



Projects Day

JUNE 6, 2003

Science and Engineering Project Center
Senior Design Projects 2002-2003

WELCOME



It gives me great pleasure to welcome you to Projects Day 2003. This is the sixteenth year of the Science and Engineering Project Center, and I would like to congratulate everyone both within the school and outside for making this Project Center the success it is today. Your dedication, skill, and hard work are greatly appreciated.

Today we present to you the results of our students' endeavors, which have been sponsored by industry, government, and other agencies, and developed by senior students in the science and engineering design program at Seattle University. Our students are very excited at this opportunity to share the results of their hard work with you.

This senior capstone experience is perhaps the most important learning experience for our students and is the culmination of their studies at Seattle University. Working in teams of four or five, they have to solve open-ended problems that may not have a unique solution while adhering to strict timelines, budgets, and the needs of outside agencies. This is an excellent preparation for the professional positions our students will fill upon graduation.

We are most grateful to our corporate sponsors, those who are veterans at sponsoring our projects and those who are new this year. It is a tribute to your faith in our students, and in the quality of their work, that you choose to invest your time and resources in these projects. Thank you.

Finally, a big thank you to everyone whose hard work has brought these challenging projects to fruition. Our faculty, students, and professional mentors have worked together for this past year to achieve the results you will see here today. Congratulations!

George Simmons, Dean
School of Science and Engineering



I also extend to you, on behalf of our faculty and students, a warm welcome to Projects Day 2003, our annual presentation of design team results to sponsoring organizations, visitors, and friends. I am grateful for the encouragement and assistance provided by our Science and Engineering Advisory Board and the Project Center Advisory Committee in promoting the external sponsorship of our projects.

I would also like to acknowledge the coordination efforts of professors Rolf Skrinde in Civil and Environmental Engineering, Alvin Moser in Electrical and Computer Engineering, Teodora Rutar Shuman in Mechanical Engineering, and Everal Mills in Computer Science, as well as Sheridan Botts, contracts manager, and Kathy Fletcher and Whitney

Johnston, administrative assistants for the Project Center.

Your hosts here today are the students from our engineering organizations, and special thanks go them for the time and energy they put into the tasks associated with our Projects Day celebration. These student societies are the American Society of Civil Engineers (ASCE), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), National Society of Black Engineers (NSBE), Society of Environmental Engineers and Scientists (SEES), Society of Women Engineers (SWE), and Tau Beta Pi.

Patricia D. Daniels, Director
Science and Engineering Project Center

SCHEDULE

8:45 a.m. – 1:30 p.m. LeRoux Conference Center, Student Center Room 160
Projects Day Registration and Displays

9:00 a.m. LeRoux Conference Center, Student Center Room 160
Welcome, President Stephen V. Sundborg, S.J. and Dean George Simmons

9:10 a.m. – 10:50 a.m. Concurrent Sessions

Student Center Room 130

AT&T Wireless Services
The Boeing Company, Commercial
ELDEC Corporation
Fluke Corporation
Honeywell

Mobile Load Test Bank
Boeing Antenna Analysis Software
Software Module Update
Mercury Project
Automated Troubleshooting Procedures

Student Center Room 210

ALSTOM EAI Corporation
Amazon.com
The Boeing Company, Commercial
The Boeing Company, Phantom Works
Enchanted Learning

Satellite Application Publisher/Subscriber
Test Case Repository
Endian Neutral Simulation Software
Network Centric Missile Simulation
Web-Based Curriculum Development Engine

Student Center Room 330

Friends of Blackman Lake
King County Water & Land Resources
Parsons Brinckerhoff
Seattle Public Utilities
SvR Design Company

Ferguson Creek Restoration
Stormwater Quality Facility Monitoring
Fremont Bridge North Approach Span
Longfellow Creek Study
City of Seattle Combined Training Facility

10:50 a.m. - Break

11:00 a.m. – 12:15 p.m. Concurrent Sessions

Student Center Room 130

Medtronic Physio-Control
Philips Medical Systems
Xilinx, Inc.

