
HRC NEWS

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A Publication of the Housing Research Center at The Pennsylvania State University

RESIDENTIAL CONSTRUCTION COURSES AT PENN STATE

In this issue we would like to highlight the academic and extracurricular programs involving the residential construction industry here at Penn State. In this article we discuss the residential design and construction curriculum that has been developed for senior and graduate-level students.

In 1980 a program in Residential and Light Commercial Construction was established under the auspices of the Departments of Civil Engineering and Architectural Engineering. From the beginning, a key component of the program was a two course sequence in the design and construction of residential subdivisions and buildings. Over the years this sequence has attracted students from architectural, agricultural, mechanical, and civil engineering as well as real estate and architecture.

CE 433: RESIDENTIAL SUBDIVISION DESIGN AND CONSTRUCTION

The overall concept of this "Capstone Design" course is to introduce the students to the "subdivision process" - a sequence of interrelated events and decisions that result in the formation of an end product; namely, a residential subdivision. A problem-solving approach is used in this fall semester course offering. Students are assigned to design teams of three or four individuals. Each student brings to the team individual areas of expertise and is expected to share equally in the tasks related to the design process.

Each team is given a parcel of raw land and 16 weeks to complete the design drawings and a written project narrative justifying and explaining the work. The instructional staff attempts to make this experience as realistic as possible by enforcing all the regulations and related ordinances of the township in which the parcel is located. The class also visits the property to analyze existing site characteristics.

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NAHB STUDENT CHAPTER

The Student Chapter of the NAHB at Penn State provides a medium for students to interact with others interested in the residential building industry. Established in 1981, the group has been actively supported by NAHB, PBA, The Home Builders Association of Central Pennsylvania, and many other organizations.

Due to the generosity of Bernard and Henrietta Hankin, computer laboratories and residential courses have been established to promote the education with regard to the residential construction industry. The Housing Research Center also provides close association with the professional world of designers and contractors.

Students in all majors are invited to become involved with our chapter, which typically averages 40 members each year. There is ample opportunity to be involved with the organization and management since we are a relatively small group with general monthly meetings. The highlight of the fall semester is the annual November Scholarship Awards Banquet. Each year approximately \$6,000 worth of scholarships are awarded at this event.

In the past, students have participated in activities such as: organizing presentations by special topic speakers for student meetings, filming the 30-hour construction of a Habitat for Humanity home, field trips to the NAHB National Headquarters and Research Center in Washington, D.C., and building small wood-framed jungle gyms and tool sheds to raffle off as fundraisers. The chapter has also taken part in the annual 24-hour Construction Management Marathon at the National Builders Show in Las Vegas, which required our group to compile an estimate, schedule, and marketing technique for a residential construction project in the form of an integrated bid package. If enough interest is generated this year, we plan to visit Frank Lloyd Wright's Falling Water in Bear Run, PA.

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Residential Construction Courses continued

The content of the course covers the design and analysis of the existing conditions (such as topography and soils), the road and lot layout, the water distribution system, the sanitary sewer system and the storm water management system. Finally, an engineering cost estimate of the entire design is completed to tie all of the assignments together.

As the semester unfolds, students are introduced to the appropriate computer software that enables them to complete their assignments. This is also an important element of the course in that it allows the students to incorporate the use of all the tools they will use out in the field. AutoCAD is used for the design drawing requirements, Benchmark is used for the surveying assignments, and SEWER and SWIRM, packages developed here at Penn State, are used to complete portions on the sewer and storm water management design. During the Fall semester 1993, this course will introduce an integrated CAD-based approach using AutoCAD as the "engine" to power the software applications for surveying as well as hydraulic and hydrologic design and analysis.

During the fall semester the design teams attend an actual township supervisors or planning commission meeting in the township in which their subdivision will be located. This is done in preparation for the team to present its own work to an actual class review board for an evaluation of the final projects. The review board consists of practicing engineers, township officials, and members of the academic community.

The final design drawing set for each group contains everything that would be required in an actual submission to the township for a residential subdivision. This includes such items as plan and profile sheets for the roads and all utilities as well as detail sheets for all aspects of the design.

A written report and set of drawings make up the physical deliverables of the course, however, the students come away with much more! They have participated in and become intensely involved in a project that could not be accomplished by individual effort. They learn first hand what it means to be a member of a design team, and they have experienced both the positive and negative factors involved in the process. It is this type of "Capstone Design" approach that makes this first course in residential construction so valuable.

