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:

Recommended Text:

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

Course Coordinator: Prof. Jason Montgomery, NCARB LEED AP
Updated: 2018 08 17
GRADING DETAILS: assignments with * require progress documentation and review by professor

**MODULE 1: 100 pts**

**Drawing Assignments:**
- 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:**
- Site Survey: 4 pts

**Assessments:**
- Reading Drawings + Text: 5 pts

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**MODULE 2: 200 pts**

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

**Reading Notes:**
- Stairs+Cutline/Up Arrow: 20 pts
- Windows/Doors: 18 pts

**Sketchbook Assignments:**
- Site Investigation: 6 pts
- Structural Components: 6 pts
- Materials + Properties: 6 pts
MODULE 3: 300 pts

Drawing Assignments:
- 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:
- 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: 30 pts
- Section Detail: 30 pts
- Annotations: 23 pts
- R-Value Calc: 22 pts

Reading Notes:
- 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:
- Assemb. + Perform Walk: 6 pts

Assessments:
- Reading Drawings + Text: 5 pts

CLASS PARTICIPATION 50 pts
- Discussions: 25 pts
- Site Walks: 25 pts
### General Education Learning Outcomes / Assessment Methods

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upon successful completion of this course the student shall be able to:</td>
<td>To evaluate the students’ achievement of the learning objectives, the professor will do the following:</td>
</tr>
<tr>
<td><strong>1.</strong> Develop Knowledge from the range of architectural disciplinary concepts presented in the course.</td>
<td>• <strong>Review</strong> student notebooks, <strong>observe</strong> student participation in class discussions, and <strong>review</strong> student applications of disciplinary concepts in drawing assignments.</td>
</tr>
<tr>
<td><strong>2.</strong> Use the texts assigned in the course as well as background knowledge from within the discipline in order to <strong>Draw Inferences</strong> from the material.</td>
<td>• Use a pre and post written exam to assess students’ development and achievement over the course of the semester.</td>
</tr>
<tr>
<td><strong>3.</strong> Apply Information from the reading within the discipline.</td>
<td>• <strong>Review</strong> student applications of disciplinary concepts in drawing assignments.</td>
</tr>
</tbody>
</table>

### National Architectural Accrediting Board (NAAB) Students Performance Criteria (SPC) / Assessment Methods

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
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<tbody>
<tr>
<td>Upon successful completion of this course the student shall be able to:</td>
<td>To evaluate the students’ achievement of the learning objectives, the professor will do the following:</td>
</tr>
<tr>
<td><strong>4.</strong> Understand the fundamentals of formal ordering systems and the capacity to inform two- and three-dimensional design.</td>
<td><strong>4. Review</strong> student drawing assignments with implementation of the organizing grid.</td>
</tr>
<tr>
<td><strong>5.</strong> 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.</td>
<td><strong>5. Review</strong> student notebooks and drawing assignments with application of material properties, rules of thumb, and performance analysis.</td>
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</table>

### Course Specific Learning Outcomes / Assessment Methods

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Assessment Methods</th>
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</thead>
<tbody>
<tr>
<td>Upon successful completion of this course the student shall be able to:</td>
<td>To evaluate the students’ achievement of the learning objectives, the professor will do the following:</td>
</tr>
<tr>
<td><strong>6.</strong> Layout plan drawings by hand and with digital tools.</td>
<td><strong>6. Review</strong> student plan assignments for accuracy and application of line weights and drawing conventions.</td>
</tr>
<tr>
<td><strong>7.</strong> Understand and apply basic principles of structural characteristics of materials following rules of thumb.</td>
<td>7. Review student drawing assignments for accurate application of rules of thumb to sizing structural elements for a specific span.</td>
</tr>
<tr>
<td>Weekly Course Outline:</td>
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<tr>
<td><strong>MODULE I</strong></td>
<td></td>
</tr>
<tr>
<td><strong>CLASS 1</strong></td>
<td><em>Activity/Assessment:</em> Intro, Reading Texts, Reading Drawings</td>
</tr>
</tbody>
</table>
| **CLASS 2**           | *SITE VISIT:* Measured Space Site Survey  
|                       | *Sketchbook:* Measured Space Site Survey |
| **CLASS 3**           | *Drawing Assignment:* Measured Space  
|                       | *Discussion:* Arch Drawing / Orthographic Projection  
|                       | *Drawing Lab:* Measured Space Plan Guideline Underlay*  
|                       | *Reading Notes:* Stairs + Egress (Reading #1)  
|                       | *Additional Discussion:* Note Taking + Reading |
| **CLASS 4**           | *Drawing Assignment:* Measured Space  
|                       | *Discussion:* Stairs + Egress (Reading #1)  
|                       | Egress, Configurations, Code, Design  
|                       | *Sketchbook:* Stair Site Investigation (added to survey)  
|                       | *Drawing Lab:* Measured Space Plans w/Stairs |
| **CLASS 5**           | *Drawing Assignment:* Measured Space  
|                       | *Discussion:* Arch Drawing / Orthographic Projection  
|                       | *Drawing Lab:* Measured Space Section Setup* |
| **CLASS 6**           | *Drawing Assignment:* Measured Space  
|                       | *Discussion:* Arch Drawing / Orthographic Projection  
|                       | *Drawing Lab:* Measured Space Axon Setup* |
| **CLASS 7**           | *Assignment Review:* Measured Space Assignment Feedback  
|                       | *Drawing Lab:* Submission Prep Demonstration  
|                       | *Reading Notes:* Building Elements (Reading #2) |
| **SUBMISSION**        | **MODULE 1:** Measured Space Drawing Assignment  
|                       | Reading #1 Notes  
|                       | Sketchbook Assignment  
|                       | **DUE DATE:** Submit Formatted Drawing / Notes / Sketchbook Files  
|                       | by CLASS 9 |
MODULE 2

