



Hudson Yards, New York City

Arch 172:
Building Construction 1
Fall 2018:
Course Home Page

course outline

last updated November 21, 2018 8:47 AM

Course Description:

This is an introduction to building construction dealing with the systems surrounding the making of buildings, building science, soils, foundations, wood frame systems and masonry systems. The course begins with an historical introduction of the primary materials of stone, steel and reinforced concrete to discover the impact of their development on Architectural design through the past 300 years.

Students will

- keep a detailed sketchbook of examples and details addressed in class
- prepare a sketch per week of an aspect of construction/materiality/the city
- complete a series of quizzes
- complete an end of term major project.

Teaching Assistants: [Nadia Shahed](#)

Laptop policy:

Please note. ALL notes are to be taken by hand in your required sketchbook. Sketchbooks will be collected at the end of the last class and will be graded on their completeness as well as neatness. Failure to attend class and take notes will be very evident. Laptops are NOT permitted in the class, nor are cellphones or mP3 players.

Office Hours:

Wednesdays 1 to 2pm

Email, anytime tboake@uwaterloo.ca

Schedule of Classes - Wednesday, 2 to 5pm- ARC 1101

Date **Topic and Assignments**

For a BONUS mark of 1% please log into LEARN and provide a profile picture. Has to be done before September 30!

Sept.
12

INTRODUCTION: Do You Own a Hardhat and Safety Boots?

INTRODUCTION: FROM TECHNIQUE TO TECHNOLOGY

Stone Construction: General Principles and Stereometry

Architects of note: Brunelleschi, Palladio, Soufflot

Material nature of stone: compressive

READ:

Course Notes:

Stone Construction [link](#)

Intrinsically Linked through Materiality [link](#)

Internet:

The Mystery of the Pyramids [link](#) (what do YOU think?)

More on Vitruvius [link](#)

50 Architects You Should Know: Brunelleschi, Bramante, Alberti, Michelangelo, Bernini, Palladio, Wren, Gaudi, Jefferson, Schinkel

SKETCHING ASSIGNMENT: A STONE DETAIL/BUILDING (this assignment is given OUT on the 12th and due on the 19th...)

*****IMPORTANT NOTE:** SKETCHES WILL BE RECEIVED BY THE TEACHING ASSISTANTS FROM 1:45 to 2pm AND NOTED AS SUBMITTED. LATE SKETCHES WILL NOT BE GRADED AND WILL BE AWARDED A MARK OF ZERO. BE ON TIME! SKETCHES FOR THIS CLASS CANNOT BE SUBMITTED FOR ANOTHER CLASS. SKETCHES ARE TO BE DRAWN FROM LIFE, NOT PHOTOS.



Sept.
19

IRON AND STEEL: THE CREATION OF THE STRUCTURAL SKELETON AND THE EVOLUTION OF MODERNISM

An historical investigation of the invention of iron and steel framing systems and the ramifications on modern architectural conceptual design theories and implementation.

Architects of note: Behrens, Gropius, Mies, any High Tech architects like Foster, Rogers, Piano

Material nature of steel: tensile

READ:

