



Arch 1240 Methods of Construction in Architecture
Professor Jason Montgomery



New York City College of Technology

City University of New York

Department of Architectural Technology

ARCH 1240 – METHODS OF CONSTRUCTION IN ARCHITECTURE

2 CREDITS

2 Classroom Hours

Prerequisites: CUNY Reading and Writing Certification

Pre or Co-Requisite: ENG 1101

Course Description:

This course will study:

Contemporary Building Components

Methods of Construction

Systems Analysis

Current Structural Innovations.

Course Policies:

1. Attendance

- a. Class Time 10am – 11:40am Tuesdays
- b. Late Arrival Policy – 5 minutes late arrival or more will be recorded. 10 minutes late arrival total = 1 absence
- c. Missing Class: 2 absences or more will expose the student to a failing grade at the discretion of the instructor.

2. Grading

- | | |
|--|-----|
| a. Weekly Quizzes | 30% |
| b. Sketch Assignment | 15% |
| c. Research Project and Model | 20% |
| d.. Research Project Oral Presentation | 5% |
| e.. Final Exam | 30% |

Course Policies:

3. Grading Exception

There will be 12 quizzes total. The quiz scoring will be based on the top 10 scores. If a student scores 93 or higher, they will be exempt from the final and the grading will be reapportioned as follows:

a. Weekly Quizzes	60%
b. Sketch Assignment	15%
c. Research Project and Model	20%
d.. Research Project Oral Presentation	5%

Course Policies:

3. 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 Requirements:

4. Required Text

Fundamentals of Building Construction Materials and Methods

Edward Allen, Joseph Iano, John Wiley & Sons, Inc

Course Requirements:

5. Quiz Protocol

Weekly Quizzes will be conducted on Blackboard. Blackboard must be accessed through Firefox web browser to work properly.

A practice quiz will be available by Wednesday at 10pm. Please take this practice quiz by Saturday 10pm this week. Quiz #1 will be available Sunday-Tuesday next week. Report any problems encountered to my email address:

jmontgomery@citytech.cuny.edu

Learning Objectives:

Upon the successful completion of this course, students shall be able to:

- 1. Explain how zoning and building codes affect material selection and architectural design.**
- 2. Explain the various foundation systems and related site work currently used including underpinning, piles, spread footings, retaining walls, caissons, slurry wall, tiebacks**



Learning Objectives:

Upon the successful completion of this course, students shall be able to:

3. Describe the various materials used in current construction to insure a totally waterproof, code compliant structure.

Materials will include siding, cladding, roofing, glass and glazing, doors, insulation types, waterproofing, interior finishes, and millwork.



Learning Objectives:

Upon the successful completion of this course, students shall be able to:

- 4. Demonstrate a broad general architectural vocabulary of the current architectural materials available.**
- 5. Design a staircase and a fireplace to meet code requirements**



Assessment:

Students will be given weekly quizzes and a final exam to test their ability to:

- 1. Cite the key factors associated in selecting a specific building material**
- 2. Explain what is meant by each of the “key terms and concepts” listed at the end of each chapter of the assigned text.**



Assessment:

Students will be given weekly quizzes and a final exam to test their ability to:

- 4. Design and draw a plan / section of a code compliant commercial staircase given a floor to floor height. Identify all the key components and show all the calculations.**
- 5. Draw a section through a fireplace and identify all the key components**



Assessment:

Students will be given weekly quizzes and a final exam to test their ability to:

3. Draw sketches or sections of the different materials and building systems discussed:

underpinning, piles, eave section, parapet details, roof decking, window head and jamb, siding, roofing types, scupper, suspended ceiling, raised floor, etc.



Project Research:

Initial Assignment:

Choose a Building in your neighborhood or along your daily commute as a case study.

Upload Photos to Discussion Board Forum by:

Monday Feb 15, 2010

Health of Us
and Our Planet



ARCH 1240

Sustainability Building “Green”

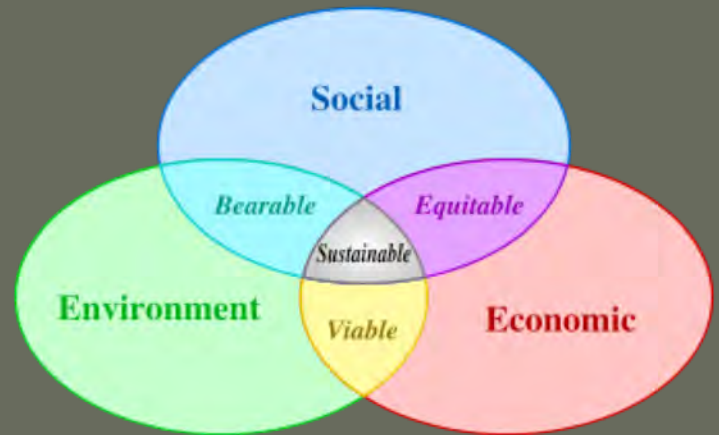
“Meeting the needs of the present generation without compromising the ability of future generations to meet their needs.”