Isolated Scalable Instrumentation Amplifier
Next-Generation Signal Processor
Software-Defined Radio Using FPGA Technology

Student Center Room 210

Microsoft Corporation
National Bureau of Asian Research
PNNL - Battelle
Seattle University Information Technology

Microsoft Terrarium
The Strategic Asia Data Integration Project
User Refinement of Document Classification
Seattle University Classes 1-2-3

Student Center Room 330

Electroimpact, Inc.
Kenworth Truck Company
Siemens Medical Systems, Inc.
Wire Dynamix

Absolute Accuracy Compensation for Robot
Dual Purpose Aero Panels
Finite Element Simulation of Ultrasound Probe
Fluid Feed Tank Re-design

12:15 p.m. LeRoux Conference Center, Student Center Room 160
Buffet Lunch

STUDENT CENTER ROOM 130

TITLE: Next Generation Digital Signal Processor: Simulation and Optimization

NUMBER: ECE 03.7

SPONSOR: Philips Medical Systems

SPONSOR LIAISONS: Dan Morrison, Dan Schmiesing

FACULTY ADVISOR: Prof. Paul Neudorfer

STUDENTS: Teddy Choi, Mathios Dejene, Brandon Huang, Adam Nguyen

Philips Medical Systems is a leader in manufacturing ultrasound equipment. They currently use application specific integrated circuits (ASICs), the de facto standard for speed in digital signal processing (DSP) systems, in their ultrasound equipment. Intrinicity, Inc. has recently released the FastMATH™ Digital Signal Processor. This is a new breed of digital signal processor (a microprocessor designed specifically for use in DSP applications) that reportedly far surpasses the performance of ASICs in degree of programmable flexibility and is comparable in speed. Philips asked the team to test the feasibility of using the FastMATH™ processor in their ultrasound machines. The team coded, modeled, and tested six DSP functions on the FastMATH™ processor and presented the results to Philips. The results of these tests will form the foundation of future feasibility testing.

TITLE: Software-Defined Radio Using FPGA Technology

NUMBER: ECE 03.8

SPONSOR: Xilinx, Inc.

SPONSOR LIAISON: Mark Sasten

FACULTY ADVISOR: Prof. Alvin Moser

STUDENTS: Yousif Al-Obaidli, Yi-Chu Bridges, Shane Erickson, Jonathan Noda

Xilinx seeks a sales tool that demonstrates an application in the field of digital signal processing using their software and hardware. To facilitate their needs, the team developed a software-defined radio using digital signal processing (DSP) techniques and field programmable gate array (FPGA) technology. The team was able to take a sampled AM (amplitude modulation) signal, demodulate it, filter out the side-band signals, and recover the original signal. Implementing DSP algorithms was straightforward using MatLab's Simulink application, allowing applications to be built in block diagram form. Filter design tools from MatLab and specialized blocks provided by Xilinx contributed to the complete system. Xilinx's ISE development environment handled fitting the code to a specific FPGA chip in the Virtex-II family. The team used an evaluation board from Xilinx for testing.

STUDENT CENTER ROOM 210

TITLE: Satellite Application Publisher/Subscriber
NUMBER: CSSE 03.1
SPONSOR: ALSTOM EAI Corporation
SPONSOR LIAISONS: Kevin Cheung, Rob St. Andre
FACULTY ADVISOR: Prof. Barbara Endicott-Popovsky
STUDENTS: Mitchell Dawson, Farhat Tejani, Tran Ha, Flavia Markiewicz, Thoai Khuu

ALSTOM EAI provides the SMP (SCADA Management Platform) to clients in the power industry. ALSTOM's SMP includes numerous standalone applications that have no way to expose their data except through their VB user interfaces. Distributed user interfaces are not supported, and as such, there is no good way for these applications to communicate their data to other applications and remote users. The team used VB.NET to provide a web service for one of the SMP applications called the Station Simulator. The web service supports simple queries, and returns dynamically refreshed XML-based result sets to external clients. The application can now be accessed remotely, and the solution can be extended to other SMP applications.