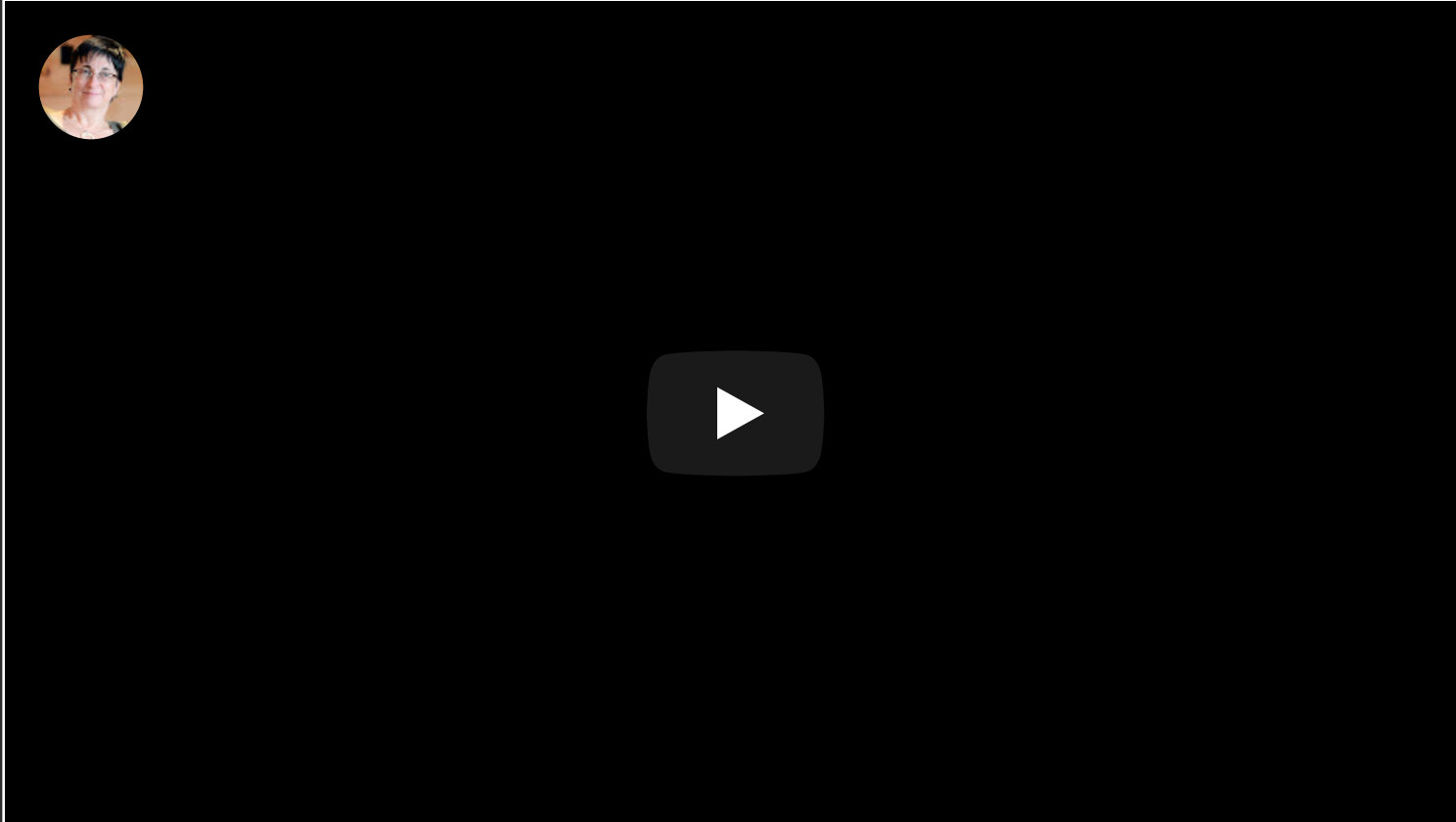
Allen: Chapter 11: Steel Frame Construction

Course Notes: Steel

[images/course_pdf/172-ch5.pdf](#)

50 Architects You Should Know: Ledoux, Sullivan, Burnham, Horta, Gropius, Mies, Neutra, Pei, Rogers, Meier, Foster, Herzog&deMeuron, Gehry, Koolhaas, Nouvel

SKETCHING ASSIGNMENT: SKETCH SOME EXPOSED STEEL DETAILS



Sept.
26

THE EVOLUTION OF REINFORCED CONCRETE AND ITS CONTRIBUTION TO MODERNISM

An historical investigation of the invention of reinforced concrete and the ramifications of the monolithic structure on modern design theories and construction practices.