CLASS 8
SITE VISIT: Case Study Building Site
Discussion: Building Elements (Reading #2)
The Building, Space, Circulation, Stairs, Transparency
Sketchbook: Site Investigation Assignment

CLASS 9
Drawing Assignment: Case Study Floor Plans
Discussion: Arch Drawing / Plan Layout
Drawing Lab: Case Study Plan Grid/Centerlines Underlay
Reading Notes: Structural Components (Reading #3)
Additional Discussion: Note Taking + Reading

CLASS 10
SITE VISIT: Structural Components
Discussion: Forces, Columns, Beams, Spans, Trusses Frames, Walls, Plates, Arches, Vaults, Domes, Joints, Connections
Sketchbook: Structural Components Sketches

CLASS 11
Drawing Assignment: Case Study Floor Plans
Discussion: Arch Drawing / Plan Layout
Drawing Lab: Case Study Plan Guidelines/Geometry
Reading Notes: Structural Typologies (Reading #4)

CLASS 12
Drawing Assignment: Case Study Floor Plans
Discussion: Structural Typologies (Reading #4)
Structural Units, Spans, Patterns Lateral Stability, Relation b/w Structure + Space
Drawing Lab: Case Study Plan Development
Reading Notes: Materials + Properties (Reading #5)

CLASS 13
SITE VISIT: Materials Walk
Discussion: Materials + Properties (Reading #5)
Stone, Brick, CMU, Wood, Concrete, Steel
Sketchbook: Materials + Properties Sketches

CLASS 14
Drawing Assignment: Case Study Floor Plans
Drawing Lab: Case Study Plan Development

CLASS 15
Assignment Review: Case Study Floor Plans Feedback

SUBMISSION MODULE 2:
Case Study Floor Plans Assignment
Readings #2,3,4,5 Notes
Sketchbook Assignments (3)
DUE DATE: Submit Formatted Drawings/ Notes/Sketchbook Files by CLASS 17
MODULE 3

CLASS 16  
**Drawing Assignment:** Case Study Axon + Structural Study  
**Drawing Lab:** Axon Grid + Guidelines*  
**Reading Notes:** Material Modules (Reading #6)

CLASS 17  
**Drawing Assignment:** Case Study Axon + Structural Study  
**Discussion:** Material Modules  
Brick/CMU Bonding, Wood Components, Steel Shapes, Concrete Beams  
**Drawing Lab:** Axon Development  
**Reading Notes:** Spans + Rules of Thumb (Reading #7)

CLASS 18  
**Drawing Assignment:** Case Study Axon + Structural Study  
**Discussion:** Spans + Rules of Thumb (Reading #7)  
Masonry Arches, Lintels, Wood Beams + Joists, Steel Beams + Joists, Reinforced Concrete Beams  
**Drawing Lab:** Structural Overlay on Axon

CLASS 19  
**Drawing Assignment:** Case Study Axon + Structural Study  
**Drawing Lab:** Structural Calcs + Sections

CLASS 20  
**Drawing Assignment:** Case Study Axon + Structural Study  
**Drawing Lab:** Structural Exploded Axon

CLASS 21  
**Drawing Assignment:** Case Study Axon + Structural Study  
**Drawing Lab:** Structural Exploded Axon

CLASS 22  
**Assignment Review:** 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
CLASS 23

**Drawing Assignment:** Masonry Exterior Wall Detail + Analysis
**Drawing Lab:** Plan/Section/Elevation Detail Layout
**Reading Notes:** Assemblies + Performance (Reading #8)

**CLASS 24**

**SITE VISIT:** Assemblies + Performance Walk
**Discussion:** Assemblies + Performance (Reading #8)
Building Envelop, Exterior Walls, Moisture Protection, Flashing, Thermal Protection
Designing Exterior Walls
**Sketchbook:** Assemblies + Performance Sketches
**Reading Notes:** Masonry Envelope Assemblies (Reading #9)

**CLASS 25**

**Drawing Assignment:** Masonry Exterior Wall Detail + Analysis
**Discussion:** Masonry Envelope 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
**Drawing Lab:** Plan/Section/Elevation Detail

