be subcontracted, a partnership, or other similar affiliations.

6. Contract Provisions

Some contract provisions for conventional demolition projects may inadvertently discourage participation in a deconstruction project or inhibit deconstruction processes to some degree. In consultation with the Contracting Officer, adapt contract provisions to facilitate deconstruction to the extent possible.

a. Bidding Requirements and Contract Clauses

Pre-Bid or Pre-Proposal Meetings: Schedule these meetings to allow sufficient time for prospective bidders or offerors sufficient time to estimate recoverable materials quantities and values quantities and incorporate this data into their bids or price proposals.

Available Information: Where possible, make available to bidders or proposers information on the building's construction and materials that would be available for recovery and reuse. The original construction documents (such as the Mobilization Drawings for WWII-era buildings should suffice, although inclusion of any major as-built features will also be helpful. Any other existing conditions that may affect deconstruction and material recovery must also be described. Bidders or offerors must be given the opportunity at the pre- bid or –proposal meetings to assess conditions such as presence of lead-based paint, damage or deterioration, and similar conditions that will affect material recovery yield, marketability, and value.

Representations and Certifications, Bidders Qualifications: When contracting for a building removal services ensure contractor qualifications and experience are addressed in the Bidder Qualifications provisions, as discussed above.

Wage Rates: Avoid applying unnecessarily high wage rates. Where demolition is not part of a new construction project, or new construction will not be performed on the site immediately following the building's removal, Davis-Bacon wages may not apply. Apply Service Contract Act wage rates wherever possible.

Avoid unnecessarily restrictive requirements for building sales. Accommodate volunteer labor or labor in exchange for value of materials. Traditional contractor licensing requirements may preclude non-traditional organizations from buying and deconstructing buildings. Instead, verify non-traditional contractors are capable of performing the Work by requiring work plans, safety management plans, and other pre-deconstruction submittals. Traditional bonding & insurance requirements may discourage non-traditional contractors from participating. Alternative financial security for USACE or the installation can be implemented through deposits, contract termination, debarment from future projects, and similar disincentives for unsatisfactory performance.

b. General Contract Requirements (or similar content)

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Summary of Work: Ensure the scope of the project is described completely and accurately. Emphasize the deconstruction and reuse elements of the project and objective to observe Net Zero Waste mandates to reduce waste beyond the minimum diversion criteria.

Access to the Site: Processing and handling recovered materials may require a larger area than simple wrecking. Define the jobsite boundaries to allow sufficient working space. This requirement would be comparable to providing a lay-down or staging area for a construction project.

Utility Service Connections: Ensure the availability or unavailability of water, sanitary, and electrical services are clearly stated in the contract document. It may be advantageous to allow electrical service to building, or parts of the building, to remain active during deconstruction. If so, ensure safety plans address electrical safety within the building. This may also affect the sequencing and certification of utility termination.

Project Meetings, Progress Documentation: Ensure project meeting requirements include discussions of material recovery and diversion performance. Ensure meetings are scheduled frequently enough to identify issues of concern about diversion and to enable adjustment of demolition and deconstruction activities if necessary.

Submittal Procedures: Ensure submittal requirements include a Construction and Demolition Waste Management Plan (or Waste Reduction Plan), Work Plan, and Safety Plan for review and approval prior to issuing a Notice to Proceed with the building removal activities.

Special Procedures, Owner Safety Requirements: If USACE construction safety standards will be applied in lieu of OSHA Construction Safety Standards, ensure these are available to the contractor, especially deconstruction contractors who may be unfamiliar with them. Attention must be paid to maintaining structural stability if personnel will be present in the building during deconstruction

Quality Requirements, Material Handling: It is the contractor's responsibility to remove materials and components from the building and site, and their best interest to preserve their value. However, USACE (or installation) also has an interest to minimize waste due to damage or theft. While it is not appropriate to specify how the contractor must protect materials, the contractor should be required to protect materials to avoid unnecessary waste which would lower the diversion rate.

Temporary Facilities: Ensure the responsibility for providing temporary facilities is clearly stated in the contract document. Describe any facilities (storage, office, hardstand, and similar) the installation could make available for the contractor's use contractor during the Work. Ensure requirements are included that facilities are returned in the condition in which they were found prior to the contractor's use.

Product Storage and Handling Requirements, Hazardous Materials: Hazardous materials should be removed from buildings prior to demolition or deconstruction commencing. Ensure

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responsibility for abatement is clearly stated in the contract document. Ensure requirements are included to govern the discovery and removal of undetected hazardous materials as the Work is being performed.

Examination and Preparation, Acceptance of Conditions: The presence of materials observed during the pre-bid or –proposal site visit is more sensitive for a deconstruction project than a conventional wrecking project. Bidders or offerors incorporate salvage value into their bid development. Rather than pilfered items being less material to dispose of, in a deconstruction context pilfered items reduce value. Require contractor to accept the site in the condition as of site visit, and then protect the site until it is turned over to the contractor.

