# AF Case Studies in "Green" Specification Writing

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## OVERVIEW

For many years the Air Force measure of success in delivering facilities has been: Did we build something that meets mission requirements within the established schedule and budget? Using these criteria, we've done a good job of providing buildings that meet our operational needs. Air Force project managers should not abandon these measures of quality, but need to broaden them to include new concepts. Today, a successful project should also conserve resources, avoid environmental degradation, and promote a healthy workplace. "Sustainable" is the term which is often used to describe projects which accomplish these goals. The "AF Environmentally Responsible Facilities Guide", now available on AFCEE's website, was written to help project teams create sustainable projects.

Executive Order (EO) 12873, Federal Acquisition, Recycling, and Waste Prevention, introduces the concept of environmentally preferable purchasing. Section 201 defines "environmentally preferable" as "products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service."

Section 401 of the EO states: "In developing plans, drawings, work statements, specifications, or other product descriptions, agencies shall consider the following factors: elimination of virgin material requirements; use of recovered materials; reuse of product; life cycle cost; recyclability; use of environmentally preferable products; waste prevention (including toxicity reduction or elimination); and ultimate disposal, as appropriate. These factors should be considered in acquisition planning for all procurements and in the evaluation and award of contracts, as appropriate." These EO requirements apply not only to newly written specifications, but also to the existing specification sections that we've used for years and continue to copy into new projects.

Setting goals to move projects toward sustainability is important, but is only the first step. Specifications are the key to getting these goals translated into specific actions that can be implemented in the finished project. If it isn't in the specs, it isn't going to get built.

This paper will walk through the specification writing process, beginning with a look at things you should consider in project planning. It will go on to describe some useful tools, and conclude with an overview of two Air Force construction projects that include sustainability in their specifications.

## THINGS TO CONSIDER BEFORE YOU START

Sustainable design and construction are extremely broad topics. Answering three questions before you start writing the specs will help you focus your efforts:

⇨ What environmental requirements apply to the project?

⇨ What additional sustainability goals does the project owner have?
⇨ What is your implementation strategy: to develop comprehensive in-house sustainable project expertise, or depend totally on the design and construction firms, or land somewhere in the middle?

Consider Environmental Requirements: Project teams should already be familiar with environmental "compliance" requirements – the things we MUST do, like preparing environmental assessments or environmental impact statements, managing hazardous materials and waste, complying with toxic substance laws, and getting permits for air emissions and water discharges. Sustainability goes beyond these compliance requirements to prevent environmental and health impacts before they happen.

One way to conserve resources is to use products that are manufactured with recycled material content. EPA writes the "Comprehensive Procurement Guidelines" (CPG) to identify products that are commercially available with recycled content, therefore they are known as "Guideline Items." There are currently 36 Guideline Items. The items likely to be purchased for use in construction and landscaping projects include:

- Insulation
- Cement & concrete containing fly ash or ground granulated blast furnace slag
- Structural fiberboard
- Laminated paperboard
- Hydraulic mulch
- Compost
- Plastic fencing
- Playground surfaces
- Running tracks
- Carpet
- Floor tiles
- Patio blocks
- Shower and restroom dividers
- Latex paint
- Garden and soaker hoses
- Lawn and garden edging
- Plastic fencing used in controlling snow or sand drifting and as a warning/safety barrier in construction

Whenever EPA Guideline Items are used in a project, the specifications must clearly state our preference for products meeting EPA's minimum standards for recycled material content as stated in the CPG. To meet the intent of EO 12873, this preference should be extended beyond the Guideline Item requirements to make use of other recycled-content products as appropriate. "Preference" means that project teams will choose to specify, purchase and install recycled-content products whenever they meet reasonable performance, price and availability requirements. When adapting previously written specs for use in a new project, watch out for and delete all language that calls for the use of "new, prime material" or otherwise precludes the use of recovered materials.

"Buy-recycled" or "affirmative procurement" requirements are explained in detail in the Air Force "Guide to Buying Recycled". You can download this Guide and its Appendices from AFCEE at www.afcee.brooks.af.mil/EQ/ap-guide.htm.

The Federal Acquisition Regulation (FAR) Part 36.601-3 addresses EO 12873 requirements as follows:

- Statements of Work for Architectural-Engineer (A-E) services shall require the designer to specify use of the maximum practical amount of recovered materials (consistent with performance, availability and price reasonableness).
- The A-E shall also consider energy conservation, pollution prevention, and waste reduction in the specifications.

Consider Sustainability Goals: Installations and higher headquarters may have already defined a set of general sustainability goals for all projects, and users may set additional goals for individual projects. Early in the design process, the facility owner and designer should meet and agree on the sustainability goals for the project. These need to be acted upon throughout design and construction. Examples of goals from previous Air Force projects include:

- Preserving natural and cultural resources
- Creating facilities with healthful indoor air quality
- Conserving energy and water
- Managing, reusing and recycling Construction and Demolition (C&D) wastes

Consider Implementation Strategy: It's best to "think the execution through" for the entire design and construction process before you specify products and practices, so the team will be prepared for all required actions during bidding and construction.