Standards:

LEED Program: USGBC

**Leadership in Energy and
Environmental Design**

US Green Building Council



Energy: Buildings account for 30 to 40 percent of world's energy use and associated greenhouse gas emissions

***Construction and Operation of Buildings in the US:
1/3 total energy use
2/3 electricity consumption
1/2 total greenhouse emissions***



Sustainability starts with land planning:

Suburban Sprawl:

- ***Consumes agricultural and undeveloped sites***
- ***Degrades natural ecosystems***
- ***Relies largely on vehicular transportation***
- ***Inefficient infrastructure***
- ***Unsustainable Water Supply / Demand***



Sustainability / LEED NC Check List

Project Checklist

Sustainable Sites

14 Possible Points

Prereq 1	Construction Activity Pollution Prevention	Required
Credit 1	Site Selection	1
Credit 2	Development Density & Community Connectivity	1
Credit 3	Brownfield Redevelopment	1
Credit 4.1	Alternative Transportation, Public Transportation Access	1
Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
Credit 4.3	Alternative Transportation, Low Emitting & Fuel Efficient Vehicles	1
Credit 4.4	Alternative Transportation, Parking Capacity	1
Credit 5.1	Site Development, Protect or Restore Habitat	1
Credit 5.2	Site Development, Maximize Open Space	1
Credit 6.1	Stormwater Design, Quantity Control	1
Credit 6.2	Stormwater Design, Quality Control	1
Credit 7.1	Heat Island Effect, Non-Roof	1
Credit 7.2	Heat Island Effect, Roof	1
Credit 8	Light Pollution Reduction	1

Water Efficiency

5 Possible Points

Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
Credit 2	Innovative Wastewater Technologies	1
Credit 3.1	Water Use Reduction, 20% Reduction	1
Credit 3.2	Water Use Reduction, 30% Reduction	1

Energy & Atmosphere

17 Possible Points

Prereq 1	Fundamental Commissioning of the Building Energy Systems	Required
Prereq 2	Minimum Energy Performance	Required
Prereq 3	Fundamental Refrigerant Management	Required
Credit 1	Optimize Energy Performance	1-10
Credit 2	On-Site Renewable Energy	1-3
Credit 3	Enhanced Commissioning	1
Credit 4	Enhanced Refrigerant Management	1
Credit 5	Measurement & Verification	1
Credit 6	Green Power	1

Materials & Resources

13 Possible Points

Prereq 1	Storage & Collection of Recyclables	Required
Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1
Credit 1.2	Building Reuse, Maintain 95% of Existing Walls, Floors & Roof	1
Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1

LEED for New Construction Rating System v2.2

Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
Credit 3.1	Materials Reuse, 5%	1
Credit 3.2	Materials Reuse, 10%	1
Credit 4.1	Recycled Content, 10% (post-consumer + 1/2 pre-consumer)	1
Credit 4.2	Recycled Content, 20% (post-consumer + 1/2 pre-consumer)	1
Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regionally	1
Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regionally	1
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1

Indoor Environmental Quality

15 Possible Points

Prereq 1	Minimum IAQ Performance	Required
Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
Credit 1	Outdoor Air Delivery Monitoring	1
Credit 2	Increased Ventilation	1
Credit 3.1	Construction IAQ Management Plan, During Construction	1
Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
Credit 4.3	Low-Emitting Materials, Carpet Systems	1
Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
Credit 5	Indoor Chemical & Pollutant Source Control	1
Credit 6.1	Controllability of Systems, Lighting	1
Credit 6.2	Controllability of Systems, Thermal Comfort	1
Credit 7.1	Thermal Comfort, Design	1
Credit 7.2	Thermal Comfort, Verification	1
Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

Innovation & Design Process

5 Possible Points

Credit 1.1	Innovation in Design	1
Credit 1.2	Innovation in Design	1
Credit 1.3	Innovation in Design	1
Credit 1.4	Innovation in Design	1
Credit 2	LEED Accredited Professional	1