Execution, Bracing and Anchoring: Structural stability is especially critical in a deconstruction scenario where work-persons may be in the building as it is being deconstructed. Ensure requirements for maintaining structural stability throughout deconstruction process are included.

Cleaning and Waste Management, Progress Cleaning: Similar to conventional demolition; police sites, require the contractor to maintain a clean worksite and prevent litter and nuisances to adjacent sites.

Construction and Demolition Waste Management: UFGS 01 74 19 Construction and Demolition Waste Management can serve as a model for the project specification. Add a reference to the ASA-IE&E Sustainable Design and Development Policy Update, December 16, 2013. The Government Policy paragraph includes a minimum diversion rate. Clarify that deconstruction and material recovery is required, not simply suggested or encouraged. Describe any reuse or recycling outlets available for the contractor on-post. Include a requirement to monitor and record diversion performance on an ongoing basis, and to submit a final diversion performance result. Refer to C&D diversion data submitted for LEED certification and submitted through the DPW Environmental Division to the SWARWeb system, and provide reporting details in the project close-out specification.

Preliminary and Final Closeout Reviews: Requirements for preliminary and final site inspections and acceptance processes should be similar to a conventional demolition project. Ensure a deadline or time period is included to vacate and remove all materials from the site.

Close-out submittals: Critical to ensure all final C&D waste diversion documentation is delivered to the USACE Project Engineer in a SWARWeb-compatible format.

7. Technical Specifications

Technical specifications for a deconstruction project should be similar to conventional demolition specifications. These are typically found in the Division 02 Existing Conditions of a construction-type contract document.

Existing Materials Assessment: The installation may include inventory of salvageable and reusable materials in the specification to assist bidders or offerors in developing reasonable bids

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or price proposals. Note this is for contractor's information only and the contractor must verify the accuracy of this assessment.

Hazardous Material Assessment: The occupational safety standards, either OSHA or USACE require protection from construction personnel where lead is present, which include removing buildings and materials with lead-based paint. Note that the presence of lead-based paint does not constitute a hazard in and of itself. It will be prudent to advise others of the presence of lead-based paint. In a building sale scenario include a requirement to disclose the presence of lead-based paint to bidders in the specifications. In any building removing scenario, include a requirement to disclose the presence of lead based paint to subsequent buyers and users of any lead-based painted materials.

The deconstruction specification may be modeled after UFGS 02 41 00 [Demolition] [and] [Deconstruction]. This specification is essentially a demolition specification, but can be edited to address issues critical to deconstruction and building material recovery. It addresses full demolition as well partial demolition, which can be applicable to building repurposing or conversion projects. Ensure this specification is consistent with UFGS 01 74 19 Construction and Demolition Waste Management.

Deconstruction specifications, however, must not direct the contractor as to means, methods, techniques, sequences or procedures of the building removal tasks. While ambiguity should be avoided in the general case, enough flexibility must be allowed to avoid forcing the contractor into an unrealistic or overly costly set of tasks. Identifying what materials and components, in what quantities, and by what methods they will be recovered for reuse must be avoided.

The following revisions to UFGS 02 41 00 [Demolition] [and] [Deconstruction] are recommended.

a. Part 1 General

02 41 00 [Demolition] [and] [Deconstruction] currently does not include definitions. Add definitions as follows:

Deconstruction: The disassembly of a building with the explicit intent of recovering building materials for reuse in a safe and economical manner.

Demolition (or Wrecking): The removal of a building in the quickest and least expensive manner possible, typically by crushing the building into debris.

Recycling: The conversion of a material into a feedstock to be used in the manufacture of another product.

Reuse: The subsequent use of a material, product, or component in generally the same manner as the original use, allowing for cleaning, repair, and/or repurposing.

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Recovery (or Salvage): Removal of materials, products, or components from a building with the explicit intent of maintaining the materials' integrity, functionality, and value.

Waste: Materials for which no other purpose is practical and the only possible disposition is landfill disposal.

Project Description: Add objectives for deconstruction and material reuse emphasis, underlying Army policy.

Demolition/Deconstruction Plan: Add an element to this plan to identify how the recovered materials will be transferred to the market or other reuse purposes.

General Requirements: This provision includes the term "salvage of identified items." Clarify that this refers to items identified by the installation to be salvaged for the installation. This would be applicable in a partial demolition scenario for a repurposing or conversion project. The contractor is free to identify items they will recover (salvage) for their own purposes.

Submittals: Add the C&D Waste Management (or Waste Reduction) Plan if it is not previously required in Division 01.

Quality Assurance: If not previously included in Division 01, add the requirement for a contractor to protect recovered materials to preserve their value and prevent additional waste. See above.

Protection of Personnel: This requirement is especially critical where personnel may be inside a building while deconstruction activities are taking place. Add a statement to this affect.