TITLE: Test Case Repository
NUMBER: CSSE 03.2
SPONSOR: Amazon.com
SPONSOR LIAISONS: Charles Fordyce, Alan Humphrey
FACULTY ADVISOR: Prof. Susan Reeder
STUDENTS: Natalie Fisher, Laura Nishi, Vu Pham, Darwin Saputra, Winnie Tsang

Amazon.com is constantly developing new code to either implement new projects or upgrade code for existing systems. This new code requires rigorous testing. However, Amazon.com did not have an efficient way of storing, re-using, and creating code requirements, test cases, projects, test plans, and test runs. The goal of the Test Case Repository (TCR) system is to capture existing code requirements, test cases, projects, test plans, and test runs to allow easy and fast retrieval of the data. The Amazon.com Quality Assurance team asked the student team to redesign the current TCR system to provide a flexible, user-friendly test object storage and retrieval system and to add functionality to store test run results. The team redesigned the user interface and the database to allow this additional functionality.

TITLE: Endian Neutral Simulation Software
NUMBER: CSSE 03.3
SPONSOR: The Boeing Company, Commercial Airplanes Group
SPONSOR LIAISON: Robert C. Kircher, Jr.
FACULTY ADVISOR: Prof. Adair Dingle
STUDENTS: Jon Davis, Nathan Harkenrider, Roy Lee, Brandon Uttech

Boeing Commercial Airplane Systems Laboratory builds and supports simulation software for Boeing's commercial aircrafts. Two key components of this complex software structure are the PSIM executive software and airplane simulation software models. Much of this software suffers from endian dependency, a legacy limitation due to incompatible hardware representation of values in memory. The Boeing Commercial Airplane Systems Laboratory wishes to move to an endian-neutral environment in order to have more freedom in its choice of hardware. To support the desired integration of new, low-cost, little endian computers into the existing big endian architecture, the project team has worked to devise methods to remove endian-dependencies from the PSIM executive software and airplane simulation software models. The team designed scripting tools to identify variables in Fortran model code that needed to be changed to allow for proper byte swapping, and designed methods for software byte swapping on the PSIM Node State Control software.

STUDENT CENTER ROOM 210

TITLE: Network Centric Missile Simulation
NUMBER: CSSE 03.4
SPONSOR: The Boeing Company, Phantom Works
SPONSOR LIAISONS: Dale Karr, Scott Moody
FACULTY ADVISOR: Prof. Everalld Mills
STUDENTS: Jaye Warner, Jessica Pham, Nicholas Leonard, Michael Frye

Boeing Phantom Works is a research and development division of the Boeing Company. The project team has been involved with the advanced network centric division of Phantom Works and they have been using an information dissemination system called an infosphere. This infosphere, called Total Domain from Boeing, provides an XML publish/subscribe capability integrating distributed processes through various protocols and common core services. This collection of tools permits applications and users to effectively share information over a wide-area network. The Seattle University team has extended the infosphere by developing a new application capability that automates component registration. This application supports registration of new sensors so other applications can discover and subscribe to the various sensors' data. This supports a more dynamic runtime environment that is not dependent on fixed resources. An XML data compression capability was also developed. This compression capability allows data to be transferred more effectively with regard to speed and system resources. A detailed report on these results was also produced.

TITLE: Web-Based Curriculum Development Engine
NUMBER: CSSE 03.5
SPONSOR: Enchanted Learning Software
SPONSOR LIAISONS: Jeananda Col and Mitchell Spector
FACULTY ADVISOR: Prof. David Joslin
STUDENTS: Selina Lau, Julian Klappenbach, Seri Vongsnakorn, Gizachew Haile Selassie, Jiravit Supavatanangura

Enchanted Learning produces web-based educational materials that have become highly popular and serve a wide range of interests. Enchanted Learning asked the team to help expand their offerings to include a tutorial-based format with integrated assessment capabilities. The team designed a web-based tutorial system with a framework modeled after the academic environment. The tutorial system incorporates logical concepts such as schools, teachers, students, tutorials, and courses and enables the users of the system to establish relationships among these concepts.

