ID Credit 1.2: Innovation in Design

Specific Title  Occupant & Public Education

Intent
To provide design teams and projects the opportunity to be awarded points for exceptional performance above requirements set by the LEED Green Buildings System and/or innovative and performance in Green Building categories not specifically addressed by the LEED Green Building Rating System.

Requirements
In writing using the LEED Credit Equivalence process, identify the intent of the proposed innovation credit, the proposed requirement for compliance, the proposed submittals to demonstrate compliance, and the design approach used to meet the required elements. (1 point)

Submittals
- Provide a narrative and supporting documents (e.g., drawings, specifications, cut sheets) for EACH innovative measure incorporated into the project. Include information that demonstrates the sustainable benefits of each measure.

Narrative
Please refer to the attached description of the intent, requirements, submittals and design approach.

Supporting Documents
- Certification Letter from SNRE regarding implementation schedule
- Drawings signage
- Specifications
- Cut Sheets
- MSDS Sheets
- Other sample website pages, occupant handbook, self-guided tour information

Prepared by Tina Roach, Quinn Evans Architects
Lara Nelson, SNRE

Date 3 June 2004
30 April 2004

MEMORANDUM

From: Carl Elefante, AIA
Tina Roach

To: LEED Program
US Green Building Council

RE: Dana Building Renovation
LEED Project no. 0326

Subject: Innovation in Design Credit 1.2
Occurrent & Public Education Program

Intent:
To provide ACTIVE public education focusing on green building strategies and solutions.

Requirements:
The 9/24/2001 ID Credit Ruling establishes that two of the following three elements must be included in an educational program.

1) A comprehensive signage program built into the building’s spaces to educate the occupants and visitors of the benefits of green buildings. This program may include windows to view energy-saving mechanical equipment or signs to call attention to water-conserving landscape features.
2) The development of a manual, guideline or case study to inform the design of other buildings based on the successes of this project. This manual will be made available to the USGBC for sharing with other projects.
3) An educational outreach program or guided tour could be developed to focus on sustainable living, using the project as an example.

Later rulings establish that the educational programs must be actively instructional and websites are identified as potential educational elements.

Supporting Documents:
- Certification Letter from the School of Natural Resources & Environment (SNRE)
- Prints from “Greening of Dana” Website
- Signage program documentation (sign description and plan locations; sample designs; to be installed by fall 2004)
- Self-guided tour (draft; final copy by fall 2004)
- Occupant Handbook (draft; final copy by fall 2004)

Design Approach:
The Dana Building, as home to the University of Michigan’s School of Natural Resources & Environment (SNRE), services multiple audiences. The SNRE faculty, staff and student population are the most direct audience and they are also being trained to further sustainable development as they move beyond their
The building is located on the Diag, the central quadrangle of the University of Michigan. This central location presents opportunities to educate both the wider University and Ann Arbor public. Through internationally available resources, like the SNRE website, SNRE is providing educational resources to an even broader audience.

SNRE has developed educational tools for each of the various audiences. During construction, the SNRE website included a prominent link to a “Greening of Dana” component. This will continue to be a permanent part of the School’s homepage; it is currently accessed via “The Dana Building” link. The website outlines the guiding design philosophies, approaches to construction and demolition, as well as specific conservation technologies and sustainable building materials used at Dana. Perhaps one of the most useful components of the website is the “Beyond Dana” section, which points browsers to other University of Michigan initiatives, as well as greening links in Ann Arbor, the State of Michigan and nationally. The website is http://www.snre.umich.edu/greendana/ Sample pages are attached to this memorandum.

SNRE has developed a comprehensive signage program to help educate occupants and visitors to the building understand how buildings can been renovated in a more sustainable way. The signage program includes signage in the two main entrance stairways, adjacent to each of the composting toilet rooms, and in the stairwells at the upper levels. Draft signage schedule, text, plan locations, and graphic designs are enclosed.

For those individuals seeking more information, SNRE has prepared a self-guided tour. It will be available on the website, but also as a “brochure” which will be included in a pocket near the primary educational signs.

SNRE has developed an Occupant Handbook that provides detailed information for the building permanent occupants – the faculty and staff. SNRE plans on including it on their website, as a .pdf file that will have a linkable index. SNRE will also have some printed copies available for visitors and will point out the site to incoming faculty and staff as part of their orientation program. A draft copy of the Handbook is included in the submission.

As certified in the enclosed letter from SNRE, the signage, tour program, and occupant handbook will be in place for the fall semester 2004.

