

ALABAMA HOME BUILDERS TRAINING



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ALABAMA HOME BUILDERS TRAINING

Course Goal: To assist you in operating your business in a manner that will help you to comply with the applicable regulations, to provide your customers with a valuable service and to enhance your reputation as a professional.

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**MAYBE YOU BUILD TRADITIONAL HOMES
OR MAYBE YOU BUILD MODERN ONES.**



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IN EITHER CASE, YOU WANT TO DO
YOUR JOB RIGHT!



ALABAMA HOME BUILDERS TRAINING

- ✦ A bit about me
- ✦ Born into a construction family
- ✦ Worked on the jobsite from age 12
- ✦ Job assignments included laborer, framing carpenter, trim carpenter, backhoe operator, welder, roofer, crane operator, truck driver, forklift operator, paper hanger, painter, concrete finisher, company pilot, etc

ALABAMA HOME BUILDERS TRAINING

- ✦ 4 ½ years as Project Engineer for major chemical manufacturer (worked on projects in US, Canada, Mexico, Puerto Rico, Belgium and India)
- ✦ 8 years as Estimator and Project Manager for general contracting firm
- ✦ 8 years as President & CEO of engineering and construction firm

ALABAMA HOME BUILDERS TRAINING

- ✦ 18 years on faculty of Department of Building Science at Auburn University
- ✦ Teach courses through NAHB University of Housing
- ✦ Provide expert witness services for numerous law firms
- ✦ Provide construction mediation services

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ALABAMA HOME BUILDERS TRAINING

- ✦ As a courtesy to others, please silence your cell phone
- ✦ Please feel free to ask questions or comment during the presentation
- ✦ I will stay after the session to grade the tests and answer the questions that you don't ask during the class

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COURSE OUTLINE

- ✦ Overview – Day 1
- ✦ 1. Site Preparation
- ✦ 2. Foundations
- ✦ 3. Framing
- ✦ 4. Moisture Control
- ✦ 5. Estimating

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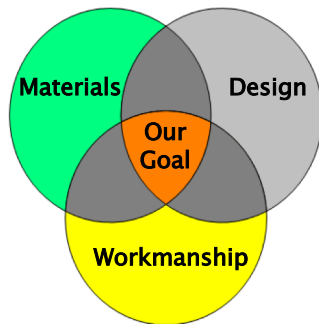
COURSE OUTLINE

Day 2

- ✕ 6. Business Practices
- ✕ 7. Alabama Energy Code
- ✕ 8. Building Codes
- ✕ 9. HBLB Law and Rules

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WHAT WE PROVIDE FOR OUR CUSTOMERS



All done to comply with the building code and HBLB regulations

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MATERIALS

- ✕ Who selects the materials?
 - + The Architect or Designer?
 - + The Owner?
 - + The Builder?
- ✕ Who is responsible for the performance of the materials?
 - + The Architect or Designer?
 - + The Owner?
 - + The Builder?
 - + The Manufacturer of the materials?

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MATERIALS

- ✘ Do you use only materials with a proven track record?
- ✘ Do you use newer materials with a limited track record? If so, who takes the risk of failure of the material to perform?
- ✘ Do you use new materials with no track record? If so, who takes the risk then?

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DESIGN

- ✘ Who provides the design?
 - + The Architect or Designer?
 - + The Owner?
 - + The Builder?
 - + A Manufacturer?
- ✘ Who is responsible for the performance of the design?
 - + The Architect or Designer?
 - + The Owner?
 - + The Builder?
 - + The Manufacturer?

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WORKMANSHIP

- ✘ Who determines the quality of workmanship?
 - + The Architect or Designer?
 - + The Owner?
 - + The Builder?
 - + The NAHB Residential Construction Performance Guidelines?
- ✘ Who is responsible for providing the expected quality of workmanship?
 - + The Architect or Designer?
 - + The Owner?
 - + The Builder?

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WORKMANSHIP

- ✦ What has your interaction with the owners led them to expect in terms of workmanship?
- ✦ What has your contract with the owners promised?
- ✦ Do you reference the NAHB Residential Construction Performance Guidelines in your contract?