TITLE: Microsoft Terrarium
NUMBER: CSSE 03.6
SPONSOR: Microsoft Corporation
SPONSOR LIAISON: Bryan Barnett
FACULTY ADVISOR: Prof. Barbara Endicott-Popovsky
STUDENTS: June Maramis Tulong, Grace Li, Victor Hanson-Smith, Chris Forgie, Bang Chau Vu

Terrarium is a multiplayer online ecosystem game developed using the .NET Framework. Players (software developers) create their own creatures using C# or Visual Basic.Net programming languages. Creatures are added to the game and compete for resources. The best creatures can survive the longest. Terrarium's original purpose was to give software developers an introduction to development with Microsoft's .NET Framework. Microsoft asked the team to extend the game's functionality in such a manner that students or developers can create creatures using a greater number of object-orientated programming principles, such as polymorphism and inheritance. The team met this challenge by making the game world more dynamic and creatures more robust. Terrarium players can now create more diverse creatures with a wider array of creature attributes.

STUDENT CENTER ROOM 210

TITLE: The Strategic Asia Data Integration Project
NUMBER: CSSE 03.7
SPONSOR: The National Bureau of Asian Research (NBR)
SPONSOR LIAISONS: Karolos J. Karnikis, Erick Thompson, David Thurman
FACULTY ADVISOR: Prof. Thomas E. Carpenter, Jr.
STUDENTS: Hung D. Pham, Khanh V. Nguyen, Kotaro Hashimoto, Ming-Chieh Liu, Thitipoom Chokwatana

The National Bureau of Asian Research (NBR) is a nonprofit, nonpartisan institution that conducts research on Asian policy-relevant issues. Some of this research is made public via an online web database named Strategic Asia. The Strategic Asia database collects data from a wide variety of primary data sources worldwide. The primary data sources are everything from web sites to CD ROMs to paper reports. Maintenance of Strategic Asia is time-consuming, due to the research effort required of NBR specialists in retrieving data from primary sources, and error-prone because data is entered manually. To minimize both data acquisition time and data entry errors, NBR asked the team to develop a web service to automate the functions of data validation and data acquisition from primary sources. This software is known as the Data Integration Tool. Primary technologies used to implement the Data Integration Tool are C#, XML, XSLT and the Microsoft .NET Platform.

TITLE: Environment for User Refinement of Document Classification
NUMBER: CSSE 03.8
SPONSOR: Pacific Northwest National Laboratory – Battelle
SPONSOR LIAISONS: Dr. Judi Thomson, Allen Chappell
FACULTY ADVISORS: Prof. Bruce Duba, Prof. Barbara Endicott-Popovsky
STUDENTS: Hiram Brown, Cristy Hoff, Greg Chattin-McNichols, Lisa Sandoval

Pacific Northwest National Laboratories solves data management problems for clients who have terabytes of data and documents. To be able to effectively search these documents, they need to be classified in some way. One classification method is to associate specific concepts (found in a structure called an ontology) with particular documents. The team created software to classify documents in a way that allows a domain expert to review a document and a hierarchy of concepts and indicate in the hierarchy which concepts are represented in the document. This classification information is saved in a classification assignment file (CAF). The domain expert can input a saved CAF file in XML or create a new one. Documents previously classified within a particular concept can be viewed to further refine classification assignments. When the domain expert finishes a classification session the system will output the XML classification assignment file (CAF).

