

ARCH 1231 BUILDING TECHNOLOGY I

1 lecture hour and 4 lab/studio hours, 3 credits

Course Description: An introduction to basic materials of construction and the fundamental principals of hand drafting and system analysis. The coursework includes surveying existing conditions, development of plans, elevations, and sections, and basic details as well as the study of material properties and applications.

Course context: This course is positioned between the Intro to Architecture course and the higher-level building technology courses. This course will prepare you for further exploration of building technology, technical documentation, and understanding of structure, materials, and building assemblies.

Prerequisites: CUNY Proficiency in Reading and Mathematics or for high school students enrolled through collaborative programs or City Poly High School who have not yet taken the SAT or completed Regents requirements; in Reading, a PSAT score of 48 or higher in Verbal and/ or Writing or successful completion of six units of high school English with an average of 80 or above and high school recommendation; and in Mathematics, a PSAT score of 50 or higher in Mathematics or a 75 or above on the math Regents exam and the successful completion of 4 units of high school algebra and geometry with an 80 or above average.
Equivalent to old course ARCH 1130

Required Texts:

Allen, Edward. *Fundamentals of Building Construction: Materials and Methods*, John Wiley & Sons, 2014.
Ching, Francis. *Building Construction Illustrated 5th Ed.* John Wiley and Sons, 2014.

Recommended Text:

Ching, Francis. *Architecture-Form, Space, & Order*. John Wiley and Sons, 2007.

Suggested Reference: See the City Tech Openlab for additional reference materials.

Attendance Policy: Regular attendance is critical. Students with more than 10% absences are likely to fall behind and struggle to earn a passing grade. Exceeding this limit will expose the student to failing at the discretion of the instructor due to lack of class participation and mastery of class material. For the purposes of record, two lateness are considered as one absence.

Academic Integrity: Students and all others who work with information, ideas, texts, images, music, inventions and other intellectual property owe their audience and sources accuracy and honesty in using, crediting and citation of sources. As a community of intellectual and professional workers, the college recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension and expulsion.

Course Structure: This course combines class discussions based on the readings, site investigations, and drawing labs. Students are required to maintain a combined notebook/sketchbook for all readings and site investigations. Students will learn to develop architectural drawings by hand as well as using digital tools.

Grading:

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|-----|-----------------------------------|
| 10% | Module 1 |
| 20% | Module 2 |
| 30% | Module 3 |
| 35% | Module 4 |
| 5% | Participation in Class Discussion |

GRADING DETAILS: assignments with * require progress documentation and review by professor

MODULE 1: 100 pts

Drawing Assignments:

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|--------------------------|--------|
| Line weight + Quality: | 10 pts |
| Guideline Underlay* | 9 pts |
| Floor Plan | 10 pts |
| Projected Section Setup* | 8 pts |
| Section 1 | 10 pts |
| Section 2 | 10 pts |
| Axon Setup* | 8 pts |
| Axon | 10 pts |

Reading Notes:

| | |
|----------------------|-------|
| Egress | 4 pts |
| Stair Design | 4 pts |
| Stair Requirements | 4 pts |
| Stair Configurations | 4 pts |

Sketchbook Assignments:

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|-------------|-------|
| Site Survey | 4 pts |
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Assessments:

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|-------------------------|-------|
| Reading Drawings + Text | 5 pts |
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MODULE 2: 200 pts

Drawing Assignment:

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|---------------------------|--------|
| Line weight + Quality | 20 pts |
| Grid/Centerline Underlay* | 20 pts |
| Guidelines + Dimensions | 20 pts |
| Poche Layer | 20 pts |

MODULE 2 continued:

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|-------------------------|--------|
| Stairs+Cutline/Up Arrow | 20 pts |
| Windows/Doors | 18 pts |

Reading Notes:

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|---------------------|-------|
| Building Elements | 4 pts |
| Forces | 4 pts |
| Columns | 4 pts |
| Beams Spans Trusses | 4 pts |
| Frames Walls Plates | 4 pts |
| Arches Vaults Domes | 4 pts |
| Joints Connections | 4 pts |
| Structural Units | 4 pts |
| Structural Spans | 4 pts |
| Structural Patterns | 4 pts |
| Lateral Stability | 4 pts |
| Stone | 4 pts |
| Brick/CMU | 4 pts |
| Wood | 4 pts |
| Steel | 4 pts |
| Concrete + Reinf. | 4 pts |