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SECTION 1. SITE PREPARATION

- ✦ Purpose
 - + Strip off topsoil and vegetation from beneath house footprint (slab or crawl space).
 - + Install building pad (for slab on grade)
 - + Provide for proper site drainage (and crawl space drainage if applicable).

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SECTION 1. SITE PREPARATION

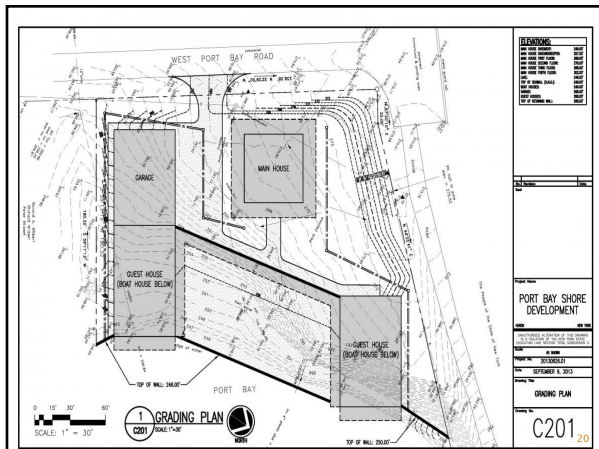
- ✦ Method
 - + Plan for proper site utilization (civil engineer may be required for drainage issues and surveyor may be required for zoning and/or covenant set backs and/or easements and setting/locating the lot pins).
 - + Set grade stakes per the plan.
 - + Perform the required cut and fill operations.
 - + Compact the fill sections to prevent excessive/differential settlement.

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SECTION 1. SITE PREPARATION

- ✘ Easement – a limited right to a piece of property without ownership of that property
- ✘ Contour line – a line connecting points of equal elevation
- ✘ Excessive settlement – vertical movement to the extent that damage occurs
- ✘ Differential settlement – vertical movement that varies in magnitude at points within the structure

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SITE PREPARATION

- + Plastic soils (AKA “gumbo”, “prairie” etc.)
 - ✘ Soils swell with increasing moisture content and shrink with decreasing moisture content.
 - ✘ The volumetric changes crack walls, cause doors and windows to bind, etc. (can destroy the entire structure).
 - ✘ Can be handled by:
 - ✘ Undercutting and replacement
 - ✘ Lime stabilization
 - ✘ Deep foundations
 - ✘ Flexible design



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SITE PREPARATION

- + Problem soils can be identified in advance.
 - ✗ Geotechnical services (soils engineers cost less than lawyers)
 - ✗ National Resources Conservation Service (formerly Soil Conservation Service)
 - ✗ Experience in the area
- + Identification of problem soils can alleviate future problems.
 - ✗ Moisture Control – during and after construction
 - ✗ Removal and replacement
 - ✗ Foundation and superstructure construction
 - ✗ Deep Foundations
 - ✗ Flexible superstructure
 - ✗ Rigid foundation
 - ✗ Construction joints

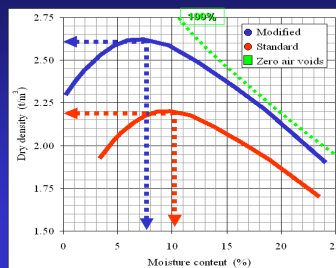
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Unified Soil Classification (USC) System (from ASTM D 2487)			
Major Divisions		Typical Names	
Coarse-Grained Soils More than 50% retained on the 0.075 mm (No. 200) sieve	Gravels 50% or more of coarse fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW Well-graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GP Poorly graded gravels and gravel-sand mixtures, little or no fines
	Sands 50% or more of coarse fraction passes the 4.75 mm (No. 4) sieve	Clean Sands	SW Well-graded sands and gravelly sands, little or no fines
		Sands with Fines	SP Poorly graded sands and gravelly sands, little or no fines
			SM Silty sands, sand-silt mixtures
			SC Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	Sils and Clays Liquid Limit 50% or less		ML Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
			OL Organic silts and organic silty clays of low plasticity
	Sils and Clays Liquid Limit greater than 50%		MH Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH Inorganic clays or high plasticity, fat clays
Highly Organic Soils		OH Organic clays of medium to high plasticity	PT Peat, muck, and other highly organic soils