TITLE: Seattle University Classes 1-2-3
NUMBER: CSSE 03.9
SPONSOR: Seattle University Information Technology
SPONSOR LIAISON: Cassy Beekman
FACULTY ADVISOR: Prof. Jeff Gilles
STUDENTS: Cecille Herrera, Tony Pehanich, Donna Strok, Bao Tran, Nibitu Yilma

Seattle University's Classes 123 webserver provides an easy-to-use option for faculty to share course materials and class announcements with students online. Seattle University's Information Technology department asked the team to migrate Classes 123 from a Windows to a UNIX environment in order to have greater stability and ease of site maintenance. The current implementation uses ASP code and stores all data in operating system files. As part of the migration, the team converted all site pages from ASP to PHP code and created a MySQL database to efficiently store all of the course data. Information Technology required the migration to be seamless from the user point of view, so testing focused on maintaining current functionality and appearance.

STUDENT CENTER ROOM 330

TITLE: Ferguson Creek Restoration
NUMBER: CEE 03.1
SPONSOR: Friends of Blackman Lake
SPONSOR LIAISON: Al Hunter
FACULTY ADVISOR: Prof. Mark Siegenthaler
STUDENTS: Kristen Anderson, Christopher Masek, Justin Nodolf

Ferguson Creek is located within the City of Snohomish and is supplied by Blackman Lake. Increased development in the area around the creek has resulted in problems with flooding and a reduction of fish habitat. Friends of Blackman Lake, the City of Snohomish, and the Snohomish School District asked the team to address these two issues. The team developed a feasibility study of restoration alternatives within the lower reaches of the creek that improves storm water conveyance, water quality, and fish passage, and minimizes regulatory and physical impacts to surrounding properties. The study will serve as a planning document for future restoration of the creek. In addition, design plans were developed to resolve the immediate storm flooding problem at the Freshman Campus Middle School. Design features included construction of an open channel, replacement of fish habitat, and reconnection to the existing storm drain system.

TITLE: Stormwater Quality Treatment Facility Monitoring and Design Evaluation
NUMBER: CEE 03.2
SPONSOR: King County Water and Land Resources Division
SPONSOR LIAISONS: Steve Foley, Kate Rhoads
FACULTY ADVISOR: Prof. Rolf Skrinde
STUDENTS: James Barnett, Sally Darmanto, Akharint Khuhapinant, Joelle Torre

King County is responsible for developing stormwater treatment facility designs that meet pollutant removal goals equivalent to those of the Washington State Department of Ecology's Stormwater Management Manual for Western Washington. King County seeks to validate its performance goals for a stormwater treatment facility (a basic wetpond) set forth in the 1998 King County Surface Water Design Manual. A sampling and analysis plan was created and implemented to monitor the pollutants entering and exiting the wetpond. Data collected during the monitoring period was analyzed to determine the wetpond's removal efficiency and whether or not it met the performance goals of the 1998 design manual. Design evaluations were made to enhance the wetpond's pollutant removal efficiency.

TITLE: Fremont Bridge North Approach Span Replacement
NUMBER: CEE 03.3
SPONSOR: Parsons Brinckerhoff Quade and Douglas, Inc.
SPONSOR LIAISON: Derek Kuzak
FACULTY ADVISOR: Prof. Richard Schwaegler
STUDENTS: Mohammed Abu-Tayeh, Michael Pena, Thomas Jackson, Vance Warren

Parsons Brinckerhoff Quade and Douglas, under contract with the City of Seattle, has requested a structural design of a new concrete bridge to replace the existing north approach spans of the Fremont Bridge in Seattle, Washington. The approach spans, along with the bascule portion of the bridge, first opened in 1917. The approaches were not designed according to current highway or seismic codes and have deteriorated significantly. The team produced a preliminary design for the major structural components for replacement of the north approach spans. These components, including the deck, girders, crossbeams and columns, were designed in accordance with the specifications set forth by the Washington State Department of Transportation and American Association of State Highway and Transportation Officials.