END OF MEMORANDUM

Prints from “Greening of Dana” Website, dated 28 March 2004.
Draft Signage program documentation, n.d.
May 26, 2004

LEED Program
US Green Building Council

Re: ST Dana Building LEED Project #0326
Radiant Cooling System Innovation Credit

Dear Sir or Madam:

This memo is to certify that the implementation date for the Occupant and Public Education Programs in the School of Natural Resources and Environment (SNRE) is scheduled for the beginning of the fall 2004 semester (September 1, 2004). It is likely that the program components will be in place prior to that time, but in no event will be later.

Included in the Occupant and Public Education Program are:

- Educational Signage throughout the Dana Building
- Occupant Handbook available via SNRE webpage and included in new faculty and staff orientation programs
- Self-Guided Tour available via display panel and on SNRE website

Draft versions of the three components of the program are attached.

Sincerely,

Rosina Bierbaum, Dean
Professor of Natural Resources and Environmental Policy
School of Natural Resources and Environment
University of Michigan

Cc: Draft Educational Signs
    Education Sign Placement
    Draft Occupant Handbook
    Draft Self Guided Tour
Dana Building

The School of Natural Resources and Environment is located in the Samuel T. Dana Building on the northeast corner of the University of Michigan diag on central campus. Prior to SNRE's residence in the building, it was used for nearly 60 years as a medical training facility. In 1961, the West Medical Building was renamed in honor of SNRE's first dean, Samuel Trask Dana, and SNRE - then the School of Natural Resources -- moved in.

The Dana Building recently underwent a major renovation. Its hundred-year-old infrastructure was upgraded and both classroom and office spaces were added. All facets of the renovation were performed with a sharp eye towards environmental responsibility. Everything from scrap disposal to finishing materials demonstrated cutting-edge environmental -- or "Green" -- practices.

In addition to classrooms and offices, the Dana Building contains several special student spaces. A Campus Computing Site is on the second floor with 26 general use computer stations. A student commons, currently under renovation, occupies the main floor covered courtyard. The commons is a favorite place for students to study, sleep or hang out between classes. Other academic facilities include an aquatics lab, a terrestrial ecosystems lab for soil analysis, an environmental spatial analysis lab, and three landscape architecture studios. The Dana Building also houses the Program in the Environment, an undergraduate interdisciplinary partnership with the College of Literature, Science, and the Arts.

Several environmental research centers are based in the Dana Building. The Center for Sustainable Systems weds engineering and environmental analysis to improve industrial processes for societal needs. The Environmental Justice Program addresses inequities arising from environmental, social and political decision making. The Ecosystem Management Initiative promotes sustainable natural resource management through research and outreach. The Erb...
Environmental Management Institute studies the environmental intersection of business, government and non-profit organizations and collaborates with students in the joint M.S. (SNRE) / M.B.A. program.
The "Greening of Dana" was a $25 million dollar renovation that resulted in a building that makes a statement - a building where environmental principles are not only taught, but upheld and demonstrated to the community. The project promoted sustainability, reduced negative health impacts and now the building serves as a laboratory and educational center for ecological themes. The renovated S.T. Dana Building balances two critical facets: the building is a comfortable place to learn and work, and it simultaneously demonstrates state-of-the-art environmentally conscious design. This building teaches environmental sensitivity, respect and awareness through its design and resource management. It demonstrates the potential effectiveness of these principles, and how transferable they are to other building situations.

**Purpose**

The purpose of the renovation was to add much-needed office and classroom space to the building. As soon as the planning began, it became very clear that the building required a total renovation and maintenance that had been deferred over its one hundred-year lifetime. Mechanical, electrical and plumbing upgrades were included in the agenda.

**Philosophy**

The philosophy behind "building green" is based in sound environmental research and with an eye to the future well-being of the planet and its inhabitants. Our "green" building plans addressed both the construction processes as well as the lifetime performance of the building. Construction and demolition debris comprises 25-50% of the waste stream destined for the landfills. In 1996, the U.S. Environmental Protection Agency estimated that construction and demolition practices generated approximately 136 million tons of waste. Building performance (in terms of conventionally-generated energy and water consumption) is traditionally very lightly regulated in the United States. Conventional electrical generation relies heavily on fossil fuel-based resources (petroleum and coal). Since fossil fuels and water are both finite resources, it behooves us to conserve these resources and look into alternatives.