Architects of note: LeCorbusier, Pier Luigi Nervi, Eero Saarinen

Material nature of concrete: compressive

READ:

Allen: Chapter 13: Concrete Construction

Course notes: Reinforced Concrete

[images/course_pdf/172-ch6.pdf](#)

50 Architects You Should Know: Wright, Perret, Le Corbusier, Kahn, Niemeyer, Saarinen, Ando, Hadid, Ito, Tange

[Info on Brutalism](#)

SKETCHING ASSIGNMENT: SKETCH SOMETHING CONSTRUCTED IN REINFORCED CONCRETE THAT HAS SOME TEXTURE.



I just updated this lecture for Architectural Engineering and added some titles and images so figured I would provide you with the copy.

Oct. 3

Quiz #1: Connecting the Nature of the Material to Design 5% (covering first 3 lectures)

The tests will be based on materials that are noted in the title of the test. So, it will include: my lecture, the powerpoint, the readings noted for those weeks.

Readings are noted in the box for the topic week. It would be helpful if you read them before the class, as what I am saying would seem clearer. At least read them after the class, to refresh and supplement the lecture. And read them at least before the test. I do NOT make up my lectures based upon the textbook. That is pretty repetitive and boring. I supplement the text. They work together.

MAKING BUILDINGS/DESIGNING BUILDINGS

The Process; Zoning; Codes; The Residential Project

READ:

Fundamentals of Building Construction:

Chapter 1: Making Buildings

Course Notes: Regulatory Determinants [link](#)

Canadian Wood Frame House Construction: p. 2-18

Internet:

Have a look at the Official Plan for the City of Toronto [link](#)

50 Architects You Should Know: Aalto, Johnson, Pei, Rossi, SOM, Libeskind

SKETCHING ASSIGNMENT: SKETCH SOMETHING THAT LOOKS ILLEGAL IN TERMS OF THE WAY THE BUILDING IS SITUATED ON A SITE OR CONSTRUCTED

[making powerpoint](#)

Oct. 10

NO CLASS - READING DAYS - AKA FALL BREAK

Oct.

Quiz #2: Making Buildings/Designing Buildings (5%)

FRIDAY.
12

SOILS, EXCAVATIONS AND SURVEYING

The implications of site conditions on design, Introduction to the principles of surveying and how to read a survey

