Impact of the Newly Renovated and Expanded Holden Hall on Materials Science and Engineering

The renovation of Holden Hall, first built in 1942, will provide the MSE department, along with our colleagues in Mining & Minerals Engineering, with a new home fit for a world-class 21st century engineering program. With the addition of a four-story block behind the historic façade, the effective size of the building will be tripled to nearly 100,000 square feet. Common spaces in the new building will allow for more flexible patterns of work, with reconfigurable collaboration spaces, open group seating, and shareable graduate student offices. This expansion will also house active-learning classrooms, centralized office suites, and upgraded research laboratories, as well as specially designed facilities to enhance departmental operations for MSE in these specific areas:

- MSE Main Office Suite: Reception area highlighted by a display wall for the department's Knoebler Glass Collection, with secure offices for administrative staff.
- The Engineering Communications Program [ECP] Center: Offices and group consultation space for staff of the department's innovative integrated communications program.
- MSE Networking and Advising Center [NAC]: Communal student work area with access to advising staff, conference room, and other collaborative resources. Serves as a vital hub for graduate and undergraduate student life in the department.
- Advanced Computing Facility: Dedicated computer modeling and simulation facility, building on strengths of several faculty research groups in computational materials science. Opens up opportunities for research in line with the ongoing "Materials Genome Initiative."

Particular attention has gone into the design of the new MSE Teaching Laboratories, which not only serve an instructional function for undergraduates but also provide research groups in MSE and other departments with shared access to a wide array of fundamental equipment for common use. Demand on these facilities is thus heavy and constant, and has been under pressure from recent enrollment increases. The planned new facilities will encompass 75% more square footage than available currently, and will include novel capabilities as well as increased capacity. The physically-integrated suite of laboratories has been designed to improve access control for better safety and security of people and resources, to enhance workflow, and to demonstrate the process of materials research, as specimens move from their raw as-formulated states through various stages of processing and preparation for analysis by various instruments and characterization methods. Lab spaces for processing, milling, and mechanical testing have been separated for better isolation of noisy work and vibrations. Also included are several new dedicated spaces:

- Laboratory Operations Center: This room will serve as the main access point for lab supervision, as well as providing A/V capabilities for instruction and presentation, and an open demonstration space for departmental recruiting.
- **M.A.D.E.** (Materials Active Design & Exploration) Lab: Flexible research space for MSE senior design and other long-term student projects, demonstrations, and other *ad hoc* instruction & research needs. Available bench space for at least 12 active projects simultaneously.
- Chemical Processes Laboratory: Core facility for the department's Corrosion Science initiative – in line with the National Strategy for Corrosion Research outlined by the National Academies of Science, Engineering, and Medicine in 2011 – and other 'wet' materials chemistry.
- Advanced Instrumental Analysis Suite: Building on our existing Thermal Analysis Laboratory, this facility is slated to include upgraded capabilities in calorimetry, thermogravimetric analysis, rheology, and dynamic mechanical analysis, as well as a spectrum of new equipment, bringing our facilities up to world-class level, including benchtop SEM/EDS, XRD, and acoustic microscope for structural analysis;

atomic force microscope and step profilometer for surface analysis; high-temperature thermal conductivity tester; piezoelectric poling station and dielectric/optical testing for investigation of electromagnetic/electro-optic properties.

Exterior view looking towards northeast

Learning theater