**Goals of the Greening of Dana Project**

- Energy conservation and efficiency
- Use of renewable energy (photovoltaics)
- Increased daylight use
- Improved indoor air quality
- Water conservation
- Inclusion of operation costs in selecting mechanical equipment

http://www.snre.umich.edu/greendana/planning/index.html
- Material efficiency, increased recycled content/recycleability of building materials
- Life-cycle-based evaluation of environmental impacts
- Maximum reuse and recycling of components and materials from demolition

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University of Michigan
ST Dana Building Renovation
LEED Project #0326
ID credit 1.2: Occupant & Public Education

http://www.snre.umich.edu/greendana/planning/index.html
SELF-GUIDED “GREENING OF DANA” TOUR
SCHOOL OF NATURAL RESOURCES & ENVIRONMENT

A few things to keep in mind as you take the tour of the Dana Building:

1) There are two stairwells in the building – east and west, and the tour references these frequently. You are standing next to the east stairwell right now.

2) The building has four floors above ground level, and a ground floor (the basement). You are on the first floor, and this tour will take you up to the second and third floors, and back to the first floor. Though it is not included in the tour, please feel free to check out the ground floor if you wish – there are labs and offices down there.

3) Please be sensitive to faculty, staff and students working in the building. If there is a class or meeting in session, peek in the window and go on to the next tour stop.

4) Please do not go up to the fourth floor of the building – this space is currently occupied by another University department, and the doors are locked.

5) For many of the finishes and technologies pointed out on this tour, there is more information available on the “Greening of Dana” website: http://www.snre.umich.edu/greendana/

Let’s begin the tour…

1) Begin with classroom 1024 in front of you.
   Look into one of the classrooms in this area (1006, 1024, 1028) and notice some of the environmentally friendly finishes:
   - the tan tackboard in 1006 and 1028 is an all-natural linseed-based material
   - 100% wool carpet is all-natural and has no toxic “carpet smell”
   - all of the wood (oak) used in the renovation is from sustainably managed forests, certified by Scientific Certification Systems
   - in rooms 1024 and 1028, the overhead panels in the front of the room are a biocomposite material, comprised of soy resin and recycled newsprint

Also in these classrooms, take note of some new features of the building:

Overhead, there are big white metal panels on the ceiling. These are the radiant cooling system – a network of copper pipes circulates cool water behind the panels. Radiant cooling is a highly efficient way to cool a building; the pump that moves the water through the pipes consumes about 10% of the energy required for fans to blow cool air into the same size space.

The exterior walls of the building are covered in dry wall, while some of the interior walls are brick. The entire building underwent an “envelope upgrade”. The exterior walls of the building were insulated and sealed to help prevent heat loss in the winter and heat gain in the summer. The windows on the exterior walls were all repaired so that they do not have any leaks.
The chalkboards and whiteboards in most rooms were salvaged from the old building and re-installed after the renovation was complete, to cut down on material resource use.

2) Walk down the corridor toward room 1040. The ceiling tiles overhead are made from pressed aspen fibers, and the ceiling panel running down the center of the corridor is another biocomposite material, made from wheat stubble.

An energy-saving feature that you might not notice is the choice of LED (light-emitting diode) exit signs throughout the building. LEDs are energy efficient (especially when compared to incandescent bulbs) and require little maintenance.

3) Go into Ford Commons (1315) to your right.
Here you can get a sense of the “infill” concept applied in the Dana Building renovation – the SNRE community decided to “build in and up”, allowing us to expand our facilities and classroom space without expanding our building footprint. This area in the center of the building used to be a courtyard. During the renovation, we added a fourth floor to the building and filled in this courtyard. These additions together added approximately 20,000 ft² of much-needed office and classroom space to the building.

The columns in this commons area are covered with bamboo plywood -- bamboo is a rapidly renewable resource. On the far side of the commons, you can see where a few former windows were filled in with bricks – many materials, including bricks, were salvaged during the demolition phases and re-used during the construction and renovation. These windows used to look out on the courtyard, but we didn’t want windows in the restrooms, so we filled the openings with salvaged brick!

The rooms on the perimeter of the commons are the mailroom and the vending room – the floor in both of these rooms is all-natural linoleum. The cabinets are made from biocomposite panels manufactured from sunflower seed hulls and wheat stubble.

Exit the commons through the same door that you entered (to the left of the glass display cases) and check to see if there is a class in session in the auditorium (1040). If there is not a class, then go into this room; if there is a class, then go back into the commons and exit at the other end (near the blue lockers) and turn left into the foyer. [skip to (5) if not going into the auditorium]

4) If you go into the auditorium, take a look at the seats – they are upholstered with fabric made from recycled soda bottles! The acoustic panels on the walls are also upholstered with fabric made completely from recycled plastic. The tan-colored tackboard at the front of the room is an all-natural linseed-based material. The oak doors and frames are milled from certified sustainably grown and harvested
lumber. The dark green panels overhead are a biocomposite material made from soy resin and recycled newsprint.