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SOIL DENSITY vs. MOISTURE CONTENT

Results



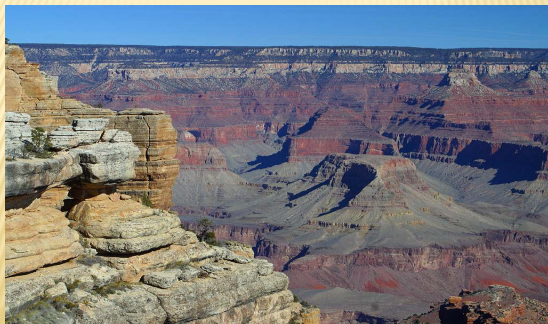
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SITE PREPARATION

- +Erosion and sediment control
 - ✗Required on sites of 1 acre or larger
 - ✗Required on lots that are part of a developed site 1 acre or larger
 - ✗Controls must be in place before land disturbance
 - ✗Controls must be maintained during construction using “Best Management Practices”

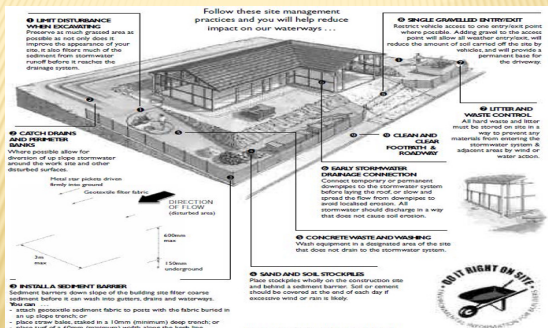
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EROSION AND SEDIMENT CONTROL



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EROSION AND SEDIMENT CONTROL



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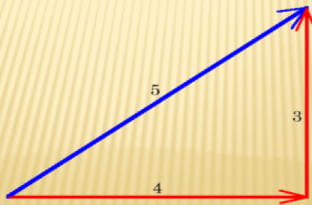
EROSION AND SEDIMENT CONTROL

- ✦ Check out www.cicacenter.org
 - + Templates
 - + Best Management Practices outlines
 - + Compliance Tools
 - + Resource Locators
 - + Hazardous waste regulations
 - + Endangered species regulations
 - + Reporting requirements
 - + Wetlands regulations, etc.

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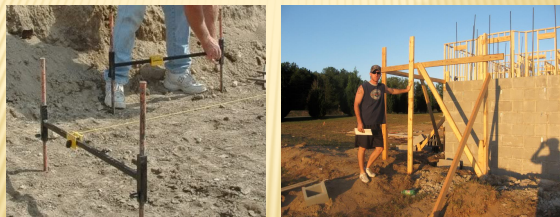
SITE PREPARATION

- + Batter boards
 - ✦ Set the finish floor elevation
 - ✦ Set the house horizontal dimensions
 - ✦ Promote a "square" start



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BATTERBOARDS



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FOR ADDITIONAL HELP...

Take the NAHB Land Development, Site Planning and Zoning course available through the Home Builders Association of Alabama.

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SECTION 2. FOUNDATIONS

+ Purpose

- ✦ Set the finish floor elevation.
- ✦ Support the superstructure.
- ✦ Provide adequate strength to “bridge” over weak spots.

+ Types

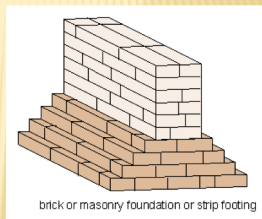
- ✦ Strip footings around the perimeter with pier footings in the interior.
- ✦ Slab with or without a brick shelf, and
- ✦ Combination (strip footing around perimeter, block walls and floating or monolithic slab).