2 to
5pm

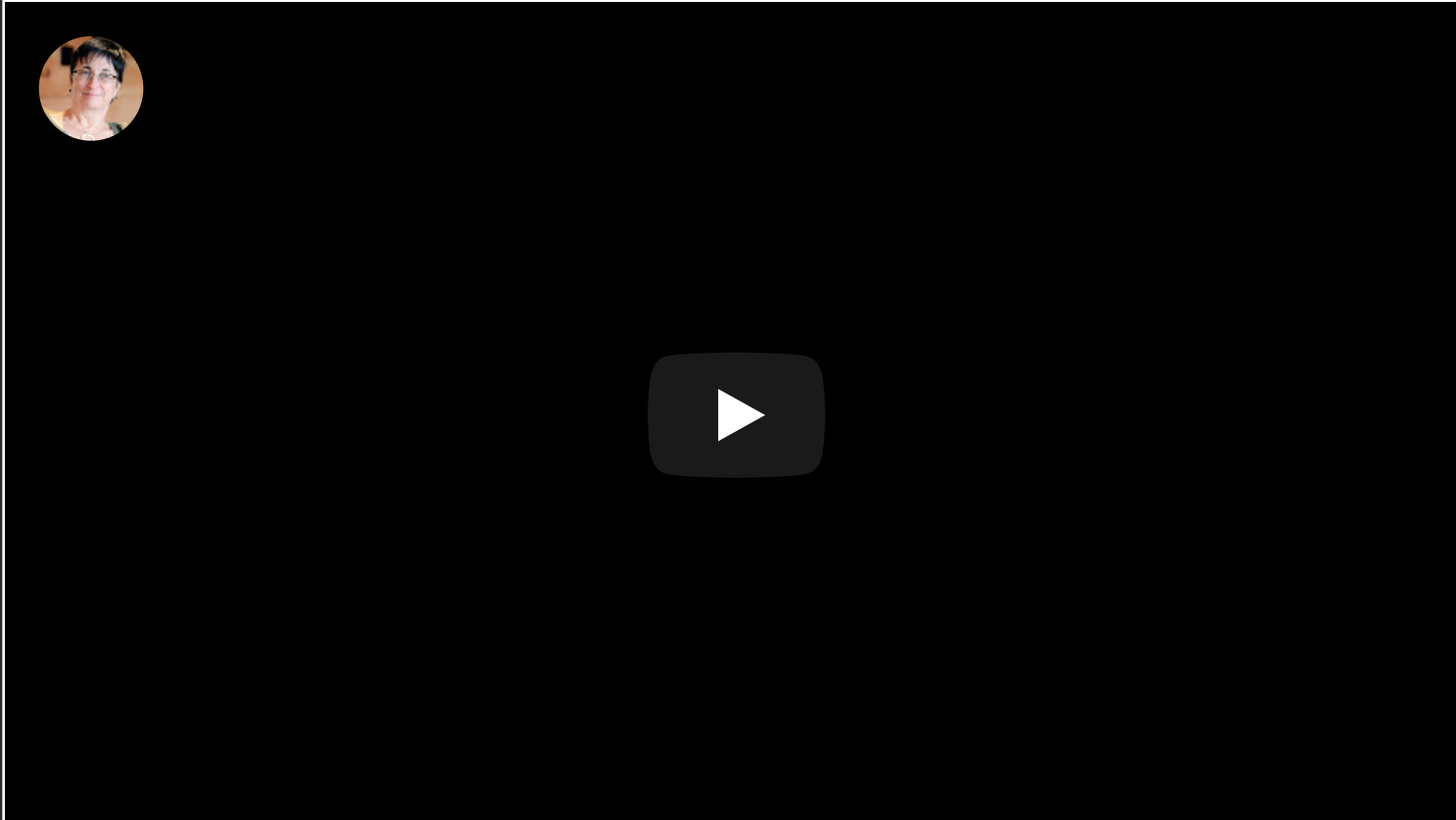
FOUNDATIONS FOR SMALL TO MEDIUM BUILDINGS

An investigation of shallow foundation types as linked to building design strategy and choices

READ:

Fundamentals of Building Construction:
Chapter 2: Foundations (excluding portion on deep foundations)
Canadian Wood Frame House Construction:
Location and Excavation p. 29-36
Canadian Wood Frame House Construction:
Concrete Work p.37-42
Footings, Foundations and Slabs p.43-72

SKETCHING ASSIGNMENT: NORTH ARROW AND MATCHING GRAPHIC SCALE



Oct. 17

[Design Build Project](#)

class will take place in the LOFT. Please come prepared and with supplies as specified on the link.

SKETCHING ASSIGNMENT: something from the structure you built.

The pasta structures are posted on the WASA Fb page for voting for people's choice award.

<https://www.facebook.com/groups/2226433053/>

Oct. 24

Quiz #3: Soils, Surveying and Foundations (5%)

FILM: "My First Building" by Aaron Nelson (60 minutes)

Please take notes during the film. This is part of your course work and will be evaluated when the sketchbooks are graded.

SKETCHING ASSIGNMENT: something from a built form that you find interesting

Oct. 31

AN INTRODUCTION TO WOOD CONSTRUCTION

The materiality of wood and the structural implications and potentials of wood systems; sawn framing (traditional) versus engineered wood (more recent)

READ:

Fundamentals of Building Construction:
Chapter 3: Wood
Chapter 4: Heavy Timber Frame Construction

Canadian Wood Frame Construction:
Protection and Care of Materials on Site p.73-76
Lumber and Other Wood Products p.77-82
Framing the House p.83-88

SKETCHING ASSIGNMENT: SKETCH SOMETHING THAT SHOWS THE SKELETAL WOOD FRAME, PREFERABLY SOMETHING UNDER CONSTRUCTION OR EXPOSED TIMBERS. DO NOT ENTER A CONSTRUCTION SITE TO DO THIS.