DESIGN AND CONSTRUCTION

This spring course also integrates a "Capstone Design" approach, focusing primarily on the design of the residence itself. The class is again divided into design teams, and each individual team member is asked to prepare a set of preliminary architectural drawings for a house. The team designs include homes for a First-Time Buyer, a Move-Up Buyer, an Empty Nester, and a Luxury Buyer. A review team consisting of Architects and Engineers then selects one of these preliminary designs as the focus of the team's project.

The entire class is given a subdivision plan from a local development. The first step for the group is to select a lot on which the selected design will be constructed. The team will then prepare a set of AutoCAD generated design drawings that include floor plans, elevations, sections, foundation plan, framing details, and all electrical and mechanical plans. The designs and specifications must conform to the CABO One and Two-Family Dwelling Code and any applicable township ordinances or subdivision covenants.

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212 Sackett Building
Penn State University
University Park, PA 16802
814-863-0623 or
814-865-2341.
FAX 814-863-7304

Editor: Steven Taylor

Contributions and news items are
welcome. The deadline for spring
submissions is February 1, 1993.

Residential Construction Courses continued

Throughout the semester the class completes designs for the structural, HVAC, electrical and plumbing systems. To take advantage of the diverse group of experts available within the College of Engineering and associated fields, the course also features guest lecturers who cover the special topics of electrical and mechanical systems.

Dr. Gren Yuill, a professor of architectural engineering, covers the issues involved in HVAC design. Mr. Charlie Claar, affiliate associate professor of architectural engineering, presents information on electrical design, and Mr. Chuck Dileccio, an architect from the Pittsburgh area, contributes to the special topic presentations with a discussion of plumbing design.

Last year our guest speakers also included a local builder and a local code enforcement officer. Jeff Lauer of S&A Custom Built Homes of Bellefonte, PA, presented an overview of S&A's operations and reviewed a complete set of S&A Homes design plans. Jeff defined the various categories of homes offered, the general construction operation, and the complete home building process from customer contact through the final finishings of the home.

Later in the semester, Harry Burd, a Centre Region Code Enforcement Official, spoke on residential code issues. His presentation included a history of building codes and a description of the various model building codes in place around the country. He also presented information on the code adoption procedure and gave a brief overview of the CABO Building Code that is enforced in the Centre Region.

Another aspect of the course requires each group to visit a local residential builder/contractor to determine the type of management systems the firm uses in the office and in the field during construction. The group then visits a local site on three occasions to observe the crews and their progress and to report on the effectiveness of these management strategies.

In the future we plan to enhance this course with the introduction of a computer integrated approach to the design process. Using AutoCAD as the "engine," we will integrate cost and scheduling, structural and HVAC software packages around the design process to give the students first hand experience in tying together the appropriate software packages.

The "Capstone Design" approach used in these residential construction courses is an extension of our

goals for the Housing Research Center at Penn State. Our goal is to offer the students a broad range of topics and a comprehensive set of design objectives that must be accomplished through a team effort. We strive to provide students with state of the art tools and techniques and experienced professional input to enable them to interact with the industry as they learn. We believe that this approach will provide the environment for the education of well qualified engineering graduates that will be a valuable addition to the residential building industry.

Contributions to this article were made by Charlie McIntyre, Mike Suchar and Steve Taylor of the HRC.

IMPORTANT

Energy Symposium:

Ben Franklin Propo

Advisory Council Me

Matt Syal steps down
Steve Taylor takes over
Assistant Director of

Advisory Council
Research Symposium

DOE Proposal due

Fundraising Receptio

Ben Franklin Propo

DOE Project Appro

NAHB Student Cha

Jack H. Willenbrock
Sabbatical at the NA
Research Center and

Phyllis A. Barner
Sabbatical at
Harvard University

Student Chapter continued

This year we will continue to provide as many events and activities as possible. The October meeting included a talk about Habitat for Humanity presented by local builder Ken Zook. Ken narrated a slide show on the second 30-hr Habitat House. The NAHB Banquet will be held November 18, 1992, at which time the scholarships and paid trips to the February National Builders Show in Las Vegas will be awarded. The trips will be awarded to the winners of the "Residential Building Construction Industry Essay Contest." The scholarships will be awarded to applicants from the student chapter based on financial need and chapter participation.

We are looking forward to an exciting year ahead. Anyone interested in our efforts should contact our Student Chapter President Jonathan Williams at (814) 862 3995 for information about memberships or future events.

Penn State NAHB Officers

IMPORTANT

National Builders Show
Las Vegas, Nevada

HRC Advisory Council
and Dinner

Advisory Council
Research Symposium

Research Proposals

Jack H. Willenbrock
Sabbatical at the NA
Research Center and

Phyllis A. Barner
Sabbatical at
Harvard University

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*The Housing Research Center at
The Pennsylvania State University
212 Sackett Building
University Park, PA 16802*

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