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FOUNDATIONS

+ Less common types

- ✦ Driven pilings,
- ✦ Drilled caissons,
- ✦ Treated wood ,
- ✦ Post tensioned, and
- ✦ Brick.

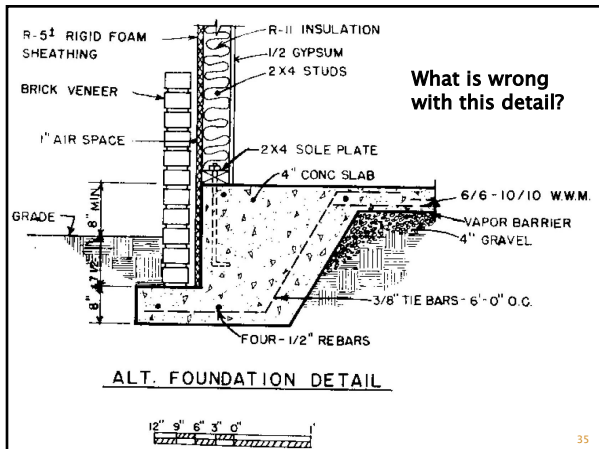


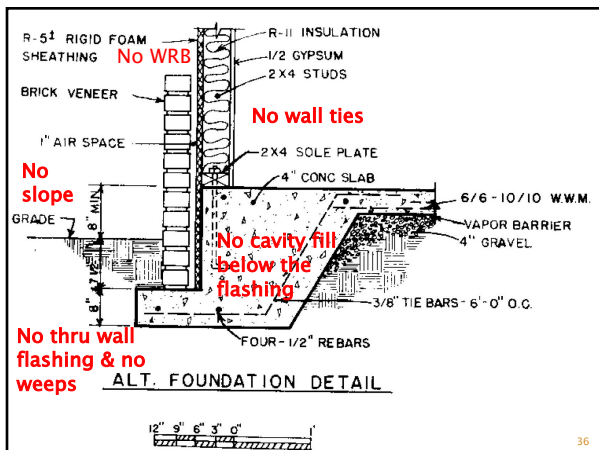
brick or masonry foundation or strip footing

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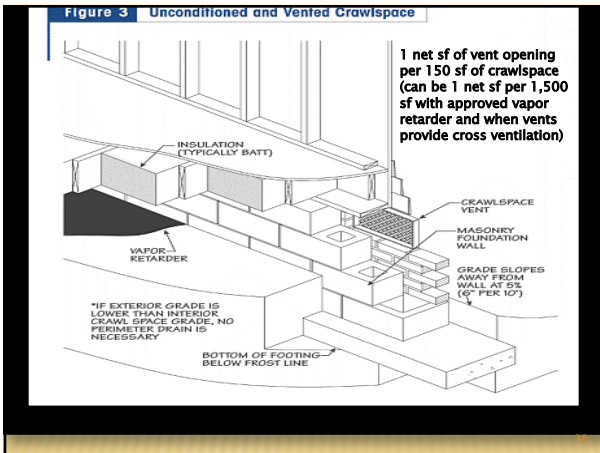
WHAT KIND OF FOUNDATION HERE?