STUDENT CENTER ROOM 330

TITLE: Longfellow Creek Study
NUMBER: CEE 03.4
SPONSOR: Seattle Public Utilities
SPONSOR LIAISONS: Beth Schmoyer, Darla Inglis
FACULTY ADVISOR: Prof. Jean Jacoby
STUDENTS: Drena Donofrio, Brian Endres, Mario Lopez-Ramos, Vanessa Rayner

Seattle Public Utilities is responsible for maintaining and monitoring surface water quality throughout the City of Seattle. Longfellow Creek is an urban creek in West Seattle that flows three miles north and discharges into the Duwamish River. Citizens of the Longfellow Creek community have voiced concerns regarding the potential impacts from the West Seattle Golf Course operations on water quality and aquatic life in the creek. Seattle Public Utilities has acknowledged the community's concerns and asked the student team to evaluate possible effects of the golf course's operations on Longfellow Creek. The team performed background research on integrated pesticide management plans, reviewed existing Longfellow Creek data and city golf course operations, and designed and implemented a benthic invertebrate sampling and analysis plan. Based on the above tasks, a project summary report was prepared that included a description of the problem, summaries of the reviewed data, description of methods and data collected, and recommendations for the modification of current golf course operations.

TITLE: City of Seattle Combined Training Facility
NUMBER: CEE 03.5
SPONSOR: SvR Design Company
SPONSOR LIAISONS: Doug Carter, Paul Dedyo
FACULTY ADVISOR: Prof. Phillip Thompson
STUDENTS: Anas Almadani, Teia Neal, Austin Polebitski, Mark Ruebel

SvR Design Company is on a consultant team hired by the City of Seattle to design a facility for training of fire, rescue, and maintenance personnel. In an effort to minimize the use of potable water at the facility, SvR asked the SU team to help in the design of the water recycling system for the fire training exercises. The team designed a system to collect, treat, and store water from the training exercises for reuse. Additionally, the team used hydrologic modeling software and groundwater monitoring data to calculate the amount of surface and subsurface water that could be collected to supplement the supply. A pressurized water distribution system was designed in accordance with City Fire Code requirements to support the fire training exercises using WaterCAD simulation software. The team evaluated alternatives to determine the most cost effective and appropriate water-reuse treatment methods. Treatment system overflows will be released downstream and will comply with City of Seattle stormwater standards for conveyance, detention, and water quality for non-potable use.

TITLE: Absolute Accuracy Compensation for Conventional Articulated Robot
NUMBER: ME 03.1
SPONSOR: Electroimpact, Inc.
SPONSOR LIAISON: Russell DeVlieg
FACULTY ADVISOR: Prof. Greg Mason
STUDENTS: John Buhardi, Matthieu LaCroix, Diane Morrow, Nelson Tam

Electroimpact is an aircraft tooling company that produces assembly systems for the aerospace manufacturing industry. The design team developed software and a methodology to improve the positional accuracy of an articulated arm robot, used in conjunction with a linear track unit. The methodology consists of finding the correct kinematics of the robot and solving for the joint and track deflections using moment equations. The design approach is applicable to any articulated arm robot by changing the kinematic parameters. The positional accuracy of the robot was improved from one eighth of an inch to less than forty one-thousandths of an inch.

STUDENT CENTER ROOM 330

TITLE: Dual Purpose Aero Panels
NUMBER: ME 03.2
SPONSOR: Kenworth Truck Company
SPONSOR LIAISON: Alec Wong
FACULTY ADVISOR: Prof. Bob Cornwell
STUDENTS: John Randolph Farlow, Robert Grimm, Gerald Miller, Diana Weyna Smith, Timothy Michael Stapleton

The team worked with the Kenworth Truck Company, the industry leader in truck design and manufacturing, to develop a cab extender design. The system developed, Dual Purpose Aero Panels (DPAP), has two functions. First, the DPAP system automatically closes the gap between the tractor and trailer at highway speeds to reduce drag. Second, the design reconfigures itself to increase aerodynamic drag to assist during high speed braking operations. The team designed, built, and tested a cab extender that successfully accomplishes these goals while being cost effective to produce, easy to maintain, and reliable in operation. The DPAP is a continuation of Kenworth's 2002 Dynamic Cab Extender project.

