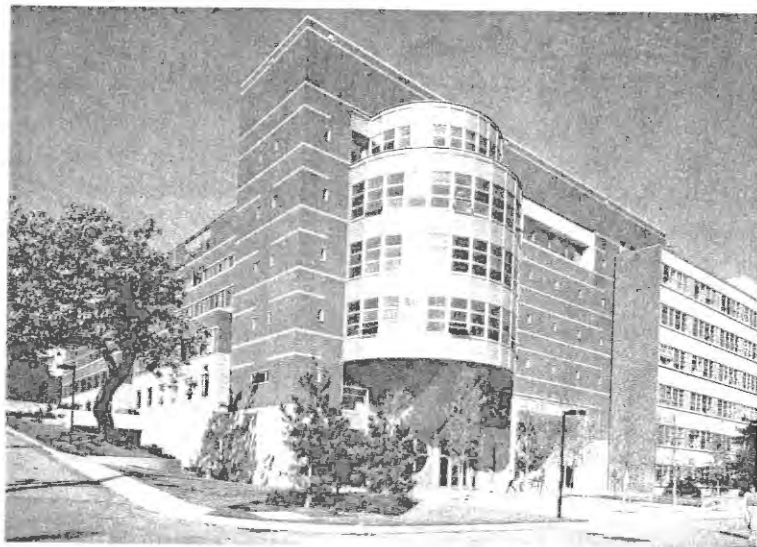


**SEATTLE UNIVERSITY
SCHOOL OF SCIENCE AND ENGINEERING
ENGINEERING DESIGN CENTER**

1988 PROJECT DAYS

**Engineering Auditorium
Thursday-Friday, May 26-27, 1988**



**Seattle
University**

FOUNDED 1891

Welcome

One year ago, Seattle University launched the most far-reaching initiative in the almost half-century of the Engineering program. This initiative is the Engineering Design Center which "officially" celebrates its first anniversary at this week's Project Days. While we have modeled the Center unabashedly on others' success, we have adapted it to our own unique situation. During these Project Days we will see the fruits of the efforts of all who participated in the Center this year.

It remains only for me to thank Prof. Rolf Skrinde, the Director of the Engineering Design Center, who so magnificently brought the Center through its difficult first year; the companies who have supplied and supported projects for our students; the liaison engineers who have guided the projects; the faculty who have drawn upon their expertise and mentored their students; and, most importantly, the students themselves who have poured so much energy into their projects, thereby making the Engineering Design Center such a successful undertaking.

Dr. Terry Van Der Werff
Dean, School of Science and Engineering

On behalf of our engineering faculty and students, may I welcome you to Project Days 1988. During these two days you will see not only the fruits of our Dean's efforts in developing these fine new facilities, but also the fruits of your own labors in advising and assisting us in developing an emphasis in the senior year on engineering design project work. Both faculty and students are appreciative of the efforts of the Engineering Advancement Council, the Departmental Advisory Boards and leading industries in the region for the support of our senior engineering design program.

Special thanks are due to the EDC Subcommittee of our Engineering Advancement Council, whose membership is as follows:

Tony Sutey, Boeing Aerospace Company, Chair
Ardell Anderson, Boeing Commercial Airplane Company
Tom Claudson, Battelle Pacific Northwest Laboratories
Bill Finnegan, Puget Sound Power and Light Company
Dick Kuhner, Pacific Northwest Bell

We not only welcome you to participate during these two days, but also encourage your feedback so that we can improve our Design Center program over the years ahead.

Thanks for all your support.
Dr. Rolf Skrinde
Director, Engineering Design Center

**SEATTLE UNIVERSITY
SCHOOL OF SCIENCE AND ENGINEERING
ENGINEERING DESIGN CENTER
PROJECT DAYS PROGRAM**

Thursday, May 26

- 10:30 a.m.** Engineering Advancement Council Meeting
12 noon Engineering Departmental Advisory Board Meeting
1:00 p.m. Registration, Coffee, Student Conducted Tours
1:25 p.m. Welcome, Dean Terry van der Werff

Presentations

- 1:30 p.m. Transmission Line Design**
Sponsor: Puget Sound Power and Light Company
Liaison: Dale Easley
Adviser: Prof. Richard T. Schwaegler
Students: Mike Dahlem, Mark Murphy, Mohd Ismail, Jeff Dragovich, Randy Richter

An integrated set of software programs developed by the Electric Power Research Institute to design overhead transmission lines was used to:

1. Check the specifications, calculations, and design parameters against current Puget Power practices.
2. Recommend modules that could be most helpful to Puget Power's engineers and technicians.
3. Assist Puget Power in training their engineers and technicians in the efficient use of the program TL Workstation.

- 1:50 p.m. RF Power Meter**
Sponsor: Puget Sound Power and Light Company
Liaison: Mollie Launer and Jim Nolan
Adviser: Prof. Paul O. Neudorfer
Students: Rick Blum, Jeff Frey, Tammie Skoglund

The company needs to monitor electromagnetic radiation surrounding communications installations. Existing technology for this purpose was surveyed. Difficulties related to near field and non-free space conditions were considered. Fiber optics were investigated as a likely possibility for non-disruptive sensors that can operate over a wide range of conditions.