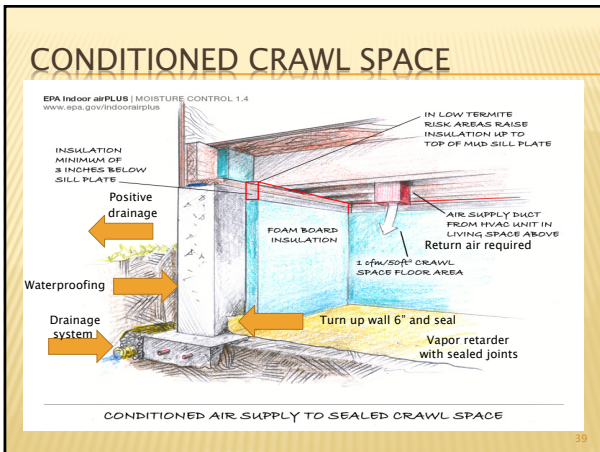






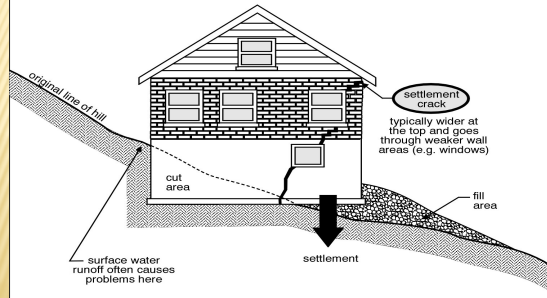






WATCH OUT FOR THIS SITUATION!

Building settlement due to cut and fill excavation



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FOR ADDITIONAL HELP...

Take the NAHB Building Technology: Structure and Exterior Finishes course available through the Home Builders Association of Alabama.

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SECTION 3. FRAMING

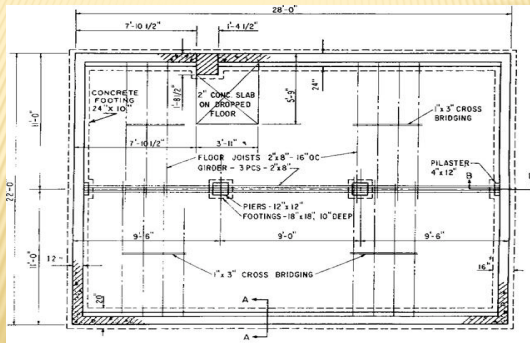
- ✦ Floor framing
- ✦ Wall framing
 - + Platform framing
 - + Balloon framing
- ✦ Roof framing
 - + Stick framed
 - + Truss framed
- ✦ Stair and railing details

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FRAMING MATERIALS



FLOOR FRAMING



GIRDER SIZES

- ✘ A single story house is 24' wide (measured perpendicular to the ridge). The girders run parallel to the ridge. Size the girders that run along the centerline.
- ✘ See Table R502.5(1). Find the section "Roof, ceiling and one center-bearing floor. (Let's use the minimum ground snow load of 30 psf.)
- ✘ Note that this table is from the 2012 International Residential Code.

FLOORS

TABLE 1002.10
GIRDER SPANS* AND HEADERS SPANS* FOR EXTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce pine No. 1 and required number of jack studs)
minimum design loads (psf)

GIRDERS AND HEADERS SIZES	20		30		40		50		60		70		80		90		100	
	20		30		40		50		60		70		80		90		100	
	Span		Span		Span		Span		Span		Span		Span		Span		Span	
	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
Roof and ceiling	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
Roof, ceiling and one ceiling bearing floor	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
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	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
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	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
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	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
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	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
Roof, ceiling and two clear bearing floors	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
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	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
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	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8
	5.2 x 8	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8	5.2	5.8

GIRDER SIZES

- ✖ A double 2x10 girder is OK to 6'–7" pier spacing. (interpolate between the values for 20' and 28')
- ✖ A double 2x12 girder is OK to 6'–7" pier spacing.
- ✖ A triple 2x12 girder is OK to 9'– 5 1/2" pier spacing.
- ✖ Note that we would use the same table to size headers and determine the number of jack studs required at each end of the header.

GIRDER CONSTRUCTION

- ✖ Wood girders must have at least 12" clearance above grade.
- ✖ Girder end joints must be located over supports.
- ✖ Girders supported on masonry or concrete must have at least a 3" bearing length measured along the girder.

FLOOR JOIST SIZING

- ✦ Dimension lumber
 - + Experience
 - + Span tables (tables in the building code)
 - + Engineering properties
- ✦ Engineered lumber & Steel joist
 - + Span tables (tables by manufacturer)
 - + Engineering properties
 - + Sized by manufacturer or dealer

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DEAD LOADS AND LIVE LOADS

- ✦ Dead loads include the weight of the structure and anything fastened to it.
- ✦ Dead loads are relatively constant and fairly predictable.
- ✦ Live loads are all other loads including people, furnishings, wind, etc.
- ✦ Live loads are variable and more difficult to predict.