Sketchbook Assignments:

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|------------------------|-------|
| Site Investigation | 6 pts |
| Structural Components | 6 pts |
| Materials + Properties | 6 pts |

MODULE 3: 300 pts**Drawing Assignments:**

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|------------------------|--------|
| Line weight + Quality: | 25 pts |
| Grid Underlay* | 25 pts |
| Axon Guidelines* | 25 pts |
| Axon | 25 pts |
| Structural Overlay | 25 pts |
| Exploded Axon | 26 pts |
| Calculations | 27 pts |
| Annotations | 27 pts |
| Component Sections | 27 pts |

Reading Notes:

| | |
|--------------------------|---------------|
| Brick/CMU Bonding | 4 pts |
| Wood Components | 4 pts |
| Steel Shapes | 4 pts |
| Reinforced Concrete | 4 pts |
| Precast Concrete Flr Sys | 4 pts |
| Brick Masonry | 16 pts |
| Masonry Arches + Lintels | 4 pts |
| Wood Beams + Joists | 4 pts |
| Wood Subfloor, Decking | 4 pts |
| Wood Plank and Beam | 4 pts |
| Steel Beams | 4 pts |
| Steel Open-Web Joists | 4 pts |
| Metal Decking | 4 pts |
| Reinfc'd Concrete Beams | 4 pts |

MODULE 4: 350 pts**Drawing Assignments:**

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|---------------------------|--------|
| Line weight + Quality: | 30 pts |
| Layout Underlay* | 20 pts |
| Axon Guidelines* | 22 pts |
| Axon | 30 pts |
| Plan/Elev/Sect Guidelines | 30 pts |
| Plan Detail | 30 pts |
| Elev Detail | 30pts |
| Section Detail | 30 pts |
| Annotations | 23 pts |
| R-Value Calc | 22 pts |

Reading Notes:

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|--------------------------------|---------------|
| Building Envelop | 4 pts |
| Walls: Moist + Flashing | 4 pts |
| Thermal Protection | 4 pts |
| Designing Ext. Wall Sys | 16 pts |
| CMU + Brick | 4 pts |
| Stone | 4 pts |
| Windows | 4 pts |
| Masonry Wall Const. | 16 pts |
| Windows and Doors | 16 pts |

Sketchbook Assignments:

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|------------------------|-------|
| Assemb. + Perform Walk | 6 pts |
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Assessments:

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|-------------------------|-------|
| Reading Drawings + Text | 5 pts |
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CLASS PARTICIPATION 50 pts

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|-------------|--------|
| Discussions | 25 pts |
| Site Walks | 25 pts |

| General Education Learning Outcomes / Assessment Methods | |
|--|---|
| Learning Outcomes | Assessment Methods |
| Upon successful completion of this course the student shall be able to: | To evaluate the students' achievement of the learning objectives, the professor will do the following: |
| 1. Develop Knowledge from the range of architectural disciplinary concepts presented in the course. | <ul style="list-style-type: none"> • Review student notebooks, observe student participation in class discussions, and review student applications of disciplinary concepts in drawing assignments. |
| 2. Use the texts assigned in the course as well as background knowledge from within the discipline in order to Draw Inferences from the material. | <ul style="list-style-type: none"> • Use a pre and post written exam to assess students' development and achievement over the course of the semester. |
| 3. Apply Information from the reading within the discipline. | <ul style="list-style-type: none"> • Review student applications of disciplinary concepts in drawing assignments. |

| National Architectural Accrediting Board (NAAB) Students Performance Criteria (SPC) / Assessment Methods | |
|--|---|
| Learning Outcomes | Assessment Methods |
| Upon successful completion of this course the student shall be able to: | To evaluate the students' achievement of the learning objectives, the professor will do the following: |
| 4. Understand the fundamentals of formal ordering systems and the capacity to inform two- and three-dimensional design. | 4. Review student drawing assignments with implementation of the organizing grid. |
| 5. Understand some of the basic principles used in the appropriate selection of interior and exterior construction materials, finishes, products, components, and assemblies based on their inherent performance, including environmental impact and reuse. | 5. Review student notebooks and drawing assignments with application of material properties, rules of thumb, and performance analysis. |

| Course Specific Learning Outcomes / Assessment Methods | |
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| Learning Outcomes | Assessment Methods |
| Upon successful completion of this course the student shall be able to: | To evaluate the students' achievement of the learning objectives, the professor will do the following: |
| 6. Layout plan drawings by hand and with digital tools. | 6. Review student plan assignments for accuracy and application of line weights and drawing conventions. |
| 7. Understand and apply basic principles of structural characteristics of materials following rules of thumb. | 7. Review student drawing assignments for accurate application of rules of thumb to sizing structural elements for a specific span. |

