REDUCING WASTE FROM MILITARY FACILITY PROGRAMS ... 
SHED THOSE UGLY TONS

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Reducing Waste from Military Facility Programs...Shed Those Ugly Tons

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A Context

- **Response to a Mission**
  - Upgrade capabilities & mission performance
  - Improve quality of life for soldiers & their families
  - Remove & replace obsolete infrastructure

- **Debris is a byproduct of other mission-related activities**
A Problem

- Over 600 million tons of C&D materials are generated in the US annually
  - 62% of Army solid waste reported FY2010
  - Costly in first and life cycle costs
  - Consumes land
  - Creates environmental stressors
A Problem

• The vast majority of environmental stressors occur during materials manufacturing*

*L Athena Sustainable Materials Institute, Environmental Impact Estimator
<http://www.athenasmi.org/>
Sustainability Drivers

- Executive Orders
- Laws & statutes
- Federal MOU, Guiding Principles for HPSB
- DoD policy
- Army policy
- Industry (USGBC & others)
- USACE guidance
Sustainability Drivers

- Net Zero Waste
  - Assistant Secretary of the Army for Installations, Energy and Environment
  - “… disposal being non-existent”
  - “A true cradle-to-cradle strategy considers the end state a the time the purchase decision is made”
Net Zero Program

- Fort Detrick, MD
- Fort Hood, TX
- Fort Hunter Liggett, CA
- Fort Polk, LA
- Joint Base Lewis-McChord, WA
- U.S. Army Garrison Grafenwoehr, Germany.
- Fort Bliss and Carson (energy, water, waste)

“A net zero waste installation is an installation that reduces, reuses, and recovers waste streams, converting them to resource values with zero landfill over the course of a year.”
Sustainability Drivers

• In a building context
Resources

- Whole Building Design Guide / Construction Criteria Base
Resources

- Federal UFC / UFGS
  - UFC 1-900-01 Selection of Methods for the Reduction, Reuse and Recycling of Demolition Waste
  - UFGS 01 62 35 Recycled/Recovered Materials
  - UFGS 01 74 19 Construction and Demolition Waste Management*
  - UFGS 02 41 00 Demolition and Deconstruction*

* SEE GREEN VERSION
Resources

• Removing buildings
  – PWTB 200-1-45 Deconstruction of WWII-Era Wood Framed Buildings
  – PWTB 200-1-48 Opportunities for Reducing Construction and Demolition Waste from Residential Communities Initiative (RCI) Programs
  – PWTB 200-1-73 Reuse of Materials from Modular Relocatable Facilities
Resources

• Recycling building materials
  – *PWTB 200-1-17, Recycling Interior Finish Materials - Carpet and Ceiling Tiles*
  – *PWTB 200-1-24, Quantifying Waste Generated From Building Remodeling*
  – *PWTB 200-1-26 Market Valuation of Demolition Salvage Materials*
  – *PWTB 200-1-27 Reuse of Concrete Materials From Building Demolition*
  – *PWTB 200-1-44 Recycling Exterior Materials*
Resources

- **USACE FRP Best Practices Toolbox**
  - *Interactive Instructional Guide (Under “CERL Library”)*
Resources

• Whole Building Design Guide
  – Construction Waste Management Resource Page
    – http://www.wbdg.org/resources/cwmgmt.php
  – Construction Waste Management Database
Resources

- Associated General Contractors of America
  - Recycling Toolkit [www.agc.org/cs/recycling_toolkit](http://www.agc.org/cs/recycling_toolkit)
Resources

- **Find C&D materials recyclers & reuse stores**
  - Building Materials Reuse Association: [www.bmra.org/directory](http://www.bmra.org/directory)
  - Construction Materials Recycling Association: [www.cdrecycling.org/find.html](http://www.cdrecycling.org/find.html)
  - Habitat for Humanity ReStores: [www.habitat.org/restores/](http://www.habitat.org/restores/)
  - Contact your state: [http://www.cicacenter.org/solidregs.html](http://www.cicacenter.org/solidregs.html)
  - Carpet: [www.carpetrecovery.org](http://www.carpetrecovery.org)
  - Online marketplaces:
    - [www.planetreuse.com](http://www.planetreuse.com)
    - [www.americanbuildersurplus.com](http://www.americanbuildersurplus.com)
Examples

We’re “Deconstructing” This Building To Reuse and Recycle Its Materials!