Project Totals

69 Possible Points

Certified 26-32 points ■ Silver 33-38 points ■ Gold 39-51 points ■ Platinum 52-69 points

LEED for New Construction Rating System v2.2

Factors contributing to a Building's Sustainability on a Life-Cycle Basis

Site Selection and Utilization
Origin & Manufacturing of
Building Materials

Consumption of Energy and
Water in Construction and
Building Use

Use and Maintenance of the
Building

Demolition of the Building



Strategies for More Sustainable Approach

- *Reduce Building Energy Consumption*
- *Avoid / Minimize Fossil Fuels*
- *Reuse Existing Buildings*
- *Build on Degraded Land (Brown Field sites)*
- *Restore Ecosystems*
- *Conserve Water*



Ultimate Goal:

Sustainable Design = Standard Design Practice



Owner and Design Team

Owner/Client

Architect

Engineers & Consultants

Construction Manager

General Contractor

Sub-contractors

Municipal Building

Inspector

End User



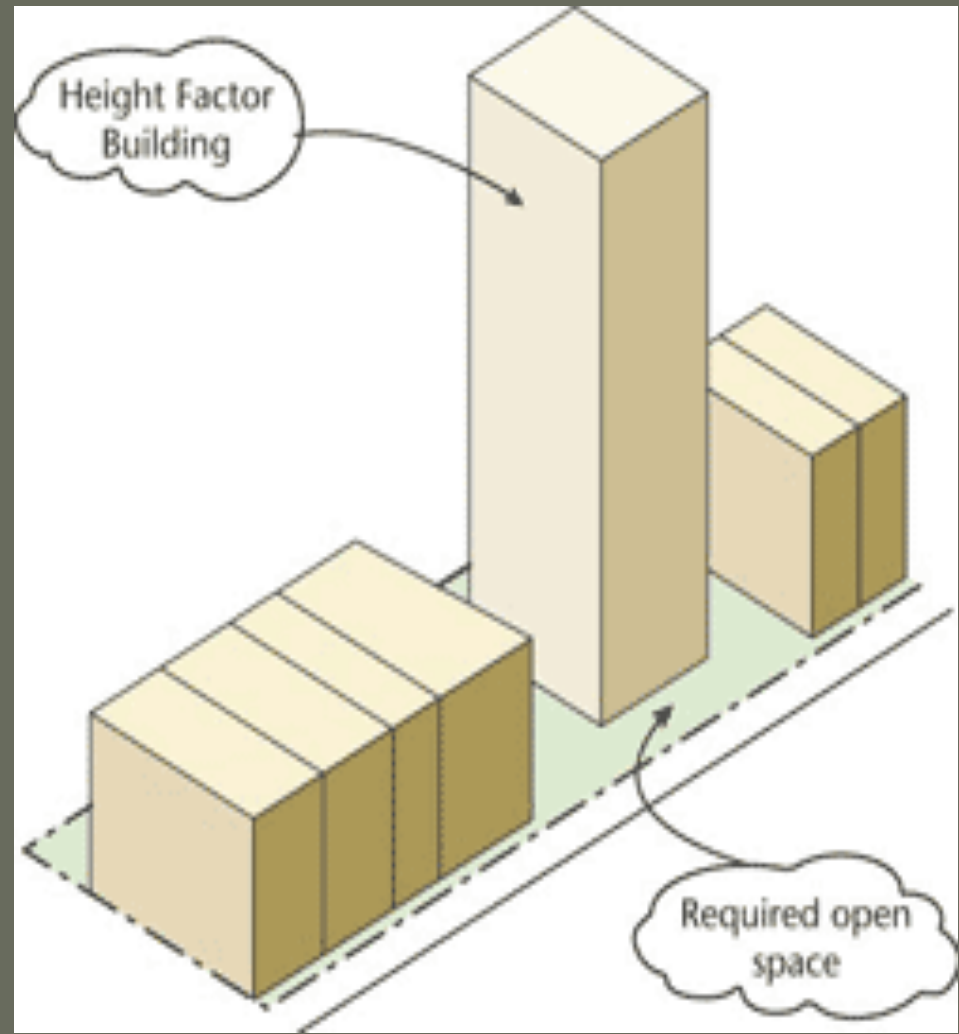
Zoning Ordinances

Land Coverage

Building Height

Setbacks

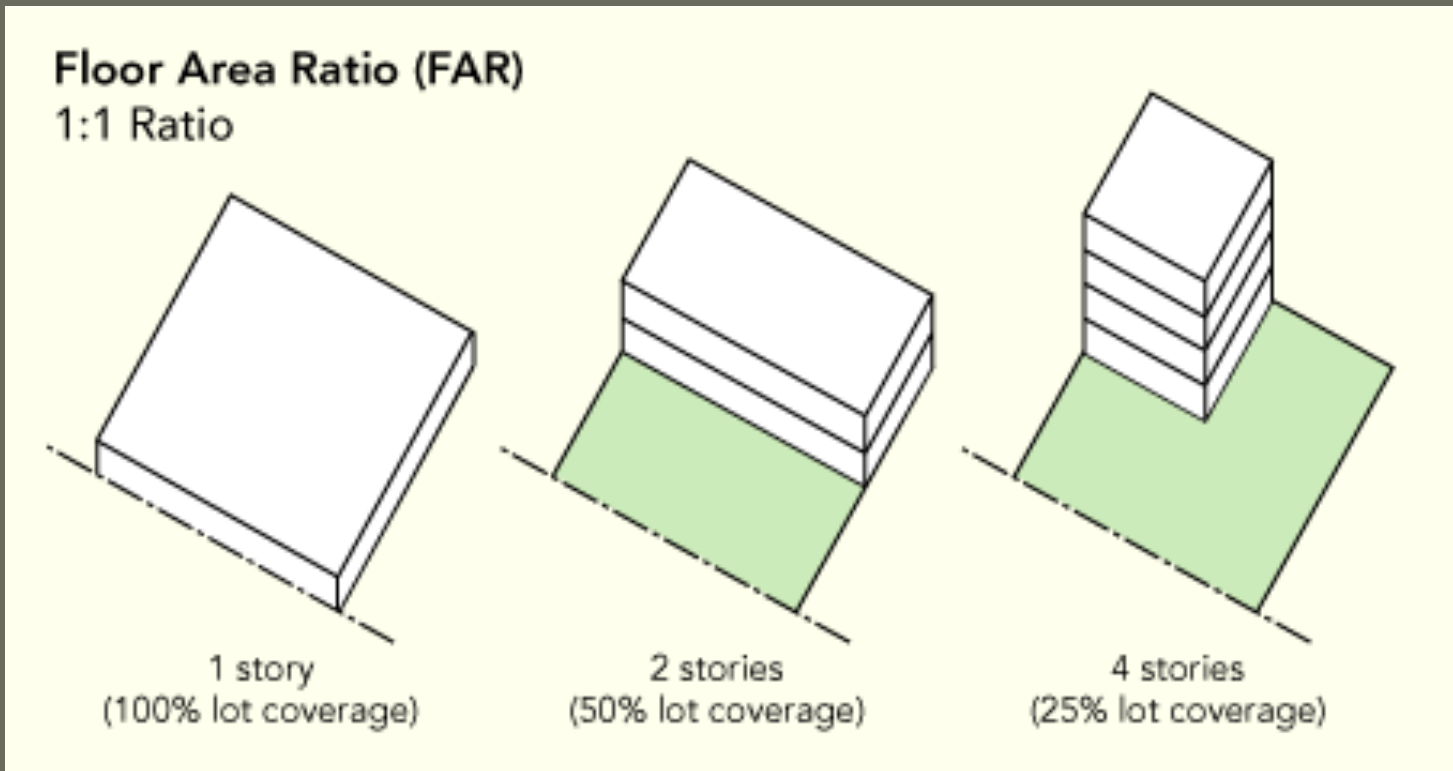
F.A.R.



Zoning Ordinances

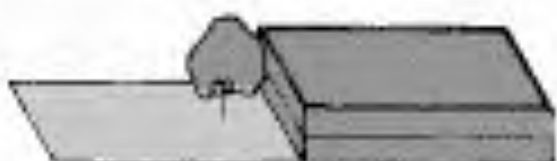
$$\text{FLOOR AREA RATIO} = \frac{\text{Total Allowable Building Area}}{\text{Total Lot Area}}$$

(F.A.R.)