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FLOOR JOIST SIZING BY TABLES

- ✦ Determine live and dead loadings.
 - + Typical dead load = 10 psf.
 - + Increased dead load for brick floors, etc.
 - + Live load 30 psf in sleeping rooms.
 - + Live load 40 psf in other rooms.
 - + Live load 100 psf for balconies and decks. (60 psf if not exceeding 100 sf in area)
- ✦ Make the appropriate selection(s) from the proper table in the code.

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FLOOR JOIST SIZING BY TABLES

- ✘ Example: Floor joist in a kitchen area span 12'-0" and are at 16" on center. If #2 southern pine is used, what is the minimum allowable member size?
- ✘ Find Table R502.3.1(2).
- ✘ At 16" on center and #2 southern pine, go across the table to the first value equal to or greater than 12'-0" in the 10 psf dead load section.
- ✘ Select 2x8 member size. (OK to 12'-10")

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JOIST SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
		2x8	2x8	2x10	2x12	2x8	2x8	2x10	2x12
		(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)
12	Douglas fir-larch SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-3
	Douglas fir-larch #1	10-11	14-5	18-5	22-0	10-11	14-2	17-4	20-1
	Douglas fir-larch #2	10-9	14-2	17-9	20-7	10-6	13-3	16-3	18-10
	Douglas fir-larch #3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Hem-fir SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-fir #1	10-8	13-10	17-8	21-6	10-6	13-10	16-11	19-7
	Hem-fir #2	10-0	13-2	16-10	20-4	10-0	13-1	16-0	18-6
	Hem-fir #3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Southern pine SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern pine #1	10-11	14-5	18-5	22-5	10-11	14-5	18-5	22-5
	Southern pine #2	10-9	14-2	18-0	21-9	10-9	14-2	16-11	19-10
	Southern pine #3	9-4	11-11	14-0	16-8	8-6	10-10	12-10	15-2
16	Spruce-pine-fir SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-6
	Spruce-pine-fir #1	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-pine-fir #2	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-pine-fir #3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Douglas fir-larch SS	10-4	13-7	17-4	21-1	10-4	13-7	17-4	21-0
	Douglas fir-larch #1	9-11	13-1	16-5	19-1	9-8	12-4	15-0	17-5
	Douglas fir-larch #2	9-9	12-7	15-5	17-10	9-1	11-6	14-1	16-3
	Douglas fir-larch #3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
	Hem-fir SS	9-9	12-10	16-5	19-11	9-9	12-10	16-5	19-11
	Hem-fir #1	9-6	12-7	16-0	18-7	9-6	12-0	14-8	17-0
	Hem-fir #2	9-1	12-0	15-2	17-7	8-11	11-4	13-10	16-1
	Hem-fir #3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
16	Southern pine SS	10-2	13-4	17-0	20-9	10-2	13-4	17-0	20-9
	Southern pine #1	9-11	13-1	16-9	20-4	9-11	13-1	16-4	19-6
	Southern pine #2	9-9	12-10	16-1	18-10	9-6	12-4	14-8	17-2
	Southern pine #3	8-1	10-3	12-2	14-6	7-4	9-5	11-1	13-2
	Spruce-pine-fir SS	9-6	12-7	16-0	18-6	9-6	12-7	16-0	18-6
	Spruce-pine-fir #1	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-pine-fir #2	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-pine-fir #3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4

FLOOR JOIST SIZING BY TABLES

- ✘ Example: A bedroom is supported by #2 2x8 floor joist with a span of 14'-0". What is the maximum allowable member spacing?
- ✘ Find Table R502.3.1(1).
- ✘ Follow down the 2x8 column with dead load = 10 psf until you find the maximum spacing for #2 southern pine with a span equal to or greater than 14'-0".
- ✘ Select a maximum spacing of 16". (OK to 14'-2")