Weekly Course Outline:

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| MODULE I | CLASS 1 | <i>Activity/Assessment:</i> | Intro, Reading Texts, Reading Drawings |
| | CLASS 2 | SITE VISIT: <i>Sketchbook:</i> | Measured Space Site Survey Measured Space Site Survey |
| | CLASS 3 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes: Additional Discussion: | Measured Space Arch Drawing / Orthographic Projection Measured Space Plan Guideline Underlay* Stairs + Egress (Reading #1) Note Taking + Reading |
| | CLASS 4 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Sketchbook:</i> <i>Drawing Lab:</i> | Measured Space Stairs + Egress (Reading #1) Egress, Configurations, Code, Design Stair Site Investigation (added to survey) Measured Space Plans w/Stairs |
| | CLASS 5 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> | Measured Space Arch Drawing / Orthographic Projection Measured Space Section Setup* |
| | CLASS 6 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> | Measured Space Arch Drawing / Orthographic Projection Measured Space Axon Setup* |
| | CLASS 7 | <i>Assignment Review:</i> <i>Drawing Lab:</i> Reading Notes: | Measured Space Assignment Feedback Submission Prep Demonstration Building Elements (Reading #2) |
| | SUBMISSION | MODULE 1: | Measured Space Drawing Assignment Reading #1 Notes <u>Sketchbook Assignment</u> DUE DATE: Submit Formatted Drawing / Notes / Sketchbook Files by CLASS 9 |

MODULE 2

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| CLASS 8 | SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i> | Case Study Building Site Building Elements (Reading #2) The Building, Space, Circulation, Stairs, Transparency Site Investigation Assignment |
| CLASS 9 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes: Additional Discussion: | Case Study Floor Plans Arch Drawing / Plan Layout Case Study Plan Grid/Centerlines Underlay* Structural Components (Reading #3) Note Taking + Reading |
| CLASS 10 | SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i> | Structure Walk Structural Components (Reading #3) Forces, Columns, Beams, Spans, Trusses Frames, Walls, Plates, Arches, Vaults, Domes, Joints, Connections Structural Components Sketches |
| CLASS 11 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes: | Case Study Floor Plans Arch Drawing / Plan Layout Case Study Plan Guidelines/Geometry Structural Typologies (Reading #4) |
| CLASS 12 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes: | Case Study Floor Plans Structural Typologies (Reading #4) Structural Units, Spans, Patterns Lateral Stability, Relation b/w Structure + Space Case Study Plan Development Materials + Properties (Reading #5) |
| CLASS 13 | SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i> | Materials Walk Materials + Properties (Reading #5) Stone, Brick, CMU, Wood, Concrete, Steel Materials + Properties Sketches |
| CLASS 14 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Case Study Floor Plans Case Study Plan Development |
| CLASS 15 | <i>Assignment Review:</i> | Case Study Floor Plans Feedback |
| SUBMISSION | MODULE 2: | Case Study Floor Plans Assignment Readings #2,3,4,5 Notes <u>Sketchbook Assignments (3)</u> DUE DATE: Submit Formatted Drawings/ Notes/Sketchbook Files by CLASS 17 |

MODULE 3

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| CLASS 16 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> <i>Reading Notes:</i> | Case Study Axon + Structural Study Axon Grid + Guidelines* Material Modules (Reading #6) |
| CLASS 17 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> <i>Reading Notes:</i> | Case Study Axon + Structural Study Material Modules Brick/CMU Bonding, Wood Components, Steel Shapes, Concrete Beams Axon Development Spans + Rules of Thumb (Reading #7) |
| CLASS 18 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> | Case Study Axon + Structural Study Spans + Rules of Thumb (Reading #7) Masonry Arches, Lintels, Wood Beams + Joists, Steel Beams + Joists, Reinforced Concrete Beams Structural Overlay on Axon |
| CLASS 19 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Case Study Axon + Structural Study Structural Calcs + Sections |
| CLASS 20 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Case Study Axon + Structural Study Structural Exploded Axon |
| CLASS 21 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Case Study Axon + Structural Study Structural Exploded Axon |
| CLASS 22 | <i>Assignment Review:</i> | Case Study Axon + Struct Study Feedback |
| SUBMISSION | MODULE 3: | Case Study Axon + Struct Study Assignment Readings #6,7 Notes DUE DATE: Submit Formatted Drawings/ Notes Files by CLASS 24 |