FAR Entire lot area 1/2 lot area 1/4 lot area

0.5



1.0

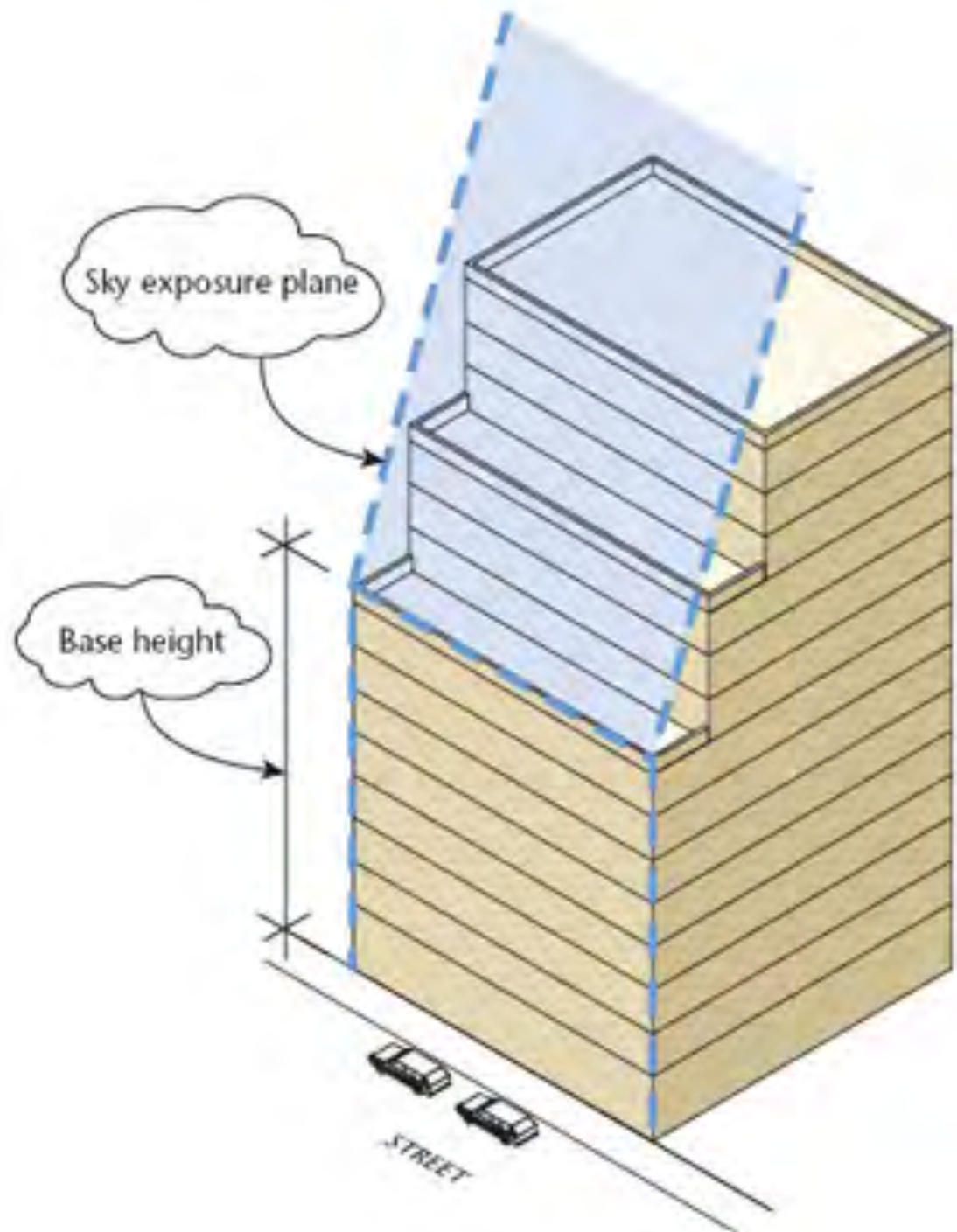


3.0

Floor Area Ratio

Zoning Ordinances

Sky Exposure Plane



Zoning Ordinances

Sky Exposure Plane

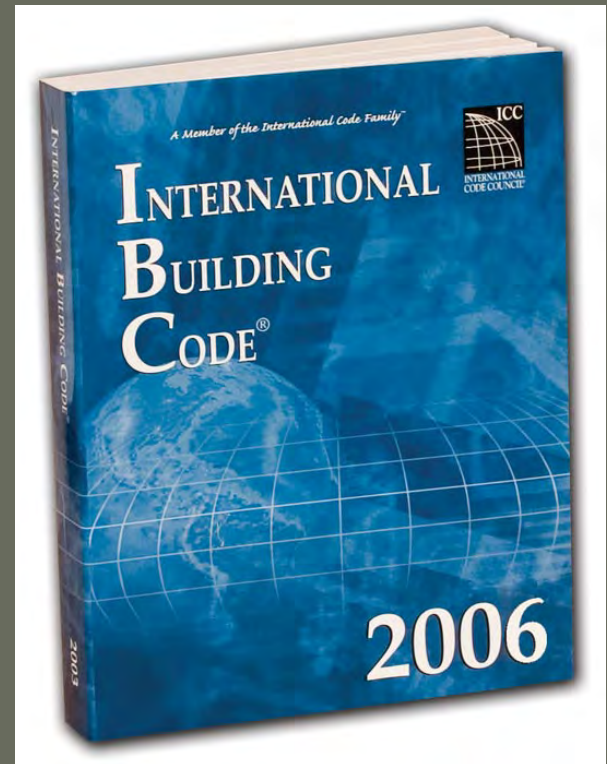


Building Codes

Protect Public Health and Safety

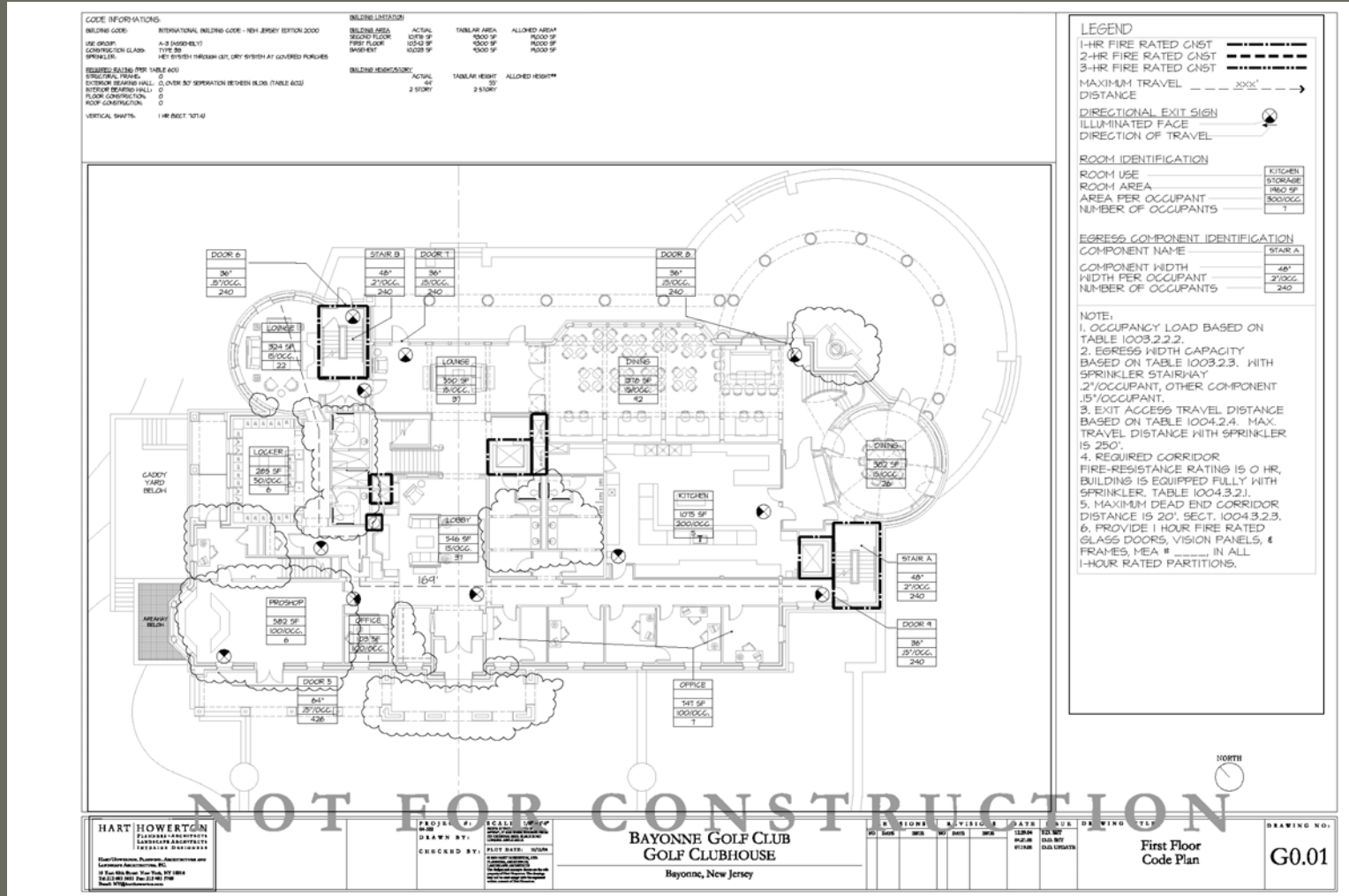
Model Building Codes

IBC



Building Codes

Life Safety Drawings



Building Codes

Occupancy Groups

Construction Types

Fire Resistance Rating Requirements

Allowable Building Areas and Heights

Sprinkler Systems

Light and Ventilation Requirements

Emergency Egress

Structural Design

Accessibility

Energy Efficiency

Building Codes

Occupancy Groups



Building Codes

Occupancy Groups

<i>A</i>	<i>Assembly</i>
<i>B</i>	<i>Business</i>
<i>E</i>	<i>Educational</i>
<i>F</i>	<i>Industrial</i>
<i>H</i>	<i>High Hazard</i>
<i>I</i>	<i>Institutional</i>
<i>M</i>	<i>Mercantile</i>
<i>R</i>	<i>Residential</i>
<i>S</i>	<i>Storage</i>
<i>U</i>	<i>Utility Buildings</i>

Building Codes

Construction Types

IA (most resistant)

IB

IIA

IIB

IIIA

IIIB

IV – Heavy Timber

VA

VB (least resistant)

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Building Codes

Occupancy Group
(vertical)

Construction Type
(horizontal)

Result: Max
Area/Floor

Height Limit (feet
above grade +