Existing Conditions: Add a statement requiring the contractor to verify all building materials and contents present at the pre-bid or –proposal site visit are in place upon the commencement of deconstruction Work. Require anything of value that is missing to be reported in the survey.

b. Part 2 Products - not used in this specification.

c. Part 3 Execution

Existing Facilities to be Removed: Clarify the requirement to separate, set aside, and prepare, store, or deliver materials refers to materials to be removed and retained by the installation. Removal, handling and disposition of recovered materials retained by the contractor are the contractor's responsibility.

Structures: Paragraphs b., c., and d. describe specific demolition methods and sequences. Indicate that alternative methods are allowable, if described in the Deconstruction Plan and approved by the Contracting Officer.

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Disconnecting Existing Utilities: Ensure this provision is consistent with requirements for terminating utilities provided in Division 01, specifically if electrical service may remain active while deconstruction is taking place. Include requirements for circuit lock-outs and tags, receptacle and fixture labeling, and other electrical safety precautions. See above.

Title to Materials: If not previously included in Division 01, indicate that the value of recovered and recycled materials not otherwise retained by the installation accrues to the contractor.

Reuse of Salvaged Items: This requirement refers to materials and equipment intended to be removed and reinstalled in the same building. This is not applicable to a full deconstruction project, but can be applicable to a building repurposing or conversion project. Clarify to which scenario this provision applies.

ENCLOSURE C
SOLID WASTE ANNUAL REPORTING, WEB-BASED (SWARWeb) SUPPORT

1. Purpose.

This Enclosure describes the contents of the Construction & Demolition (C&D) Debris category within the Army's Solid Waste Annual Reporting, Web-based (SWARWeb) system. The Project Manager shall record and report the diversion and disposal of C&D materials to the designated Installation Point of Contact for data entry to SWARWeb as required in Army Regulation (AR) 420-1, Army Facilities Management, Section 23-15.a, according to the format below. This Installation Point of Contact is typically in the DPW Environmental Division, Solid Waste Management.

Note that the information required by SWARWeb is not identical to the minimum information required for LEED Construction and Demolition Waste Credit submittals. SWARWeb requests greater detail than is required for LEED. Therefore, recording only what is required by LEED will not necessarily satisfy the SWARWeb requirement. However, the SWARWeb data can be utilized in any LEED Construction and Demolition Waste Credit submittals, as a description of the materials diverted from landfill disposal, and the total weight as the numerator in the LEED diversion rate calculation.

2. General.

For each disposal (landfill) transaction, report:

- The time and date
- Name and location of the disposal site
- Weight of waste (and indicate if actual scale measurement or an estimate)
- Unit cost of disposal, e.g., \$/ton or \$/CY.

For each type of C&D debris material diverted, report the following data elements:

- Date Occurred: The date the materials were delivered to a reuse, recycling, or disposal facility. List each delivery separately.
- Category: "C&D Debris" for all materials
- Type: List material by each type from the list below.
- Info Source: Note either "Weight Actual" or "Weight Estimated."

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- Tons: Self explanatory.
- DRMO: Note “Yes,” if the material was delivered to DRMO, “No” if it was delivered elsewhere.

For Type, list all materials that were generated through the construction and/or demolition activities of a project broken down as follows:

ABC-ASPHALT
ABC-BRICK
ABC-CONCRETE
ABC-CONCRETE BLOCK UNIT
ABC-OTHER (C&D MASONRY/ASPHALT)
ABC-STONE
ASPHALT
BRICK
C&D REFUSE
CARPET
CONCRETE
CONCRETE & MASONRY
CONCRETE STONE ASPHALT
CONCRETE/STONE
CONSTRUCTION RUBBLE
COVER SOIL
CRUSHED CONCRETE
DEBRIS
DIRT
GRAVEL
LAND-CRUSHED STONE/BASE
LAND-OTHER (C/D LAND CLEARING)
LAND-SOIL, LEAD-TAINTED, NON-HAZARDOUS
LAND-SOIL, PETROLEUM-TAINTED
LAND-SOIL, SUBSOIL
LAND-SOIL, TOP
LAND-VEGETATION/TIMBER (TREE TRUNKS & LIMBS)
METAL
METAL-ALUMINUM
METAL-COPPER
METAL-MIXED METAL
METAL-OTHER (C/D METAL)
METAL-STEEL
MIXED C&D (ALL TYPES)
MIXED METAL
MIXED RECYCABLES
OD/I/M-CEILING TILE

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OD/I/M-COMPOSITION ROOF

OD/I/M-DOORS/WINDOWS/STAIRS/CABINETS

OD/I/M-GLASS

OD/I/M-GYPSUM/PLASTER

OD/I/M-INSULATION

OD/I/M-OTHER (C/D OTHER)

OD/I/M-PAPER

OD/I/M-PLASTIC

OD/I/M-SIDING

RECYCLED C&D DEBRIS

TELEPHONE POLE

WOOD-OTHER (C/D WOOD)

WOOD-STRUCTURAL