**CLASS 26**

**Drawing Assignment:** Masonry Exterior Wall Detail + Analysis
**Drawing Lab:** “Peel Away” Axon Guidelines

**CLASS 27**

**Drawing Assignment:** Masonry Exterior Wall Detail + Analysis
**Drawing Lab:** “Peel Away” Axon

**CLASS 28**

**Drawing Assignment:** Masonry Exterior Wall Detail + Analysis
**Drawing Lab:** Annotations

**CLASS 29**

**Assignment Review:** Masonry Ext Wall Dtl + Analysis Feedback

**CLASS 30**

**Activity/Assessments:** 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:
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_YYMMD.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_YYMMD.pdf
  - 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 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:
#1 Stairs + Egress: Building Construction Illustrated
  Egress A.10-A.11
  Stair Design 9.03
  Stair Requirements 9.04-9.05
  Configurations 9.06-9.07

#2 Building Elements: Building Construction Illustrated
  Building Elements 2.02-2.03

#3 Structural Components + Forces: Building Construction Illustrated
  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
### #4 Structural Typologies: *Building Construction Illustrated*

<table>
<thead>
<tr>
<th>Category</th>
<th>Page(s)</th>
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<tbody>
<tr>
<td>Structural Units</td>
<td>2.19</td>
</tr>
<tr>
<td>Structural Spans</td>
<td>2.20</td>
</tr>
<tr>
<td>Structural Patterns</td>
<td>2.21</td>
</tr>
<tr>
<td>Lateral Stability</td>
<td>2.22-2.23</td>
</tr>
</tbody>
</table>

### #5 Materials + Properties: *Building Construction Illustrated*

<table>
<thead>
<tr>
<th>Material</th>
<th>Page(s)</th>
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</thead>
<tbody>
<tr>
<td>Stone</td>
<td>12.10</td>
</tr>
<tr>
<td>Brick/CMU</td>
<td>12.06-12.07</td>
</tr>
<tr>
<td>Wood</td>
<td>12.11-12.12</td>
</tr>
<tr>
<td>Steel</td>
<td>12.08</td>
</tr>
<tr>
<td>Concrete + Reinforcement</td>
<td>12.04-12.05</td>
</tr>
</tbody>
</table>

### #6 Material Modules: *Building Construction Illustrated*

<table>
<thead>
<tr>
<th>Module</th>
<th>Page(s)</th>
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</thead>
<tbody>
<tr>
<td>Brick/CMU Bonding</td>
<td>5.26-5.27</td>
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<tr>
<td>Wood Components</td>
<td>12.13-12.14</td>
</tr>
<tr>
<td>Steel Shapes</td>
<td>4.16, 5.37</td>
</tr>
<tr>
<td>Reinforced Concrete</td>
<td>4.04, 5.04-5.05</td>
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<tr>
<td>Precast Concrete Floor Systems</td>
<td>4.11-4.12</td>
</tr>
</tbody>
</table>

*Fundamentals of Building Construction*

- Brick Masonry: Chapter 8

### #7 Material Spans + Rules of Thumb: *Building Construction Illustrated*

<table>
<thead>
<tr>
<th>Component</th>
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</thead>
<tbody>
<tr>
<td>Masonry Arches + Lintels</td>
<td>5.20-5.21</td>
</tr>
<tr>
<td>Wood Beams + Joists</td>
<td>4.26-4.27, 4.35</td>
</tr>
<tr>
<td>Wood Subfloor, Decking</td>
<td>4.32, 4.40</td>
</tr>
<tr>
<td>Wood Plank and Beam</td>
<td>4.38-4.39</td>
</tr>
<tr>
<td>Steel Beams</td>
<td>4.16-4.18</td>
</tr>
<tr>
<td>Steel Open-Web Joists</td>
<td>4.19-4.21</td>
</tr>
<tr>
<td>Metal Decking</td>
<td>4.22</td>
</tr>
<tr>
<td>Reinforced Concrete Beams</td>
<td>4.04</td>
</tr>
</tbody>
</table>

### #8 Assemblies + Performance: *Building Construction Illustrated*

<table>
<thead>
<tr>
<th>Component</th>
<th>Page(s)</th>
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</thead>
<tbody>
<tr>
<td>Building Envelop</td>
<td>7.02</td>
</tr>
<tr>
<td>Walls: Moisture + Flashing</td>
<td>7.22, 7.28-7.29</td>
</tr>
<tr>
<td>Thermal Protection</td>
<td>7.39-7.47</td>
</tr>
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</table>

*Fundamentals of Building Construction*

- Designing Exterior Wall Systems: Chapter 19

### #9 Masonry Envelop Assemblies: *Building Construction Illustrated*

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Page(s)</th>
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<tbody>
<tr>
<td>CMU + Brick</td>
<td>5.23-5.25</td>
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<tr>
<td>Stone</td>
<td>5.33-5.34</td>
</tr>
<tr>
<td>Windows</td>
<td>8.22-8.23, 8.27</td>
</tr>
</tbody>
</table>

*Fundamentals of Building Construction*

- Masonry Wall Construction: Chapter 10
- Windows and Doors: Chapter 18