*How much effort do you want to put into specification writing?* "Effort" in this case means the level of detail you put into the specs. There is a full spectrum of possibilities, ranging from writing general statements of preference for recycled materials and sustainable initiatives (and leaving it to the construction contractor to propose products and ideas you will have to review later), to doing detailed product research at the start of design (and writing specific requirements into each affected specification section.) In other words, where do you want to place your learning curve – at the beginning, while you are writing specs, or at the end, when you are confronted with questions from bidders or constructors?

*What submittals will you require from the construction contractor, and who will review and approve the submittals?* To understand the specs written by the A-E, and to effectively review building material submittals and proposed substitutions later on in the process, the project engineers and architects may need educational support. The "AF Environmentally Responsible Facilities Guide" is designed to be a resource for the design team. Ideally, a pollution prevention expert from the base environmental flight should help at all stages – acting as a consultant to define requirements, propose project goals, recommend "green" products or sources of information to identify these products, and review the specifications. The first project is the hardest and takes the most time. It gets much easier with the ones that follow.

*What training will your construction inspectors need?* Education is also needed for the Quality Assurance Evaluators (QAEs, or inspectors) who will monitor the project. In addition to their usual activities, they need to watch for construction practices that cause unnecessary environmental damage or otherwise fail to meet the sustainability requirements in the specs.

## TOOLS FOR MAKING DESIGN DECISIONS

Before writing specs for the project you will need to make a lot of design decisions at the system level. For example, will it be a steel framed, wood framed or concrete structure? These are very general decisions. Specific product decisions will follow later. Try to tie the design decisions you make at this stage back to the environmental goals that were made at the start of project planning. For example:

- If maximizing the use of recycled content building materials is one of your goals, consider using steel framing (available with high percentages of recycled steel) and crushing demolished concrete slabs for reuse as aggregate in the new construction.

- If conserving energy is a goal, look at insulated concrete form construction or other specialized construction methods.
- If natural resource conservation is a goal, consider timber framing using sustainably harvested timber, and engineered joists that minimize the use of forest products.

Suggested tools for making system-level design decisions include:

**American Institute of Architects (AIA) Environmental Resource Guide.** Provides information on the environmental performance of different building materials. It is available through a subscription service and is updated periodically. AIA members can call 1-800-365-2724 to order at discounted rate. Ordering information is also found at www.aia.org.

**Sustainable Building Technical Manual.** Published in 1996 by Public Technology, Inc. with support from US Green Building Council, Dept. of Energy, and EPA. This manual has sections covering Economics and Environment; Pre-Design Issues; Site Issues; Building Design; Construction Process; O&M; and Issues and Trends. It provides a lot of detailed technical information in ways both engineers and environmental managers can understand, and is useful to both groups. The manual is free for downloading from www.sustainable.doe.gov (choose the "Toolkit" and look under "Green Buildings").

Once the basic design decisions have been made, it's time to locate and specify environmentally preferable building materials. Suggested tools for identifying products and manufacturers include:

**EPA report, "Construction Products Containing Recovered Materials", and EPA Fact Sheet, "1997 Buy-Recycled Series - Construction Products"** - www.epa.gov/epaoswer/non-hw/procure.htm

**National Park Service "Sustainable Design and Construction Database"** - free, but old (1995 data) – download the database from www.nps.gov/dsc/dsgncnstr

There are many other tools for environmentally preferable product selection. Most of them are available free of charge or for a nominal fee. For more links and leads, visit the DOE Center of Excellence for Sustainable Development's website at the address above, or the City of Austin, TX Greenbuilder Program's website at www.greenbuilder.com/general/BuildingSources.html.

TOOLS TO HELP WITH WRITING THE SPECIFICATIONS

Now that you've made your design decisions and identified products, it's time to start writing the specs (or editing previously used specs). Two suggested tools include:

**GreenSpec: Guideline Specifications for Environmentally Considered Building Materials and Construction Methods.** Available for $15 from Alameda County (CA) Recycling Hotline, (510) 639-2498. GreenSpec is a template that includes electronic specification sections and a user's manual. It includes model language for each of CSI divisions 1 through 16 to "cut and paste" into your specs. GreenSpec also includes a lot of general background information that helps to explain the environmental concerns associated with different building materials and specification sections.

**WasteSpec: Model Waste Specification for Construction Waste Reduction, Reuse and Recycling.** Available for $28 from Triangle J Council of Governments - information and an order form are found at www.state.nc.us/TJCOG/solidwst.htm#morespec. WasteSpec is a tool that's very much like GreenSpec except this one focuses on construction waste reduction techniques, material reuse and recycling. It also

includes model language for CSI divisions 1-16. The authors have also done a series of case studies from projects that used WasteSpec. In no case did it cost the owner money to reuse and recycle construction and demolition materials, even where the local landfill disposal ("tipping") fees were as low as $17/ton!

## AIR FORCE SUSTAINABLE CONSTRUCTION PROJECTS

AFCEE believes that by observing and participating in sustainable projects, and developing case study information for crossfeed Air Force-wide, we can make it easier for other project teams to begin to include sustainability actions in their own projects.