MODULE 4

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|-------------------|---|---|
| CLASS 23 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> <i>Reading Notes:</i> | Masonry Exterior Wall Detail + Analysis Plan/Section/Elevation Detail Layout Underlay Assemblies + Performance (Reading #8) |
| CLASS 24 | SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i> <i>Reading Notes:</i> | Assemblies + Performance Walk Assemblies + Performance (Reading #8) Building Envelop, Exterior Walls, Moisture Protection, Flashing, Thermal Protection Designing Exterior Walls Assemblies + Performance Sketches Masonry Envelope Assemblies (Reading #9) |
| CLASS 25 | <i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> | Masonry Exterior Wall Detail + Analysis Masonry Envelop Assemblies Masonry Cavity Walls, Brick Coursing, Stone Lintels, CMU Coursing + Bond Beam, Rigid Foam Insulation, Batt Insulation, Vapor Barrier, Interior Furring, Plaster on Lath, Drywall Plan/Section/Elevation Detail |
| CLASS 26 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Masonry Exterior Wall Detail + Analysis "Peel Away" Axon Guidelines |
| CLASS 27 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Masonry Exterior Wall Detail + Analysis "Peel Away" Axon |
| CLASS 28 | <i>Drawing Assignment:</i> <i>Drawing Lab:</i> | Masonry Exterior Wall Detail + Analysis Annotations |
| CLASS 29 | <i>Assignment Review:</i> | Masonry Ext Wall Dtl + Analysis Feedback |
| CLASS 30 | <i>Activity/Assessments:</i> | Activity, Reading Texts, Reading Drawings |
| SUBMISSION | MODULE 4: | Masonry Exterior Wall Detail + Analysis Readings #8,9 Notes DUE DATE: Submit Formatted Drawings/Notes/Sketches Files by CLASS 30 or on alt date required by professor |

Learning Activities:

Course format will include a combination of any of the following activities:

- **Site Visits / High Impact Learning Practices:**
Site trips will look to visit existing buildings and construction sites, tour newly constructed buildings and urban spaces or visit institutions, including but not limited to museums, churches, or other colleges with discussions led by either the instructor or on-site experts in the field or the subject.
- **Discussions:**
Discussions will be led by a qualified instructor and if warranted invited guest lecturers or experts in the field or subject.
- **Activities:**
Students will participate in activities that provide them with the opportunity to apply what is learned in a given subject.
- **Research Activities:**
Students will be given directed readings and be required to correlate their readings with the lab exercises. Supplemental research will be encouraged to promote a greater analytical and critical understanding.
- **Presentations:**
Students will participate in written, oral and graphic presentation of course subjects and issues identified through their reading, writing, and lab work.

Contact Info:

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|----------------|--|
| Professor: | Jason A. Montgomery, NCARB LEED AP |
| Email: | jmontgomery@citytech.cuny.edu |
| Text messages: | 718.791.2787 (always include your name in message) |
| Office Hours: | Tuesdays 12:35pm-2:30pm V207 |

Format Requirements for Submission:

All work submitted must be formatted as follows:

- Each reading topic and sketchbook assignment should be submitted as single pdf file (with multiple pages as required)
- Each component of a drawing assignment should be submitted as a separate pdf file.
- All images must be formatted using Adobe Illustrator per OpenLab templates
- All work must be scanned or photographed following professional standards and edited as required for clarity and resolution.
- Submitted file name for **reading notes** and **sketchbook assignments** must follow this format: Lastname_firstname_ARCH1231_readingtopic_YYMMDD.pdf
 - *Reading Notes Example:*
Montgomery_Jason_ARCH1231_buildingelements_20180817.pdf
 - *Sketchbook Assignment Example:*
Montgomery_Jason_ARCH1231_structure walk_20180817.pdf
- Submitted file name for **drawing assignments** must follow this format: Lastname_firstname_ARCH1231_assignment_drawingname_YYMMDD
 - *Drawing Assignment Example:*
Montgomery_Jason_ARCH1231_casestudyfloorplans_firstfloorplan_20180817.pdf
- **NOTE: Work submitted that does not meet above standards will not be graded and must be resubmitted.**