[Structure and Properties of Wood](#), [Engineered Wood](#)

Nov. 7

WOOD FRAME CONSTRUCTION

An in depth investigation of the making and detailing of the wood frame building

READ:

Fundamentals of Building Construction:

Chapters 5, 6 and 7: Wood Light Frame Construction, Exterior and Interior Finishes.

Canadian Wood Frame Construction:

Floor Framing, Wall Framing, Ceiling and Roof Framing, Roof Sheathing and Coverings, Wall Sheathing and Exterior Finishes, Exterior Trim and Millwork p.89-190

Wood Resources [link](#)

Interesting video of framing in Japan [link](#)

SKETCHING ASSIGNMENT: WOOD FRAME CONSTRUCTION



Nov. 14

Quiz #4: Wood Frame Construction (5%)

AN INTRODUCTION TO MASONRY CONSTRUCTION

Introduction to the fundamentals of masonry construction, including brick and concrete block, modular sizing, terminology, building practices

READ:

Fundamentals of Building Construction:

Chapter 8: Brick Masonry

Chapter 9: Stone and Concrete Masonry

Links (for reference, not for the quiz):

Brick Institute of America <http://www.bia.org/>

Hanson Brick (coursing charts and good general diagrams)

http://www.hansonbrick.com/english/products/sizes_coursing_us.php



Nov. 21

Quiz #5: Masonry Basics (5%) - quiz on first part of lecture only

THE RESIDENTIAL PROJECT:

Building and fire code issues as they apply to housing.

BARRIER FREE DESIGN:

It is a legal requirement that we design for barrier free in all public buildings, no matter how large or small. This includes interior and exterior requirements.

<https://www.constructioncanada.net/a-practical-guide-to-barrier-free-washrooms/>

[City of Toronto Guide for Barrier Free Design](#)

Nov. 28

MASONRY AND WOOD FRAME CONSTRUCTION AND CASE STUDIES

A detailed investigation of several building case studies to expose the ramifications of proper and improper detailing

READ:

Fundamentals of Building Construction:
Chapter 10: Masonry Load Bearing Wall Construction

[image of a brick "soft joint"](#)

SKETCHBOOKS ARE DUE AT THE END OF THIS CLASS

Dec. 17

Hand in for Final Term Project at 4pm to the Front Office.

[link to information on Final Term Project](#)

Evaluation:

Evaluation for this course will take place as follows. There will be a series of SIX short (30 minute) tests on both the content of the lectures and the assigned reading material. These tests will take place during class time, as scheduled in the course outline. You will be permitted to use your sketchbooks as aids for the test. If you are not present to take the test when given, you will forfeit the opportunity to write the test unless your circumstances are substantiated by a doctor's certificate. Missing two tests will constitute a failure of the entire course. The final term grade will consist of an average of submitted work as follows, however, **FAILURE TO ACHIEVE A PASSING GRADE IN THE TERM PROJECT WILL CONSTITUTE FAILURE OF THE COURSE.** Final term projects are to be handed in hard copy, i.e. "on paper". *Digital submissions will not be accepted.*

QUIZZES: 25% 5 tests @ 5% each

SKETCHBOOK: 20%

You are required to keep a sketchbook/notebook for the course. 8 ½" by 11" format is recommended with BLANK pages. I will be using the blackboard to sketch technical aspects and details during class. These are to be recorded in your sketchbooks as well as written notes and supplemental notes from study. Grades are allocated based upon both notes taken in class *and additional notes taken while reviewing the Allen text for study purposes.* The sketchbook will be submitted with the final project at the end of term and graded. **PLEASE DO NOT FORGET TO SUBMIT YOUR SKETCHBOOK.** These will be returned at the in time for you to use them for your final project in this course. The sketchbook will be able to be used during the quizzes for reference. You will also be expected to keep preliminary idea drawings for the Final Project in the sketchbook. It will be handed in immediately after the last class for evaluation. **Evaluation will be graded /10 for the number of lectures attended, including additional notes and /10 for the completeness and quality of the sketchbook. ie. if you miss 2 lectures you will lose both the points for having attended as well as the quality/completeness.**