When you are finished in this room, exit on the far side and continue to the foyer.

5) West entrance foyer. The flooring under your feet is made from 100% recycled rubber – the black is from tires and the white is post-industrial waste!

6) Go up the West stairs to the second floor. Consider this… if you were a part of the SNRE community prior to the renovation and expansion, then you will remember that the Dana Building looked (in terms of spaces and rooms) fairly similar to what it looks like today. While some walls were moved and the infill is obviously new, much of the existing structure was maintained. The most environmentally-sensitive features of the building are not the paints or carpet – they are the things you can’t see: the entire building had a mechanical and electrical overhaul, and more energy- and water-efficient systems were installed. These systems will save resources over the lifetime of the building.

7) On the second floor, go left (the Dean’s and Administrative Offices should be in front of you). Notice the biocomposite panels overhead… Continue around the corridor. Go into the campus computing site on your left. Go to the far end (by the printers) and go out on the infill balcony to take a good look at the infill, and note the natural light that filters into the interior spaces by way of this “lightwell”. Here, if you look up, you can also see the new fourth floor (above the old brick wall). All of the windows on the old brick wall were replaced during the renovation; the old windows were still functional, so Recycle Ann Arbor (a local non-profit organization devoted to recycling and “green” building) took the old windows to sell in their Re-Use Center, diverting over 3,000 pounds of material from the landfill!

8) Go back out to the corridor and continue along toward the east stairs. Stop to peek into the Dean’s conference room (2026) – the pine table and ceiling fixture were milled from 100-year-old Southern Yellow pine beams salvaged from the old attic of the building at the beginning of the renovation.

9) Continue to the east stairwell. If you’d like to see the opposite corridor (mostly offices and a few classrooms), feel free – just come back to this stairwell to continue the tour.

10) Go up the East stairs to the third floor. Turn right (the Center for Sustainable Systems is in front of you).

Note: you can find more information on the Center for Sustainable Systems and other research initiatives within SNRE on the SNRE website: http://www.snre.umich.edu/
11) Continue down the corridor. The landscape architecture studios are on your left; very little changed in these studios during the renovation, as they were renovated recently. The studios did get new paint, carpet, and cooling panels, and the floors were refinished.

12) On the other side if the corridor, the “infill” side, you will find the Environmental Spatial Analysis (ESA) computer lab (rooms 3315 and 3325), where students work with Geographic Information Systems (GIS) to conduct research and do classwork.

13) As you walk down the corridor, take note of the fabric covering the bulletin boards – it’s made from recycled plastic bottles.

14) Go through the west stairwell and walk around the other corridor on the third floor. Check out some of the classrooms in this corridor and look for some of the “green” finishes already mentioned on the tour: the tackboard, biocomposite panels, carpet, upholstery fabric and linoleum.

15) The restrooms are on your right. Take a look into either the men’s room or the women’s room (you choose!). The tiles on the floor and walls are made mostly from recycled glass. The plastic partitions and countertops are made from 100% recycled #2 plastic (that’s heavy plastic bottles, like shampoo and laundry detergent). The toilets and water faucets are low-flow fixtures, and the men’s rooms are outfitted with waterless urinals, all of which contribute to water conservation within the building.

16) In between the men’s room and the women’s room (on the first, second and third floors), you will find a composting toilet – try it out! Composting toilets are a very environmentally sound choice because they don’t use any water.

17) Continue down the corridor to the east stairwell. Descend two flights of stairs to the building entrance – now you are back where you started (you picked up this tour guide just to the side of the foyer.) We hope that you enjoyed this tour and that maybe you will see buildings and construction in a new light, and maybe you will consider renovating your home or office with some of these environmentally sensitive goals – energy conservation, water conservation, material resource conservation and indoor environmental quality – in mind.
The Greening of Dana

A Handbook for Occupants of the Renovated S.T. Dana Building

2003
How to Use This Handbook

The aim of this book is to help occupants of the newly renovated S.T. Dana Building to make choices that make the most of the building’s environmental features and technologies. In addition, there is information on actions to be taken and choices to be made at work, at school or at home, that will contribute to a healthier environment. Each chapter of this handbook includes, at the end, a section entitled, “What Can I Do?” This section is intended to provide tips to building occupants about environmentally sensitive choices that they can make every day. There is also information in this section to point occupants toward more in-depth sources of information, should they desire to delve more deeply into these topics.