stories)

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS
Height limitations shown as stories and feet above grade plane.
Area limitations as determined by the definition of "Area, building," per floor.

GROUP	HGT(feet) Hgt(S)	TYPE OF CONSTRUCTION										
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V			
		A	B	A	B	A	B	HT	A	B		
A-1	S	UL	5	3	2	3	2	3	2	3	2	1
	A	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500			
A-2	S	UL	11	3	2	3	2	3	2	3	2	1
	A	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000			
A-3	S	UL	11	3	2	3	2	3	2	3	2	1
	A	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000			
A-4	S	UL	11	3	2	3	2	3	2	3	2	1
	A	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000			
A-5	S	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	S	UL	11	5	4	5	4	5	3	2	1	
	A	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000			
E	S	UL	5	3	2	3	2	3	1	1	1	
	A	UL	26,500	14,500	23,500	14,500	25,500	18,500	9,500			
F-1	S	UL	11	4	2	3	2	4	2	1	1	
	A	UL	25,000	15,500	19,000	12,000	33,500	14,000	8,500			
F-2	S	UL	11	5	3	4	3	5	3	2	2	
	A	UL	37,500	23,000	28,500	18,000	50,500	21,000	13,000			
H-1	S	1	1	1	1	1	1	1	1	1	NP	
	A	21,000	16,500	11,000	7,000	9,500	7,000	10,500	7,500	NP	NP	
H-2	S	UL	3	2	1	2	1	2	1	1	1	
	A	21,000	16,500	11,000	7,000	9,500	7,000	10,500	7,500	3,000		