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		FLOORS									
		TABLE R503.2.1(1) FLOOR JOIST SPACING FOR COMMON LUMBER SPECIES (Residential sleeping areas, live load = 30 psf, L/A = 360) ^a									
JOIST SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
		2 × 6	2 × 8	2 × 10	2 × 12	2 × 6	2 × 8	2 × 10	2 × 12	2 × 6	2 × 8
		(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)	(R-16)
12	Douglas fir-larch	SS	12-6	16-6	21-0	25-7	12-6	16-6	21-0	25-7	
	Douglas fir-larch	#1	12-0	15-10	20-3	24-8	12-0	15-7	19-0	22-0	
	Douglas fir-larch	#2	11-10	15-7	19-10	23-0	11-6	14-7	17-9	20-7	
	Douglas fir-larch	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-9	
	Hem-fir	SS	11-10	15-7	19-10	24-2	11-10	15-7	19-10	24-2	
	Hem-fir	#1	11-2	15-3	19-5	23-7	11-7	15-2	18-6	21-6	
	Hem-fir	#2	11-0	14-6	18-6	22-6	11-0	14-4	17-6	20-4	
	Hem-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7	
	Southern pine	SS	12-3	16-2	20-8	25-1	12-3	16-2	20-8	25-1	
	Southern pine	#1	12-0	15-10	20-3	24-8	12-0	15-10	20-3	24-8	
	Southern pine	#2	11-10	15-7	19-10	24-2	11-10	15-7	18-7	21-9	
	Southern pine	#3	10-5	13-3	15-8	18-8	9-4	11-11	14-0	16-8	
16	Spruce-pine-fir	SS	11-7	15-3	19-3	23-7	11-7	15-3	19-5	23-7	
	Spruce-pine-fir	#1	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7	
	Spruce-pine-fir	#2	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7	
	Spruce-pine-fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7	
	Douglas fir-larch	SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-0	
	Douglas fir-larch	#1	10-11	14-5	18-5	21-4	10-8	13-6	16-5	19-1	
	Douglas fir-larch	#2	10-9	14-1	17-2	19-11	9-11	12-7	15-5	17-10	
	Douglas fir-larch	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6	
	Hem-fir	SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11	
	Hem-fir	#1	10-6	13-10	17-8	20-9	10-4	13-1	16-0	18-7	
	Hem-fir	#2	10-0	13-2	16-10	19-8	9-10	12-5	15-2	17-7	
	Hem-fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6	
20	Southern pine	SS	11-3	14-8	18-9	22-10	11-2	14-8	18-9	22-10	
	Southern pine	#1	10-11	14-5	18-5	22-5	10-11	14-5	17-11	21-4	
	Southern pine	#2	10-9	14-2	18-0	21-11	10-5	13-6	16-1	18-10	
	Southern pine	#3	9-0	11-6	13-7	16-2	8-1	10-3	12-2	14-6	
	Spruce-pine-fir	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-4	
	Spruce-pine-fir	#1	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10	
	Spruce-pine-fir	#2	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10	
	Spruce-pine-fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6	

FLOOR DECK SELECTION

- Find Table R503.2.1.1(1).
- For the joist spacing that you use, select a deck that is equal to or greater than the thickness shown.
- Alternatively, read the markings on the panel itself.



		TABLE R503.2.1(1) ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANELS FOR ROOF AND SUBFLOOR SHEATHING AND COMBINATION SUBFLOOR UNDERLAYMENT ^a									
SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	ALLOWABLE LIVE LOAD (psf) ^b		MAXIMUM SPAN (inches)		UNIFORM LOAD (psf)		POINT LOAD (psf)		MAXIMUM SPAN (inches)	
		DEAD	DEAD	With edge support ^c	Without edge support ^c	Roof	Live load	Roof	Live load	Roof	Subfloor ^d
Sheathing ^e											
16/0	1/2	30	—	16	16	40	30	0	0	0	0
24/0	1/2	50	—	20	20	40	30	0	0	0	0
24/0	1/2	100	30	24	20	40	30	0	0	0	0
24/16	1/2	100	40	24	24	30	40	16	16	16	16
32/16	3/4	180	70	32	28	40	30	16	16	16	16
40/20	3/4	305	130	40	32	40	30	20	20	20	20
48/24	3/4	—	175	48	36	45	35	24	24	24	24
60/32	3/4	—	305	60	48	45	35	32	32	32	32
Underlayment, C-C plugged, single floor ^f											
16 o.c.	1/2	100	40	24	24	30	40	16	16	16	16
20 o.c.	1/2	150	60	32	32	40	30	20	20	20	20
24 o.c.	1/2	240	100	48	36	35	25	24	24	24	24
32 o.c.	1/2	—	185	48	40	30	40	32	32	32	32
48 o.c.	1/2	—	250	60	48	30	40	48	48	48	48