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I. History of the Dana Building and Its Renovation

A Brief History of the S.T. Dana Building

In 1901, construction began on the West Medical Building. The building was occupied by the Medical School in 1903, the same year that the University of Michigan established the Department of Forestry within the College of Literature, Science and the Arts. The new medical building cost $167,000 to construct. The Department of Forestry was housed at the time in the Kraus Natural Science building on the Diag.

While the Department of Forestry evolved into the nation’s first School of Forestry and Conservation (1927) and then the School of Natural Resources (1950) and finally the School of Natural Resources and Environment (1992), the West Medical Building became home to the School of Natural Resources 1961 and was renamed the Samuel Trask Dana building in 1973 in honor of the former dean of the School of Forestry and Conservation. When SNR moved into the building in 1961, there were significant renovations (costing approximately $925,700), and over the course of the last forty years, the building has been renovated in a piecemeal fashion according to need and funding. In 1997, the University and the School determined that a major renovation was needed. The renovation was planned with the following three goals: ensuring that the building met local and state codes and University regulations, increasing office and classroom space, and increasing the comfort and health of the building’s occupants.

The New Construction and Renovation

Once it was decided that the school would undergo a renovation, the SNRE community suggested that the renovation should be a “green” renovation – in keeping with the School’s mission “to contribute to the protection of the earth’s resources and the achievement of a sustainable society.” The components of this green renovation would include material resource conservation, energy conservation and water conservation. And so it was decided that the renovation of the S.T. Dana Building would be a model of environmental sensitivity, both during the construction and demolition phases, and in the completed building itself.
II. Introduction to Green Building

Buildings have a huge effect on our environment—construction and operation of residential, commercial and institutional buildings require enormous amounts of energy, water and materials and generate large quantities of waste. The location and physical orientation of buildings can affect the environment as well—buildings and their foundations create heat islands, affect water drainage patterns, and change sedimentation and run-off flows. The materials and chemicals used in construction and maintenance can alter the surrounding natural environment as well, depending on their use and disposal.

Because of the countless impacts that buildings impose on the natural environment over the course of a building’s lifetime, people have been investigating and developing more environmentally sensitive methods of building construction, renovation, maintenance and demolition. These practices are often referred to, generically, as “green building techniques.”

The environmental agenda for the renovation and new construction at the S.T. Dana Building incorporated the following four principles into the project: energy conservation, water conservation, indoor environmental quality, and material resource conservation. While these principles are part of the design of the completed building, they were also a critical component of the demolition and construction phases of the project.

What Can I Do?

• Thinking of building or renovating a home or office building? Consider making it a green project and employing some of the design and management principles outlined above. For more information, see the following websites:
  ~The Greening of Dana website
  http://www.snre.umich.edu/greendana/
  ~US Green Building Council
  http://www.usgbc.org/
  ~Oikos.com has a searchable database of green products and a newsletter.
  www.oikos.com
  ~Environmental Building News
  http://www.buildinggreen.com/
What Can I Do? (cont.)

- Visit green buildings in Southeast Michigan:
  - Recycle Ann Arbor’s En-House
    http://www.recycleannarbor.org/eh/enhouse.html
  - Urban Options house in E. Lansing
    http://www.urbanoptions.org/house/uohouse.htm
  - The Upland Hills Ecological Awareness Center, Oxford, MI
    http://www.uheac.org/default.html
  - Leslie Science Center Michigan Nature House, Ann Arbor, MI

III. Occupants in a Green Building

Occupant behavior is one of the biggest factors contributing to the net environmental impact of a building. A recent study estimates that in a residential home, the operating costs of the home over a 30-year period will equal the purchase price plus financing of the home.5

Building occupants can choose to recycle, prevent waste, conserve energy and water and educate others. In many cases, occupants must operate appliances and equipment correctly in order to capitalize on the efficiency features. In the Dana Building, for example, the highly energy efficient air conditioning system will work most effectively if occupants keep the humidity levels low in the building (e.g. no open windows or propped doors).

The construction phase is just a small part of the life of a building. Installing energy- and water-efficient materials and systems is one step toward decreasing the resource consumption associated with a building, but the most important step follows with ensuring that occupants operate and maintain those materials and systems so that they can achieve their full potential and continue to perform to the efficiency standards for which they were selected.
IV. Energy Conservation

Electricity

The newly renovated Dana building is a showcase of energy conservation technologies and opportunities. Some of the most significant energy-conservation features, though, are not very visible. The entire building envelope was upgraded during the renovation, meaning that all external walls were insulated with fiberglass insulation and covered with drywall. Prior to the renovation, all exterior walls of the building were comprised of sixteen inches of brick; now drywall covers several inches of insulation on the interior of all of these walls. This envelope upgrade will contribute to energy savings because the building will not “breathe” as much as it did prior to the renovation. The walls will not feel cold in winter, and the rooms will not feel drafty.