H-3	S	UL	6	4	2	4	2	4	2	1	1	
	A	UL	60,000	26,500	14,000	17,500	13,000	25,500	10,000	5,000		
H-4	S	UL	7	5	3	5	3	5	3	2	2	
	A	UL	37,500	17,500	28,500	17,500	36,000	18,000	6,500			
H-5	S	3	3	3	3	3	3	3	3	2	2	
	A	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000			
I-1	S	UL	9	4	3	4	3	4	3	2	2	
	A	UL	55,000	19,000	10,000	16,500	10,000	18,000	10,500	4,500		
I-2	S	UL	4	2	1	1	Np	1	1	NP	NP	
	A	UL	15,000	11,000	12,000	Np	12,000	9,500	NP	NP		
I-3	S	UL	4	2	1	2	1	2	2	1	1	
	A	UL	15,000	11,000	10,500	7,500	12,000	7,500	5,000			
I-4	S	UL	5	3	2	3	2	3	1	1	1	
	A	UL	60,500	26,500	13,000	23,500	13,000	25,500	18,500	9,000		
M	S	UL	11	4	4	4	4	4	3	1	1	
	A	UL	21,500	12,500	18,500	12,500	20,500	14,000	9,000			
R-1	S	UL	11	4	4	4	4	4	3	2	2	
	A	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000			
R-2 ^a	S	UL	11	4	4	4	4	4	3	2	2	
	A	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000			
R-3 ^a	S	UL	11	4	4	4	4	4	3	3	3	
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL	UL	
R-4	S	UL	11	4	4	4	4	4	3	2	2	
	A	UL	24,000	16,000	24,000	16,000	20,500	12,000	7,000			
S-1	S	UL	11	4	3	3	3	4	3	1	1	
	A	UL	48,000	26,000	17,500	26,000	17,500	25,500	14,000	9,000		
S-2	S	UL	11	5	4	4	4	5	4	2	2	
	A	UL	79,000	39,000	26,000	39,000	26,000	38,500	21,000	13,500		
U	S	UL	5	4	2	3	2	4	2	1	1	
	A	UL	35,500	19,000	8,500	14,000	8,500	18,000	9,000	5,500		

