How to Conduct a Tool Day

What's Tool Day?

A one-day, behind-the-scenes peek at the secret life of buildings.

Why Do Tool Day?

Tool Days are great learning and teaching experiences that involve a rich mixture of teachers, students, and practitioners, cool tools, and intriguing buildings. Professional architects can earn AIA/CES credits by participating in Tool Day and even self-report their credits to the national AIA.

What Do You Need?

You only need a few things to conduct an intensive one-day case study examination of a building.

- **Experienced Trainers.** If you've had Vital Signs experience, you're ready. Or you can gain experience vicariously from the web sites below. It's essential to recruit some trainers with Vital Signs experience to help facilitate the training and case study methodology. Or your TAs and advanced students may be appropriate trainers, but, of course, you'll want to train them first.

- **Chutzpah.** You have to be a risk taker. These explorations are exciting, but risky. Oh, extensive planning doesn't hurt!

- **Tools.** Provide sufficient tools (type and quantity) so each team can do conduct a successful study. A suggested tool inventory is included, but planning can reduce the number and sophistication of the list. An internal grant proposal that funded a tool kit at the University of Idaho is included as an aid for obtaining support at your school or workplace. Example tool exercises are posted on the Agents of Change web site <http://aoc.uoregon.edu>.

- **Building.** Find a provocative building that asks many questions about design and performance. Make sure that it's accessible and available for your study. Enthusiastic occupants are helpful; surprised managers are not.

- **Participants.** You could run a tool day for your class, your office, your local AIA chapter, but it is particularly effective when the participants represent a cross-section of students, faculty, and practitioners. There are a lot of opportunities for peer learning, teaching, and epiphanies.

- **Handouts.** Hand out information on the building, including articles and drawings.

- **Stinkin' Badges.** You do need to show some stinkin' badges when you include a lot of people who don't know each other.

Historic Tool Days

National Building Museum	<http://www.aa.uidaho.edu/bldgvital/NBMToolDay/>
Boise Tool Day	<http://www.aa.uidaho.edu/bldgvital/BoiseToolDay/BoiseToolDay.htm>
Patagonia Tool Day	<http://www.aa.uidaho.edu/bldgvital/PatagoniaToolDay/>

Original Organizers

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Arch 463/464 Hands-On Learning Initiative

Teaching and Learning Grant* Proposal Narrative

This proposal addresses two of the Teaching/Learning Grant Program's areas of development:

- Development of acquisition of materials to enhance alternative learning strategies.
- Improvement of classroom efficiency via application of technological solutions to educational problems.

Problem. The Vital Signs Project <http://www-archfp.ced.berkeley.edu/vitalsigns/index.html> is a nationwide effort to develop methods for using a new generation of small, easy-to-use, microchip-based instruments to help students understand how buildings and sites interact with environmental forces such as sun, wind, light, and sound. Over the last five years I have created Vital Signs teaching resource packages and case studies and have benefitted from the two-year loan of a $25,000 Vital Signs toolkit. During these two years, in order to use these loaned instruments to improve student learning, I restructured my required environmental technology lecture courses, Arch 463 and 464 (syllabi at <http://www.aa.uidaho.edu/arch/courses.htm>), and instigated many new exercises to provide hands-on experiences for students to measure and analyze building and site performance (e.g., effectiveness of external shading devices; microclimatic influences on a rural site; interactions among windows, sun, and light; effects of walls and roofs as thermal and acoustic barriers). These exercises and the instruments from the borrowed Vital Signs tool library have proven to be extremely popular with the students—the instruments have been in constant demand and used by students throughout the curriculum, not just those students in Arch 463/464. Next year, the toolkit must be returned. We need to replace or upgrade key equipment (the handheld instruments and micro-dataloggers in the toolkit have been improved in performance and reduced in cost during the last five years) to allow architecture students continued access to these cutting-edge, hands-on methods for understanding our built environment.

Proposed Project. I propose to extend my restructuring of Arch 463/464 to incorporate more and better hands-on, team-based methods for measuring, analyzing, and understanding environmental interactions among building, site, and environmental forces. These methods will encourage student teamwork in developing specific issues to investigate, performing the experiments in actual buildings and outdoor spaces, and analyzing the results. Through these exercises students will gain insights into the performance of building materials and components, the effects of architectural design on human comfort, and the power of everyday environmental forces. This experientially gained knowledge will improve the students' understanding of the interactions between buildings and the environment and ultimately will help them design buildings that respond appropriately to the environment while providing human comfort.

I seek grant support to procure the instruments required to assemble three hands-on tool kits that will make implementation of these course innovations possible. Based on my experience with the toolkit loan, I have identified instruments (and upgrades) which can be integrated into teaching Arch 463/464. The $25,000 tool kit will be effectively replaced with about $3,200 worth of new tools. Specific instruments include:

- compass/clinometers to measure site orientation and horizon obstructions
- spot pyranometers to measure surface temperatures of building and site materials
- temperature/relative humidity data loggers to collect indoor and outdoor climate condition readings
- weather meters to measure instantaneous airflow speed and direction over sites and in buildings as well as temperature and relative humidity
- digital sound level meters to detect noise problems on sites and in rooms
- digital camera to record site and building features.