The windows throughout the building were removed, repaired and replaced so that all windows are operable. This eliminates air infiltration around windows and will allow occupants a greater level of control over their individual spaces, and contribute significantly to occupant comfort.

The light fixtures throughout the building have fluorescent lamps, which are more energy efficient and longer-lasting than incandescent bulbs. The lights in offices, classrooms and restrooms are connected to motion sensors to ensure that the lights do not remain on when a space is not occupied.

All of the new exit signs in the building are lit with light emitting diodes (LED) rather than incandescent bulbs; LEDs are incredibly energy efficient and require little maintenance. For comparison, the incandescent bulbs in a conventional exit sign consume 40 watts of energy and need to be replaced every eight months on average, but LED lights consume less than 5 watts and have a lifetime of 25 years! While this might not seem like a significant feature of the building, consider the following: there are 150 to 200 million exit signs in the United States, and if all of them operated with LEDs instead of incandescent bulbs, we would save over 30 billion kilowatt-hours of electricity every year (equivalent to the output of five large nuclear plants)!

The new space in the building – the “infill” in the center of the building where the courtyard used to be – is covered by a skylight to allow natural light to penetrate into the interior of the building. A solar photovoltaic (PV) system on the roof of the Dana Building generates an estimated 46,000 kilowatt-hours per year.

The University of Michigan is an Energy Star® partner with the US Environmental Protection Agency (EPA). As a partner, the University has committed to a program of increased performance in energy efficiency and education of staff and the public about Energy Star achievements.
What Can I Do?

• You’ve heard this before: Turn off lights when you leave a room! It actually makes a difference.

• Find out more about the University’s Energy Star® programs: http://www.plantops.umich.edu/utilities/energy_management/EnergyStar/

• For more information on lighting and energy-efficient lighting technology:
  - EPA site on lighting http://yosemite1.epa.gov/estar/consumers.nsf/lighting.htm
  - International Association for Energy Efficient Lighting http://www.iaeel.org/index.html

• Update your home to be more energy efficient. The EPA has a software tool that will calculate your energy savings and the related savings in money and pollutants. http://www.epa.gov/seahome/energy.html

• Purchase Energy Star® rated appliances for your home or office. http://www.energystar.gov/

• Don’t use a halogen torchière lamp in your office or lab. Instead, use a compact fluorescent fixture (they use 70 percent less energy and are safer)\(^9\)

• Replace incandescent or halogen bulbs with compact fluorescent lamps – even though they are more expensive to purchase, you will save money on your energy bills!

• Turn off your computer and monitor when you are finished for the day. Be sure to turn off speakers, printers and accessories as well.

• Turn off your monitor when you leave the room, even if only for a few minutes – monitors can use up to 80% of the energy consumed by your computer!\(^10\)

• Set the power management functions on your computer. Change the functions until you achieve the right balance between performance and energy savings.\(^11\) Screen savers do not save energy – sometimes they actually increase energy usage!

• Turn off all office lights at night.

• Use task lighting if it works for you (a lamp focused on your desk rather than overhead lighting) – be sure to use a task light with a compact fluorescent bulb.

• Use daylight if possible.
Heating and Cooling
One of the most significant energy loads within a building is the heating, ventilation and air conditioning (HVAC) system. The technology, maintenance and control of the system can all contribute to energy savings.

The Dana Building has all new mechanical and ventilation systems.

Heating
The Dana Building is heated in the same way that most University buildings are heated – with steam from the Central Power Plant. The Central Power Plant is a cogeneration facility, meaning that steam for heating and cooling is generated by the combustion of fuel (natural gas in the University’s case), and excess steam (which is sometimes a by-product of boilers) is captured and used to generate electricity. The steam for heating and cooling is run through a complex of tunnels underneath the campus and distributed to the buildings. The “co” in cogeneration, then, describes the generation of both electricity and steam, both of which are useful products.

Cogeneration facilities fuelled by natural gas are extremely efficient, especially when compared to conventional power plants which do not use the captured steam for electricity generation.