TITLE: Finite Element Simulation of Ultrasound Probe Temperature Rise
NUMBER: ME 03.3
SPONSOR: Siemens Medical Systems, Inc.
SPONSOR LIAISON: John Dennis
FACULTY ADVISOR: Prof. Teodora Rutar Shuman
STUDENTS: Alex Byrne, David Dimock, Jeremy Fritts, Don Warner

Siemens Medical Solutions specializes in the research, design and manufacture of medical equipment, including ultrasound. Advances in ultrasound technology have indirectly resulted in an increase of the transducer surface temperature. The surface temperature is approaching Food and Drug Administration regulations for medical equipment that touches skin. This project focuses on understanding the thermal behavior of an ultrasound transducer with respect to operating conditions. Siemens requested that a finite element model be developed to generate temperature profiles in agreement with experimental data for various operating conditions. An investigation into the effects of modified material and geometry parameters was also requested. The team designed a finite element model of the transducer and obtained data in concurrence with the experimental data supplied by Siemens for all operating conditions requested. Variations in materials and geometry were analyzed using a finite element model. Recommendations were made regarding a decrease in transducer surface temperature.

TITLE: Fluid Feed Tank Re-design
NUMBER: ME 03.4
SPONSOR: Wire Dynamix
SPONSOR LIAISON: James Steele
FACULTY ADVISOR: Prof. Pierre C. Gehlen
STUDENTS: Fawn Sieger, Kristin Little, Lawrence Casem, Paul Cook, Steven Cook

Wire Dynamix utilizes fluid feed tanks to inject CableCURE, a silicone-based fluid, into water tree damaged electrical cables to enhance their overall dielectric strength. The current feed tank incorporates a mechanical float valve that occasionally malfunctions by either closing prematurely or not closing at all. Another problem is that the clear PVC walls of each feed tank become discolored with use and prevent accurate readings of the fluid level. Some of these tanks are placed in remote locations preventing easy access. To address these issues, Wire Dynamix asked the team to redesign and build a prototype fluid feed tank. The team designed a coated aluminum feed tank utilizing an internal fluid bladder that will eliminate the need for a float valve. The team also designed a unit that remotely senses the pressure and temperature of the CableCURE fluid and showed how this data can be used to determine the remaining volume of fluid in the tank.

SPONSORING ORGANIZATIONS AND LIAISONS

We want to acknowledge with special thanks the organizations that sponsored projects in 2002-2003, and especially the liaisons representing the sponsors, who worked with the students throughout the year. The time these liaison representatives spent in consultation with our teams is much appreciated by the students and their faculty advisers. It is the liaisons who provide the history and background of each project, its relationship to other work in the sponsoring organization, and much of the technical direction that makes a project successful.

ALSTOM EAI Corporation, Kevin Cheung and Rob St. Andre

Amazon.com, Charles Fordyce and Alan Humphrey

AT&T Wireless Services, Ian King and Caleb Oglesby

The Boeing Company, Commercial Airplanes Group, Kurt Heidergott and Robert C. Kircher, Jr.

The Boeing Company, Phantom Works, Dale Karr and Scott Moody

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Honeywell, Walt Devensky and Dennis Jones

Kenworth Truck Company, Alec Wong

King County Water and Land Resources Division, Steve Foley and Kate Rhoads

Medtronic Physio-Control, Scott Eby and Tom McGrath

Microsoft Corporation, Bryan Barnett

The National Bureau of Asian Research (NBR), Karolos Karnikis and Erick Thompson

Pacific Northwest National Laboratory – Battelle, Judi Thomson, Alan Chappell, and David Thurman

Parsons Brinckerhoff Quade and Douglas, Inc., Derek Kuzak

Philips Medical Systems, Dan Morrison and Dan Schmiesing

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CIVIL AND ENVIRONMENTAL ENGINEERING