Class Submittals List: Following is a list of submittals that will be due throughout the course of the semester. They are subject to change:

Drawing Assignments:

Measured Space Assignment:

- Plan
- Sections (2)
- Axon

Case Study Floor Plans Assignment:

- First Floor Plan
- Second Floor Plan

Case Study Axon + Structural Study

- Axon
- Axon Overlay
- Exploded Axon
- Component Sections
- Calcs

Masonry Exterior Wall Details + Analysis

- Plan Detail
- Elevation Detail
- Wall Section
- Axon
- Analysis Diagram

Note: Grades for Incomplete Assignment Submissions will be pro-rated per % of missing drawings

Sketchbook Assignments:

- Measured Space Site Survey
- Case Study Site Investigation
- Structural Components Walk
- Materials + Properties Walk
- Assemblies + Performance Walk

Notebook Assignments:

Reading Notes and Sketches for readings #1-9 covering **all sections** of each reading.

READINGS:

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|------------------------------------|--|-----------|
| #1 Stairs + Egress: | <i>Building Construction Illustrated</i> | |
| | Egress | A.10-A.11 |
| | Stair Design | 9.03 |
| | Stair Requirements | 9.04-9.05 |
| #2 Building Elements: | Configurations | 9.06-9.07 |
| | <i>Building Construction Illustrated</i> | |
| | Building Elements | 2.02-2.03 |
| | <i>Building Construction Illustrated</i> | |
| #3 Structural Components + Forces: | Forces | 2.11-2.12 |
| | Columns | 2.13 |
| | Beams Spans Trusses | 2.14-2.16 |
| | Frames Walls Plates | 2.17-2.18 |
| | Arches Vaults Domes | 2.25-2.26 |
| | Joints Connections | 2.30 |

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|-------------------------------------|--|-----------------|
| #4 Structural Typologies: | <i>Building Construction Illustrated</i> | |
| | Structural Units | 2.19 |
| | Structural Spans | 2.20 |
| | Structural Patterns | 2.21 |
| | Lateral Stability | 2.22-2.23 |
| #5 Materials + Properties: | <i>Building Construction Illustrated</i> | |
| | Stone | 12.10 |
| | Brick/CMU | 12.06-12.07 |
| | Wood | 12.11-12.12 |
| | Steel | 12.08 |
| #6 Material Modules: | <i>Building Construction Illustrated</i> | |
| | Brick/CMU Bonding | 5.26-5.27 |
| | Wood Components | 12.13-12.14 |
| | Steel Shapes | 4.16, 5.37 |
| | Reinforced Concrete | 4.04, 5.04-5.05 |
| | Precast Concrete Floor Systems | 4.11-4.12 |
| | <i>Fundamentals of Building Construction</i> | |
| | Brick Masonry | Chapter 8 |
| #7 Material Spans + Rules of Thumb: | <i>Building Construction Illustrated</i> | |
| | Masonry Arches + Lintels | 5.20-5.21 |
| | Wood Beams + Joists | 4.26-4.27, 4.35 |
| | Wood Subfloor, Decking | 4.32, 4.40 |
| | Wood Plank and Beam | 4.38-4.39 |
| | Steel Beams | 4.16-4.18 |
| | Steel Open-Web Joists | 4.19-4.21 |
| | Metal Decking | 4.22 |
| | Reinforced Concrete Beams | 4.04 |
| #8 Assemblies + Performance: | <i>Building Construction Illustrated</i> | |
| | Building Envelop | 7.02 |
| | Walls: Moisture + Flashing | 7.22, 7.28-7.29 |
| | Thermal Protection | 7.39-7.47 |
| | <i>Fundamentals of Building Construction</i> | |
| | Designing Exterior Wall Systems | Chapter 19 |
| #9 Masonry Envelop Assemblies: | <i>Building Construction Illustrated</i> | |
| | CMU + Brick | 5.23-5.25 |
| | Stone | 5.33-5.34 |
| | Windows | 8.22-8.23, 8.27 |
| | <i>Fundamentals of Building Construction</i> | |
| | Masonry Wall Construction | Chapter 10 |
| | Windows and Doors | Chapter 18 |