Cooling
The Dana Building has a new and extremely energy efficient radiant cooling system (as opposed to a conventional forced air system). The panels mounted on the ceilings of offices, classrooms and labs (except on the fourth floor), conceal a network of copper pipes. Chilled water runs through the copper pipes and “radiates” cool air to the surrounding space. The water pump for this system requires 10% of the energy required for fans in a forced air system.

Did you know that the renovated Dana Building is expected to use 30% less energy than a baseline building with similar systems and functions? Not bad for 100 years old!
What can I do?

- Exercise careful control over your thermostat. In the winter, try to keep it near 70 degrees. In the summer, 69 or 70 degrees is optimal. The thermostats allow temperatures to be controlled between 68 and 72 degrees.
- Learn more about radiant cooling systems: http://www.sterlingheat.com/html/radheatcool.html
- Learn more about co-generation at the University of Michigan:
  For more information on the Central Power Plant (including photos, information on equipment and yearly production data), check the Utilities and Plant Engineering website: http://www.plantops.umich.edu/utilities/CentralPowerPlant/
- If you open the windows in your office or classroom in the summer, the air conditioning will be less efficient in your space. If you decide that you would rather have the windows open than the air conditioning on, please close the door to your space so that you do not affect the temperature of the rest of the building. Do not prop building doors open – if the door has a closer on it, then it must be closed for the building system to operate efficiently.
- More tips for energy saving strategies at home and at work at http://www.energyhawk.com/
- In the extreme heat of summer, close blinds to eliminate the heat gain from direct sunlight. In winter, close blinds when you leave your space at night to cut down on heat loss.

Infrared photo showing the cool ceiling panels.
V. Water Conservation

The Dana Building has several water conserving features. The fixtures in all restrooms are low-flow, so they use significantly lower volumes of water than conventional fixtures (new toilets can use less than one third of the water that old toilets required.)\textsuperscript{13} The faucets are also low-flow, and the sensors on the faucets ensure that the water isn’t left running in the sink.

The men’s restrooms have waterless urinals, which (obviously!) require no water (except for cleaning).

\begin{center}
\textbf{Commercial buildings and facilities use over 9.5 billion gallons of water per day. (Homes use an estimated 26 billion gallons of water per day!)}\textsuperscript{14}
\end{center}

The building now has three unisex restrooms with composting toilets – on the first, second and third floors between the men’s restroom and the women’s restroom. Composting toilets are not just “indoor outhouses.” Composting toilets are clean, natural and odor-free. There is no water used to transport the waste, and the waste goes into a storage tank in the basement of the building in which a complex microbial breakdown process occurs (the composting phase). The chute of the toilet has a highly engineered ventilation system to ensure that odors do not get trapped in the building. The storage tank and contents require careful management and monitoring to make sure that the breakdown process is occurring. Eventually the material in the storage tank decomposes into a non-toxic compost that is designated for use as a fertilizer around campus. The benefits of composting toilets are many: no water consumption or pollution, no waste transportation requirements, and beneficial end products. Over the course of about six years, a given volume of waste in the storage tank can decompose to about 2% of its original volume!\textsuperscript{15}

Diagram showing the toilets, storage tank and ventilation system.
The landscaping around the Dana Building requires no irrigation system. To the east of the building is the Native Garden, which was originally planted in 1994 and replanted in 2004 by the SNRE community after the renovation was complete. Appropriate landscaping can be a big contributor to water savings, since a huge amount of the water that we “consume” per person per day in the United States (a total of 150 gallons)\textsuperscript{16} goes to watering our lawns and gardens (between 20 and 50\%).\textsuperscript{17}

**What Can I Do?**

- The Huron River Watershed Council’s website has info and tips for water conservation, plus information on the Huron River
  http://comnet.org/hrwc/
- Don’t throw items into the composting toilets! No food, garbage, plastic bottles, batteries, keys, pens, etc – you get the picture. The system only works with human waste products. Want more information on composting toilets? http://www.clivusmultrum.com/
- Visit the website of the American Water Works Association: http://www.awwa.org/waterwiser/
- Find out more about landscaping with native plants:

![Map of the Huron River watershed](image)
VI. Material Resource Conservation

During the demolition and construction phases of the project, the Greening of Dana project aggressively attempted to divert waste materials from the landfill. We recycled a range of demolished materials and construction scrap, including glass, porcelain, carpet, brick, concrete, plywood and dimensional lumber, cardboard and scrap metal.