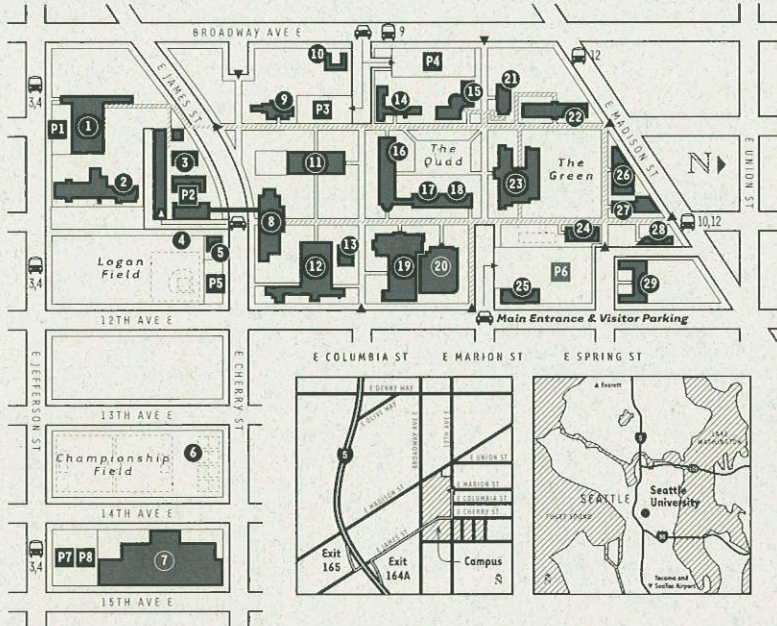
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▲ Campus Entry Point ♿ Accessible Route 🚗 King County Metro 🚗 Parking Entrance P9 Parking Area

- | | | |
|--|--------------------------------|--|
| 22 Administration Building | 25 Campus Services Building | 13 McGoldrick Center |
| 20 Admissions Office | 15 Casey Building | 23 Pigott Building |
| 22 Alumni Office | 24 Chapel of St. Ignatius | 28 Institute of Public Service |
| 3 Archbishop Murphy Apartments | 7 Connolly Center | 23 Public Relations Office |
| 9 Arrupe Jesuit Residence | 22 Development Office | 14 School of Education |
| 16 Arts and Sciences | 16 Engineering Building | 19 School of Law |
| 18 Bannan Biology Wing | 4 Field House | 21 School of Nursing |
| 17 Bannan Building | 26 Fine Arts Building | 10 School of Theology and Ministry Annex |
| 16 Bannan Center for Science and Engineering | 21 Garrard Building | 16 Science and Engineering |
| 12 Bellarmine Residence Hall | 20 Human Resources | 8 Student Center (opens fall 2002) |
| 2 Bessie Burton Sullivan Skilled Nursing Residence | 5 International Student Center | 27 Student Union Building |
| 20 Book Store | 11 Lemieux Library | 19 Sullivan Hall |
| 23 Albers School of Business and Economics | 14 Loyola Hall | 6 Tennis Courts and Facility |
| 1 Campion Residence Hall | 28 Lynn Building | 20 University Services Building |
| | 15 Matteo Ricci College | 25 Xavier Residence Hall |

P1 10th and E. Jefferson Lot F, S
 P2 11th and E. Cherry Garage D, F, S, V
 P3 10th and E. Columbia Lot D, J, S

P4 Broadway and E. Columbia Garage C, F
 P5 12th and E. Cherry Lot S
 P6 12th and E. Marion Lot C, D, S, V

P7 14th and E. Jefferson South Lot S
 P8 14th and E. Jefferson North Lot F

C Carpool D Disabled F Faculty and Staff J Jesuit S Student V Visitor



Seattle University
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Science and Engineering Project Center
 900 Broadway
 Seattle, WA 98122-4340

(206) 296-5504
 sciengpc@seattleu.edu
 www.seattleu.edu/scieng/engpc

DIRECTIONS

Take the James Street exit off 1-5 (southbound exit #165, northbound exit #164A), continue east to Broadway. One long block east of Broadway turn right into the Murphy Apartments Garage and park on the first level. Take the elevator in the northeast corner of the garage up to "SB" and take the skybridge across to the Student Center. Then take the elevator or main stairs down to the first floor to room 160, the LeRoux Conference Center.