The Department of Architecture has used extramural funding (mainly from the Vital Signs project) over the past five years to buy some of the basic instruments (one spot pyranometer, illuminance and luminance meters, and temperature data loggers), but our tool library remains incomplete and the Vital Signs project funding has lapsed.

Evaluation. The project's success will be measured by the amount and types of activity recorded in the tool library log. Students will be surveyed to assess tools used, effectiveness of the exercises, utility of the tools, tool use for other courses, which tools they would use after graduation, and suggestions for other appropriate exercises. Another measure of success will be gleaned from analysis of student evaluations of teaching. The most important measure of

success will be the quality of student work in the hands-on exercises and succeeding architecture studio projects (cross-over application). The past two years' experience with the widespread use of the Vital Signs tools and techniques in my classes is extremely encouraging. I will disseminate findings from this project through paper presentations at professional meetings and workshops for teachers and students at venues throughout the country.

Benefits. Because Arch 463/464 is required for every architecture and interior architecture major, each student in our department (as well as many architecture minors from departments university-wide) will participate in these hands-on learning experiences. Two colleagues, Rula Awwad-Rafferty and Sandy Stannard, are also involved in Vital Signs projects and have encouraged their students to extend the use of the tools and techniques to other learning environments—lecture classes, seminars, and studios. I also will teach both studio and advanced seminars that will incorporate tool use that builds on the basic methods of Arch 463/464. Moreover, the instruments can continue to be used in delivering continuing education workshops to design professionals (e.g., 1998 Northwest Daylighting Forum in Seattle) and intensive workshops to students at other universities (Ball State, Cornell, Oklahoma State, Oregon). Each of the tools is a simple device of enduring usefulness that will benefit student learning for many years to come. Measuring, analyzing, and understanding building performance gives students an appreciation of the impact of design on the lives of building occupants in addition to the architect's responsibility to provide buildings that successfully address environmental issues. As well as the short-term impact on student learning, the grant will have a long-term benefit to the state and the nation by raising professional architects' level of understanding of building performance issues in design.

Budget—Instruments

Suunto DP–65 Global Compass [compass/clinometers to measure site orientation and horizon obstructions]	3@ $44.95	$134.85
Raytek Hand-held Infrared Thermometers [spot pyranometers to measure surface temperatures of building and site materials]	2@ $169	$338.00
Hobo Temperature/Relative Humidity Loggers [temperature/relative humidity data loggers to collect indoor and outdoor climate condition readings]	6@ $129	$774.00
Kestrel 3000 Pocket Weather Meter [weather meters to measure instantaneous airflow speed and direction over sites and in buildings as well as temperature and relative humidity]	3@ $159	$477.00
Forestry Suppliers Digital Sound Level Meter [digital sound level meters to detect noise problems on sites and in rooms]	3@ $219	$657.00
Olympus D–600L Zoom Digital Camera [digital camera to record site and building features]	1@ $899	$899.00
Subtotal		$3,279.85
Department of Architecture share		-779.85
Teaching and Learning Grant Support Total		**$2,500.00**

* A grant program internal to the University of Idaho to encourage innovative teaching and learning.

Sample Tool Day Budget—Instruments for Five Teams

Suunto DP–65 Global Compass [compass/clinometers to measure site orientation and horizon obstructions] <http://www.ForestrySuppliers.com>	5@ $44.95	$224.75
Raytek MiniTemp MT4 Infrared Thermometers [spot pyranometers w/laser pointer to measure surface temperatures of building and site materials] <http://www.flw.com/raytprod.htm>, 831.458.1100	5@ $99	$495.00
Hobo Temperature/Relative Humidity Loggers [temperature/relative humidity data loggers to collect indoor and outdoor climate condition readings] <http://www.onsetcomp.com>	15@ $79	$1,185.00
BoxCar Pro 4.0 Starter Kit [temperature/relative humidity data loggers to collect indoor and outdoor climate condition readings] <http://www.onsetcomp.com>	1@ $95	$95.00
Kestrel 3000 Pocket Weather Meter [weather meters to measure instantaneous airflow speed and direction over sites and in buildings as well as temperature and relative humidity] <http://www.nkhome.com>	5@ $159	$795.00
Forestry Suppliers Digital Sound Level Meter [digital sound level meters to detect noise problems on sites and in rooms] <http://www.ForestrySuppliers.com>	5@ $239	$1,195.00
Testo Velocity Stick [digital hot wire anemometer to measure air speed and temperature in hard-to-reach places] <http://www.testo.com>	5@ $129	$645.00
Total **(or about $950 per team)**		**$4,634.75**