Information about these projects is being placed on AFCEE's web page along with the AF Environmentally Responsible Facilities Guide. The Web page is a work in progress, so please bear with us as we develop it. The Design and Construction Directorate (AFCEE/DC)'s Design Group Division, and the Environmental Quality Directorate (AFCEE/EQ) are teaming on this effort. The Guide is linked to both directorate's pages, but as of the date this paper is submitted for publication, information on specification writing and case studies is only accessible through EQ's page. This is an interim fix. We're working on expanding and crosslinking the information. For now, please visit www.afcee.brooks.af.mil/eq/eqform.htm and look for the Sustainable Development link.

You may download the "Sample Specifications for AF Sustainable Construction Projects" document from EQ's page. This is not a complete set of specs – instead, it's a set of excerpts compiled from current projects. "GreenSpec" and "WasteSpec" already provide generic specification templates. Rather than duplicating them, this document is intended to show how these tools may be applied to AF projects.

Two of the case studies we're currently following are described in this paper:

### Seymour Johnson AFB, NC (Air Combat Command): F-15 Squadron Operations Facility

HQ ACC selected this FY 97 MILCON project as the command's pilot sustainable construction project. Project goals emphasize construction and demolition (C&D) resource recycling, use of recycled-content building materials, and healthful indoor air quality.

With rare exceptions, the Corps of Engineers acts as the design agent for all AF MILCON projects. Savannah District is the design agent for this project and is responsible for managing the A-E contract. HQ ACC hired an architect with expertise in sustainability to act as a consultant to the project team. He took an active role in developing and reviewing the specs.

The project team spent a lot of time "up front" developing detailed sustainability language in the specs, starting with a 16-page "Sustainability" section and adding pertinent details throughout the other sections. A very ambitious goal of 75% recycling and reuse of C&D "wastes" was implemented by specifying a requirement for the construction contractor to prepare a Waste Management Plan and use a spreadsheet to track the disposition and costs for all C&D resources. You can download a copy of this spreadsheet from AFCEE/EQ's website along with the "Sample Specifications" document described above.

The Squad Ops Facility is currently under construction. The team's efforts to write complete and clear specifications have paid off, with no unusual construction problems or cost increases attributed to sustainability. Even so, the project's sustainability consultant believes improvement would be possible if

a more cohesive approach to spec writing were taken, or if standard "sustainable" guide specifications were developed. Generally, different spec sections are written by a variety of experts (landscape architects, interior designers, mechanical engineers to name a few), with the product being a document several inches thick. We also tend to copy specification sections from past projects for new project specs. The specs go "out for review" to all the experts, who look at their areas of concern, but the document is seldom read and edited as a whole.

Vandenberg AFB, CA: Construct Military Family Housing (Air Force Space Command) - 108 units

Vandenberg AFB is on the Central California coast in an environmentally aware and sensitive area. As a result the base already had established goals for natural resource preservation and restoration, energy and water conservation, and air quality. Adding to these, the list of sustainability goals for this project now includes reducing the solid waste disposed during demolition, construction and operations, and increasing the use of recycled-content building materials.

The Air Force acts as its own design agent for Military Family Housing projects, so the Corps is not involved. AFCEE/DC manages this project for AF Space Command. The AFCEE engineering project manager asked an AFCEE/EQ pollution prevention specialist to act as an environmental consultant. With HQ AFSPC's concurrence, we partnered with the Base design team to set sustainability goals. The AFCEE and Base design team and the A-E design firm then signed a formal Charter committing us to promote sustainability in this project and future Housing construction projects at Vandenberg. The Goals and Charter are available for download from the EQ website along with other documents developed during design of this project.

AFCEE made a lot of suggestions for products and practices to try. Some were welcomed by the base architects, and some weren't. They had the final say – it's their project, and they will have to live with it. The A-E firm was not selected with sustainable design experience in mind, and some personnel were hesitant at first to try new things. We had to convince them we were serious, and then they began to bring good ideas of their own to the project.

The completed Vandenberg specs require the construction contractor to prepare plans for management of non-hazardous waste; hazardous waste management and disposal; emergency response and spill prevention; and storm water pollution prevention. A new Section 01505, Construction Waste Management, was written using "WasteSpec" as a template. "GreenSpec" was also used. Energy efficient systems, products that minimize emissions of volatile organic compounds (VOCs), and recycled-content products are called out in affected divisions. We specified a requirement for the contractor to save, crush, and re-use "waste" concrete from the demolition of existing roads and slabs as aggregate in the new construction. The added design costs due to sustainability were minimal – the A-E estimated an extra 60 hours were spent on "greening" the design, and also stated it would not take as long to do it a second time. Project construction has not yet begun.

SUMMARY

To meet Executive Order requirements, all Federal project managers need to review and revise construction specifications to include recycled-content materials and other environmentally preferable products and practices. Preparing detailed specs requires up-front education and effort, but prevents confusion and costly mistakes when construction actually starts. The A-E must do the work, but the customer should set goals and be informed enough to make sound design decisions. The A-E is a resource; pick one that's experienced, but also keep watch to make sure your goals are being met.

Finally, follow through during construction and don't allow product substitutions to dilute the environmental benefits called out in the specifications.