Columbia University
Graduate School of Architecture, Planning and Preservation

Architecture A4809X – Envelopes: An introduction to Enclosure Systems and Design

Erik Verboon, Professor (adjunct) Fall 2014

Course Description

This course is an introduction to building contemporary building envelope systems, their constituent materials, and necessary performance criteria. Through a lecture/seminar format, the students will be exposed to a number or current façade system strategies as well as the process of façade design and engineering that will prepare them for the advanced curtain wall design course offered in subsequent semesters.

While the course will cover modern systems and recent developments in façade technologies, particular attention will be paid to the various aspects of façade performance that include energy, sustainability, comfort, constructability. The building envelope is no longer seen as a static boundary between exterior and interior, but rather performative building system that has a direct impact on the environmental and comfort performance of the building as a whole. When conceived and designed as part of an integrated building system, the building envelope has the ability to play an important role in a building's performance strategy.

Finally, while the advanced course offered in later semesters focuses on curtain walls, this course will introduce students to other types of façade construction as well as all aspects of the building envelope including below-grade conditions and roofing. The performance of these elements in relation to local code requirements will be presented and discussed in detail. At the courses completion, students should be equipped to collate a project's performance criteria and be able to provide a number of appropriate envelope systems to meet those various criteria.

Lectures will be presented in a PowerPoint projection and supplemented with various technical readings supplied in PDF form. It is foreseen that the course will incorporate a single guest lecturer who is an expert in building energy analysis who will demonstrate case studies of full building energy analysis to study the impact of the building envelope. If the schedule allows, a field trip to a building's construction site will be made.

Course Requirements

Students will be graded through their course attendance as well as two multiple cjoise exams at mid-semester and at the final semester. Furthermore, students will be required to perform a single case study of a chosen envelope system.

Participation in course lectures is encouraged and will be considered in grading. This is assessed by the students success in exams, in-class discussions, and case-study assignment completion.

Grades are assed as follows:

Class Attendance and Participation.....50%
Homework/Research/Case Study Project.....20%
Mid-Term and Final Exams.....30%

Reading

Assigned readings will be technical in nature and will consist primarily of excerpts from professional organization documents such as:

ASHRAE (American Society of Heating Refrigeration and Air Conditioning)
ASTM (American Society for Testing and Materials)

ASCE (American Society of Civil Engineers))
CWCT (Center for Window and Cladding Technology)

All readings will be provided to students in pdf format.

Professor Info:

Erik Verboon is an adjunct Professor and has taught at both Pratt Institute School of Architecture and Stevens Institute of Technology School of Mechanical Engineering over the past 7 years. Professor Verboon leads the Façade Engineering team at Buro Happold New York. Founded in 1993, Buro Happold has provided integrated engineering services for hundreds of high profile projects around the world.

Professor Verboon's architectural clients include SHoP Architects, Robert A.M. Stern, Snohetta, Ennead, Richard Meier & Partners, FX Fowle, KPF, Diller Scofidio + Renfro, Gensler, Kennedy-Violich Architects, The Living, Selldorf Architects, Peter Marino Architects, BKSK, Cetra Ruddy, Moshe Safdie Architects, 360 Architects, ODA, Sasaki, TVS, Callison, CookFox. Herzog & DeMuron, UN Studio, Adjaye & Associates, Nastasi Architects, Pelli-Clark-Pelli & Associates, Fosters and Partners, and many others.

Students can contact Prof. Verboon to arrange office hours. Contact information is as follows:

Office Address: 100 Broadway Flr 23,
Office Phone: 212-616-0393
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Course Outline:

Class No.	Date	Topic
1	9/4/14	A Brief History of Enclosures and their Drivers
2	9/11/14	Design Drivers: Performance Criteria from Code to Comfort
3	9/18/14	Understanding the Enclosure Design Process and the Tools that Help
4	9/25/14	Preventing a Soggy Bottom…and Top: Below grade and roofing waterproofing and insulation.
5	10/2/14	The Vertical Enclosure Part 1: Bearing and Mass Walls
6	10/9/14	The Vertical Enclosure Part 2: Cavity Walls & Rain Screens
7	10/16/14	The Vertical Enclosure Part 3: Fenestration-Windows, Storefronts, and Curtain Walls
8	10/23/14	Mid Term Exam
9	10/30/14	The Vertical Enclosure Part 4: Passive Design Strategies
10	11/6/14	The Vertical Enclosure Part 5: Active Design Strategies
11	11/13/14	Assessing Enclosure Performance during the design process
12	11/20/14	System Synergies: Integrated Facades Design Assessment (Guest Lecturer)
	11/27/14	Thanksgiving – No Class
13	12/4/14	Final Review Week – Exam
14	12/11/14	Field Trip

NOTE: Class topics, format, quiz dates, etc. are subject to change as class progresses.