A Sustainable Project From Your Directorate of Public Works
Demolition & Recycling

• Building 501, Tencza Terrace, Fort Myer, VA
  – Facility Reduction Program, contracted by USACE
  – Contractor initiated recycling for cost savings
  – Salvaged & recycled prior to demolition
  – Imploded building & recycled rubble as aggregate
  – Total debris diversion: 91%
  – Contractor saved approx. $1.1 Million
Deconstruction & Reuse

• Barracks, Fort Lewis WA
  – Demolition separated from Design/Build contract
  – USACE specified minimum 50% diversion, w/ contract options for diversion up to 75%
  – Environmental contractor & deconstruction subcontractor
  – “Hybrid” techniques; panelization, tipping
  – Total diversion: 95% for 52 buildings:
  – Cost & duration similar to conventional
  – (earlier demonstration at Fort McClellan, AL)
Recycle Rights Sale

• GP Warehouses, Fort Gordon
  – Sold “recycle rights” through QRP
  – Extensive outreach was performed
  – Auctioned 4 warehouse bays for $4,300
  – Deconstructors retrieved an estimated of $50,000-worth (retail value) of lumber each bay
  – Total diversion: 80%
  – Total cost: 60% of conventional demolition cost
  – (similar experience at Fort McCoy, WI, and Fort Knox, KY)
Rebuild / Reconfigure

D-Area Barracks Upgrade, Phase II

Fort Bragg, N. C.

Construction Supervised by
South Atlantic Division
US Army Corps of Engineers

Architect:
ECIP Associates Ltd.
Charleston, SC

Contractor:
Construction Inc.
Greenville, SC

Contract No. DACA 21-99-C-0041

16. 3. 2001
New Construction

- MILCON new construction; LEED policy
Lessons Learned

• C&D materials diversion is now common in the building industry
  – Army experience has been positive (72% C&D diversion reported Army-wide) although somewhat inconsistent
  – High rates of construction waste diversion are being achieved in the USACE MILCON program
  – There should be no reluctance to incorporate diversion requirements into project requirements in most cases

• Small projects (or in remote locations) may be an exception
Lessons Learned

• Cost & schedule impacts associated with C&D materials diversion can be accommodated if addressed early in project planning
  – C&D waste management is typically a very small cost factor in a construction or design/build project
  – Adding a diversion requirement after budget & schedule are established is sub-optimal
  – Imposing a diversion requirement post-contract makes more enemies than friends
    – (construction guys vs. environmental guys)

• Artificial schedule constraints reduce opportunities for materials recovery
Lessons Learned

• “Free” tipping at on-post landfills isn’t free
  – Building debris consumes finite landfill capacity that will not be replaced
  – Landfill operations cost the installation
  – Long term monitoring costs the installation
  – Charging for tipping* will encourage contractors to increase diversion

Lessons Learned

• Project personnel must familiarize themselves with the resources available in the region and exploit them to the greatest extent possible
  – Reusable & recyclable materials from buildings
  – Available services & material markets
  – Value of building materials
  – See “Resources” above

• Installations may need to perform outreach to ensure all necessary services are aware and can participate in building removal projects

• Especially as we push the Net Zero envelope
Lessons Learned

- Project personnel should collaborate with their Contracting Office to develop the project delivery strategy best able to accomplish both project & C&D diversion requirements
  - Competitive bidding may not yield the best overall performance (price AND diversion)
  - Best value solicitation, negotiated IDIQ task, performance based contracting and other alternative strategies may achieve better overall cost and diversion performance

- Separating demolition from construction or design/build contracts has worked well
Lessons Learned

• Including a 50% minimum C&D diversion requirement into project specifications or contract language does not, in and of itself, guarantee that performance will be achieved
  – A C&D Waste Management Plan must be required, diligently developed and diligently applied throughout the project (just like other required plans)
  – Contractor must include C&D diversion performance in their QC activities
  – Government must include C&D diversion performance as part of their QA system
  – Off-site C&D recycling facilities must be monitored
  – Government must enforce diversion criteria
Lessons Learned (an editorial)

- C&D waste reduction Policy; letter or spirit?
  - 50% demolition diversion criterion is typically met by virtue of concrete & metal recycling
  - Concrete is heavy, metals are valuable
  - Wood and other reusable materials and products are often dismissed as having no value; recycled as hog fuel or landfilled

A Liability … or a Resource?
Challenges

Inertia

_Noun._ The ability of a body to resist a change in its state of motion
Conclusions

- **Shift the Paradigm**
  - Remove … instead of demolish
  - Resource … instead of debris
  - Incentive … instead of path of least resistance

- **Acknowledge other economic factors**
  - Cost avoidance, esp. gov’t landfill
  - Value of recovered materials
  - Full cost / Life Cycle Cost impacts
Conclusions

• Accommodate Schedules
  - Plan ahead, incorporate diversion criteria up front
  - Evaluate alternative building removal strategies

• Take advantage of the marketplace
  - Research industry capabilities & practices
  - Evaluate “non-traditional” sources of services
  - Identify marketable materials
  - Know costs & values

• Adjust business practices
  - Plan
  - Incorporate contract & specification provisions
  - “Mainstream” the practice
Conclusions

One architect who wanted to sort and recycle construction waste met resistance from the construction workers. He motivated the crew in a time-honored fashion - with beer. On Fridays, he showed up with a case of beer. If the recyclables had been sorted, the carpenters got the beer; if not, they didn't. After the first time the architect left without giving the construction crew the beer, the recyclables were sorted every time.

-From "A Primer on Sustainable Building" Rocky Mountain Institute
Questions / Comments?

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