A number of the finishes in the building are resource efficient in that they either have a high content of rapidly renewable materials or a high content of recycled materials. Some examples of the renewable content materials include: linoleum flooring, wool carpet, bamboo floors and column covers and cork tile flooring. Some examples of materials with a high recycled content are: recycled rubber flooring, recycled glass tile in the restrooms, recycled plastic partitions and countertops in the restrooms. A number of materials were salvaged and re-used in the building throughout the course of the renovation, including brick, furniture, pine timbers, hardware, doors and casework.

What Can I Do?

- Know your local recycling options so that you can take advantage of them!
  Reduce, reuse, recycle and buy recycled!
  ~Recycling at the University of Michigan
  http://www.recycle.umich.edu/grounds/recycle/
  ~Recycle Ann Arbor
  http://www.recycleannarbor.org/
  ~City of Ann Arbor Department of Solid Waste – lots of info on recycling in Ann Arbor
  http://www.ci.ann-arbor.mi.us/SolidWaste/index.html
  ~Michigan Recycling Coalition
  http://www.michiganrecycles.org/
  ~ReDO is a national non-profit organization dedicated to promoting material reuse
  http://www.redo.org/
What Can I Do? (cont.)

- Print double-sided if your printer allows it. Alternatively (or additionally if you’re so inclined!) many printers have an option to print “multiple pages per sheet”.

Don’t know how to print double-sided or multiple sheets per page? Try this:
When you click “Print” and the print window comes up, click on “Properties”. In the “Properties” window, select the tab for “Layout”. Then you can select long-edge or short-edge duplex printing (depending on the orientation of your page), and/or use the “Pages Per Sheet” option. If you’re still having trouble, contact the IT staff.

- Learn more about the green finishes in the Dana Building:
  http://www.snre.umich.edu/greendana/green_materials/recycled.html

- If you are considering or are in the midst of construction, demolition or renovation, divert as much material as possible from the landfill:
  ~Construction site waste management
  ~Construction Materials Recycling Association
  http://www.cdrecycling.org/

- Learn more about environmentally preferable building materials and finishes from the Building for Environmental and Economic Sustainability (BEES) database:
VII. Commuting
If you live in Ann Arbor or nearby, consider commuting by bicycle:
http://www.getdowntown.org/biking.html

Get Downtown: Commuting Opportunities in Ann Arbor
http://www.getdowntown.org/index.html

Environmental Defense’s Tailpipe Tally – find out how much your car pollutes
http://www.environmentaldefense.org/tool_pop.cfm?tool=tailpipe

IX. Want even more information?
• About green building and construction:
  Lawrence Berkeley National Laboratory’s Environmental Energy Technology
  Division’s website holds a wealth of information on building technologies, energy
  analysis and indoor environments
  http://eetd.lbl.gov/

• About energy usage in the United States:
  Energy Information Administration has all the facts about energy use in the US
  http://www.eia.doe.gov/

• About environmental stewardship at the University of Michigan:
  http://www.umich.edu/~urel/stewardship/

• About Ann Arbor environmental initiatives and green things to do in Ann Arbor:
  This list is by no means comprehensive – just a place to get started…
  ~The Ecology Center
  http://www.ecocenter.org/
  ~Recycle Ann Arbor
  http://www.recycleannarbor.org/
  ~Sierra Club, Huron Valley Chapter
  http://www.mirror.org/groups/mi-enviro/

• About the Greening of Dana renovation:
  http://www.snre.umich.edu/greendana/

Be green!
Notes

1 Bentley Historical Library website: http://www.umich.edu/~bhl/bhl/BentleyMap/HTML/Text/DanaBldg.intro.html
and from interviews.

2 The University of Michigan: an Encyclopedic Survey, Wilfred B. Shaw editor, 1942, Ann Arbor, MI, p 56.
http://www.hti.umich.edu/cgi/t/text/text-idx?type=simple;c=umsurvey;cc=umsurvey;sid=felba52ad30fafeb270bdd7a845f1890;rgn=div3;q1=west%20medical%20building;view=text;subview=detail;sort=occur;idno=AAS3302.0006.001;node=AAS3302.0006.001%3A2.5.3

3 For the complete mission statement, see the SNRE website:
http://www.snre.umich.edu/about-snre/mission-statement.html


5 Website of Affordable Sustainability Technical Assistance (Operated by the National Center for Appropriate Technology): http://www.homeasta.org/ 15 May 2003.


11 For more information on power management on PCs, check the following website:
User Guide to Power Management in PCs and Monitors published by Lawrence Berkeley Labs

12 In reality, the cold ceiling is absorbing the heat from the surrounding space, even though the system is called radiant cooling.


17 American Water Works Association website:

Questions? Comments?
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