SKETCHES: 10%

Sketching is one of the basic talents that an architect must develop in order to be able to communicate their ideas. Students are required to go out into Cambridge/the city and prepare one sketch for each week of the term (10 in total) that address the construction processes, detailing and materiality of the city. The particular topic will be announced during the class. *The sketches should be included in your sketchbook. The sketches will be graded each week. You will receive either 1/1 or 0/1 for the sketch. If it is not complete when due, you will be awarded zero for the sketch.*

FINAL DESIGN: 45% a set of drawings

Reference Texts and other Materials:

The following texts will be used for BOTH Arch 172 and Arch 173 (Winter term).

CMHC. Canadian Wood Frame House Construction. Available as a downloadable PDF. [here](#)

Allen, Edward. Fundamentals of Building Construction: Materials and Methods.

Sixth Edition preferred. If you are using an older edition, please refer to the chapter titles (rather than chapter numbers) and read the appropriate sections. Honestly, whatever you can get your hands on will do. This is an expensive text but it is also used for Arch 173: Building Construction 2 and will serve as a reference for the balance of your student career.

50 Architects You Should Know. Prestel Press.

<http://www.amazon.ca/50-Architects-You-Should-Know/dp/3791340433>

Course notes. Available online. As linked throughout the course outline, or find them all here:

[crsnotes.html](#)

Wood Resources:

Below are links to pdf copies of some fantastic guides put together by Canada Mortgage and Housing Corporation on different construction practices in Canada. They are fairly hefty in size, so download with a good connection. Each has a series of details contained within the text. The one on "Wood Frame" would be applicable to most areas of Canada. Since BC is so wet, they have

developed a special set of details for BC construction. You could also refer to these for your work -- they are just "better" from a building science perspective. The BC guide also includes some more developed information on different assemblies. Those of you detailing roofs without attics, need to look in the BC guide under roof assemblies for a sandwich type roof that is comprised of rigid polystyrene insulation rather than batt insulation. You need to vent batt insulation as it can retain moisture and freeze/leak. Rigid polystyrene (the blue stuff that comes in boards) is a closed cell system and does not get waterlogged. It is used on flat roofs and below grade around foundations.

CMHC Best Practice Guides: [Wood Frame Guide](#), [BC Wood Frame Guide](#), [Brick and Block](#) and [Brick and Steel Stud](#)

All of the CMHC Best Practice Guides are available in binder as well as CD form in Musagetes.

Just looking for neat ideas of how to build in wood? Look at the Wood Design & Building periodicals in Musagetes!

Powerpoint Presentations:

The files listed below will take you to some interactive powerpoint files. Upload the files then go to the slide show mode. Every time you click your mouse, the detail will "build itself". You will be able to see all the materials and the sequence of assembly. They are all for wood frame with stucco or wood veneer. You will have to extrapolate the sequence as it applies to masonry veneer situations.

Window Head [link](#)

Window Sill [link](#)

Door Sill [link](#)

Exterior Stair Landing [link](#)

"Saddle" (where a roof parapet from a lower roof meets a wall) [link](#)

Exhaust Vent [link](#)

Avoidance of Academic Offenses

Academic Integrity: To create and promote a culture of academic integrity, the behaviour of all members of the University of Waterloo is based on honesty, trust, fairness, respect and responsibility.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4, <http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 - Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>

Appeals: A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term. Once registered with OPD, please meet with the professor, in confidence, during my office hours to discuss your needs.