- 2:10 a.m. Cutter Lifting Device**
Sponsor: The Robbins Company
Liaison: Ken Deering
Adviser: Prof. Lewis Filler
Students: Scott Bear, Debbie Limb, Shawn Phillips, Randy Britts, Gene Carpenter

The present method of cutter disk replacement in tunnel boring machines is labor intensive and results in significant down time. The team designed, fabricated and tested a device to lift, and insert into its housing, a disc cutter assembly weighing 450 pounds.

Break

- 3:00 p.m. Sulfur Dioxide Removal From Flue Gas**
Sponsor: Seattle University
Adviser: Prof. David W. Schroeder
Students: Azhar Daud, Shahnam Shaghghi, Ihsan Mohdidris

Sulfur dioxide in flue gases from smelting operations and the combustion of coal causes air pollution such as acid rain. Ozone and air activated by ultraviolet radiation were used to oxidize SO₂ to SO₃ so that sulfur compounds could be removed by simple scrubbing with water. The team designed and constructed a model, followed by a laboratory test program.

- 3:20 p.m. Crack Velocity Measurement**
Sponsor: Seattle University
Adviser: Prof. Dennis W. Wiedemeier
Students: Khairuddin Hashim, Rocky Koreis, Tom Thatcher, Alex Irwanto

The team designed, built and tested a digital system to measure the growth rate of a propagating crack in a fracture test specimen. The team included both Mechanical Engineering and Electrical Engineering students.

- 3:40 p.m. Voltage-to-Frequency Converter Test Program**
Sponsor: Sundstrand Data Control Inc.
Liaison: Ron Leonardson
Adviser: Fr. Lammert B. Otten, S.J.
Students: Margaret Achey, Hendra Suhartanto, Michael Kelly, Billy Tam

The project developed a PC interface board that accepts TTL level signals up to 10 MHz to test voltage-to-frequency converters. Comparison measurements were made with an external high precision DVM and high precision digital counter with IEEE-488 control.

Friday May 27

9:00 a.m. Cannon Downrigger Automation

Sponsor: Cannon/Seattle University
Adviser: Prof. Gary J. Erickson
Students: Vernon Perryman, Russell Powell, Mike Riley

The team designed an acoustic fathometer which measures the distance from a boat to the bottom of the ocean. This information will be used to control an electric downrigger manufactured by the Cannon Company. A sinker which controls the depth of a fishing line raised and lowered, depending on the depth of the ocean, thus avoiding hooking the weight on the bottom while keeping the lure at the proper depth.

9:20 a.m. Kenworth Power Hood

Sponsor: Kenworth Company
Liaison: Ludi Giese
Adviser: Prof. Dennis W. Wiedemeier
Students: Mitch Hayes, Robert Simpson, Kent Preston, Steven Johnson, Bridget Brewer

The design team developed and tested an inexpensive mechanism which permits the operator to open the hood of his truck from within the cab. This mechanism can be provided to customers as an option which will cost the company less than \$200 per unit during production.

9:40 a.m. Storm Drain Design

Sponsor: Seattle Engineering Department/Seattle University
Liaison: Wayne J. Greer
Adviser: Prof. Percy H. Chien
Students: Greg Ebc, Andy Marshal, Tim Hume, Mike Norton

An existing storm drainage system has proven to be inadequate during periods of heavy rainfall. Alternative solutions and designs by the rational method resulted in a cost effective drainage system which satisfied long term storm projections and was publicly acceptable.

Break

10:30 a.m. Design of a Log Splitter

Sponsor: Seattle University
Adviser: Prof. Hamid Moosavi-Rad
Students: Mohd Shaibi Ahmad Hijazi, Alan Rodrigues, Muhammad Faiz, Mohamed Sibo Zeng, Jamaluddin Mustakim

The team designed, built and tested a log splitter which attaches to the standard three-point hitch on a small farm tractor. The splitter uses the motion of the hitch to split firewood logs.

10:50 a.m. Water Hammer

Sponsor: Seattle University
Adviser: Prof. Percy H. Chien
Students: Craig Hislop, Charles Smith, Karen Irby

A physical model has been designed and built for the investigation of water hammer. The model has the capacity of identifying and measuring the magnitude and velocity of the water hammer pressure wave.

11:10 a.m. Design of a Polariscope

Sponsor: Seattle University
Adviser: Prof. Hamid Moosavi-Rad
Students: Marwan Al Hammadi, Ken Davis, Bill Balogli, Mike Feider, Mark Barnett

A portable polariscope was designed and constructed for class demonstrations. The device is placed on an overhead projector and illustrates the stress patterns in specimens loaded in tension, compression and bending.