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².
UL = Unlimited
a. As applicable in Section 101.2.

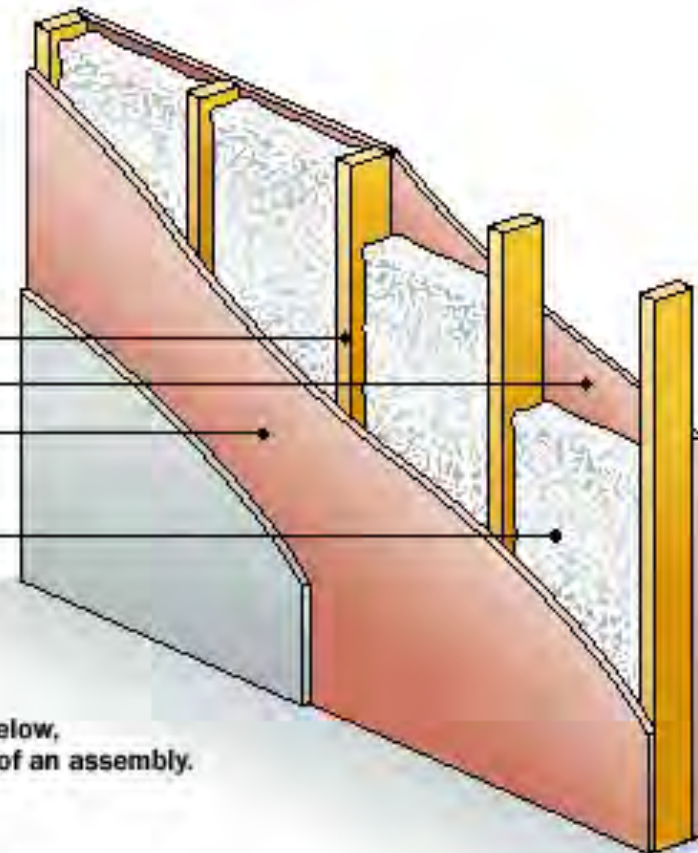
Building Codes

Fire Resistance Rating

Tested in a Laboratory

“the time in hours or fractions of an hour, that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria.”

Component	Time/Min.
Dricon® studs 16" on center	20
5/8" Dricon® plywood - Exterior	15
5/8" Dricon® plywood - Interior	15
Rockwood or slag mineral wool batts weighing not less than 1/4 lb./sq. ft. of wall surface	15
Assembly Total	65



By adding the values shown in the Tables below, you can compute the fire resistance rating of an assembly.

Time Assigned to Protective Membranes

Other Codes & Regulations

Health Code

Plumbing Code

Electrical Code

Energy Code

Americans with Disabilities Act [ADA]

Occupational Safety and Health Act

[OSHA]

NEC[®] 2005

NFPA 70: National Electrical Code[®]
International Electrical Code Series[™]



An International Codes
and Standards Organization

OSHA

Occupational Safety
and Health Administration

www.osha.gov

OSHA 2004-018
2002

Information Resources

ASTM:

***American Society for
Testing and Materials
specs for common materials***



ANSI:

***American National
Standards Institute
standards for industrial products***



Information Resources

CSI:

Construction Specifications Institute

Technical standards

MasterFormat:

Division 1: General Requirements

Division 2: Site Work

Division 3: Concrete

Division 4: Masonry.....

Division 7: Thermal & Moisture Protection

Division 8: Doors & Windows

Division 9: Finishes.....



Design Professional's Challenge

What provides required functional performance?

What provides the desired aesthetic result?

What is possible legally?

What is most economical?

How can it be built in a sustainable manner?