11:30 a.m. Brake Release Design Fixture

Sponsor: PACCAR
Liaison: Mike Gilbert
Adviser: Prof. Robert F. Viggers
Students: Dan Holiday, Dan Lavallee, Andy Hogenson, Brian Sheldon

A fixture was designed and constructed to slowly depress a truck brake pedal to obtain a desired pressure in the brake air chamber. Once steady state is achieved at the desired pressure, the fixture releases the pedal instantaneously without applying any external forces to the pedal as it retracts. The fixture will be used to test airbrake systems to ensure that they meet specifications.

Lunch

1:00 p.m. Induction Generator Relay Protection

Sponsor: Puget Sound Power and Light/Seattle University
Liaison: Simon H. Cheng
Adviser: Xusheng Chen
Students: Ginette Berosik, David Fujiki, Christopher Kang, Allyson Kaai, Todd Robbins

An increasing number of relatively small induction generators are being connected to power grids at the distribution level. A relaying scheme for protecting wind-turbine induction generators against islanding using only local intelligence was designed, built and tested.

1:20 p.m. External Pressure Measurement System

Sponsor: Seattle University
Liaison: Don Meredith
Adviser: Prof. Pierre C. Gehlen
Students: Jon Chandler, Richard Hutmacher, Don Fowler, Linda Garmanian, Sarah Jokela

A device was designed, constructed and calibrated to detect pressure changes inside hydraulic tubing. This was accomplished by measuring changes in the tubing's diameter using strain gauges and LVDT's. It is primarily meant for trouble shooting in aircraft.

1:40 p.m. TVRO Equipment Installation Design

Sponsor: Seattle University
Adviser: Mr. H. Ward Silver
Students: Brian Clapp, Hanh Phan, Fermin Munoz, Peter Do, Steven Simonsen

The team provided engineering services on the installation of the Electrical Engineering Departments TVRO satellite equipment. The team followed an engineering approach to the project by characterizing the system goals, surveying the physical site and equipment, providing design as necessary, and supervising installation.

2:00 p.m. Dimmer Control for Aircraft Pilot Lights

Sponsor: AVTECH
Liaison: Doug Damon, Chris Anderson
Adviser: Prof. Robert G. Heeren
Students: Bill Acheson, Richard Burko, Yan Lo, Brian Marley, Louia Wiedman

The team developed an AC input AC output 75 Watt incandescent lamp dimmer, operating at 115 Volt RMS at 400 Hertz input. The best circuit topology for application was determined, considering weight, package size, input vs. output voltage, performance requirements, environmental factors, and electromagnetic interference requirements.

Break

3:00 p.m. Digital Communications

Sponsor: Pacific Northwest Bell
Liaison: David Alfred
Adviser: Prof. Patricia D. Daniels
Students: Omar Abdulrahim, Jong Chien, Michalis Tsalidis, Michael Ciacciarella, Samok Ouch

Equipment was designed to test the capability of transmitting alarm information over telephone lines to an alarm company. The objective was to determine if a line can transmit a 36Hz tone from the customer to a central scanner with an acceptable amount of loss.

3:20 p.m. Air Flow Visualization

Sponsor: John Fluke Company
Liaison: Howard Voorheis
Adviser: Prof. Stephen B. Robel
Students: Thay Chheng, Michele Letizia, Mike Towey, Kelly Davis, John Kipp

The team designed and constructed a wind tunnel to analyze cooling of circuit boards and similar electronic devices. Local temperatures and velocities can be logged to a computer and a smoke-stream generator is provided to help locate heat sink deadspots.

3:40 p.m. Corrosion Control

Sponsor: Pacific Northwest Bell/Seattle University
Liaison: Stanley D. Overby
Adviser: Prof. Xusheng Chen
Students: Gurdev Bassan, Jerome Roos, Hyo Chan Lee, Lawrence Sherwin

A device to minimize stray current corrosion of underground utility lines adjacent to electric railways was designed, constructed and tested. Small amounts of stray current will trigger an electrical connection which will inhibit the passage of stray current from the utility line being protected to the railway.

4:00 p.m. VLSI Circuit Design

Sponsor: Boeing/Seattle University
Liaison: Todd Hill, Mike Raftery
Adviser: Prof. Gary J. Erickson
Students: Steve Baldwin, Linda Bender, Jeff Sanders

The objective of this project was to design an ETM controller using a silicon compiler or comparable IC design tool. The project team studied the TM concepts by performing the following functions:

1. Derive controller requirements from the VHSIC specification and Boeing inputs.
2. Perform trade studies to analyze design options.
3. Design the ETM Controller to the requirements.

Seattle University Engineering Advancement Council

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Dr. Anthony Sutey, Boeing Aerospace Company, Vice-Chair
Dr. Harlow G. Ahlstrom, Boeing Aerospace Company
Mr. Ardell J. Anderson, Boeing Commercial Airplane Company
Mr. Larry Azure, Pacer Corporation
Mr. Robert A. Brown, Eldec Corporation
Dr. Thomas P. Claudson, Battelle Pacific Northwest Laboratories
Dr. Vince Corbin, Quantum Medical
Mr. William J. Finnegan, Puget Sound Power and Light Company
Mr. Jack Porter, Weyerhaeuser

In addition, the Chair and Vice-Chair of each Departmental Advisory Board are members of the EAC.

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