For S1: 1 inch = 25.4 mm, 1 point per square foot = 0.0479 kPa.
a. The allowable total loads were determined using a dead load of 10 psf. If the dead load exceeds 10 psf, then the live load shall be reduced accordingly.
b. Point loads shall be applied to the edge of the panel.
c. Point loads shall be applied to the edge of the panel.
d. Applies to panels 24 inches or wider.
e. Lumber blocking, panel edge clips (one midway between each support, except two equally spaced between supports when span is 48 inches), tongue-and-groove panel edges, or other approved type of edge support.
f. Uniform load deflection limitation: Δ_{max} of span under live load plus dead load, Δ_{max} of span under live load only.
g. Lumber blocking, panel edge clips (one midway between each support, except two equally spaced between supports when span is 48 inches), tongue-and-groove panel edges, or other approved type of edge support.
h. Maximum span 24 inches where 1/2 inch wood framing flooring is installed at right angles to joists.
i. Maximum span 24 inches where 1/2 inch of lightweight concrete or approved cellular concrete is placed over the subfloor.
j. Unsupported edges shall have tongue-and-groove joints or shall be supported with blocking unless minimum nominal 1/2 inch thick underlayment with end edge joints offset at least 1/2 inch or 1/2 inch of lightweight concrete or approved cellular concrete is placed over the subfloor, or 1/2 inch wood framing flooring is installed at right angles to the supports. Alternative uniform live load at maximum span, based on deflection of Δ_{max} of span, is 100 psf except panels with a span rating of 48 or better are limited to 65 psf total uniform load at maximum span.
k. Alternative live load values at spans of 16" o.c. and 24" o.c. taken from reference standard APA E36, APA, Engineered Wood Construction Guide. Refer to reference standard for allowable spans and loads in the table.

STUD SIZES

- ✦ 2x6 @ 24" o/c – OK to support either a roof/ceiling or habitable attic plus one floor.
- ✦ 2x6 @ 24" o/c – OK for interior bearing walls supporting only one floor.
- ✦ 2x6 @ 24" o/c – OK for interior non-bearing walls.
- ✦ 2x6 @ 16" o/c – OK to support two floors plus a roof/ceiling or a habitable attic.

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STUDWALLS

- ✦ Bottom plate same width as studs.
- ✦ Double top plate with joints staggered a minimum of 24".
- ✦ Single top plate with 3" x 6" x .036" steel plates at joints with six 8d nails per side. (joist or rafters must not land more than 1" off center of the studs)

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DRILLING STUDS

- ✦ Studs in load bearing walls (interior or exterior) may not be drilled with holes greater in diameter than 40% of their width. (40% of a 2x4 = 1.4 inches)
- ✦ Studs in load bearing walls (interior or exterior) may be drilled with holes between 40% and 60% of their width if the stud is doubled. (60% of a 2x4 = 2.1")

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DRILLING STUDS

- ✖ Studs in non load bearing walls may not be drilled with holes greater in diameter than 60% of their width. (60% of a 2x4 = 2.1")
- ✖ All drilled holes must have a minimum of 5/8" between the hole and the outer face of the stud.

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NOTCHING STUDS

- ✖ Studs in load bearing walls (interior or exterior) may not be notched more than 25% of their width. (25% of a 2x4 = .875" that's 7/8")
- ✖ Non bearing wall studs may not be notched more than 40% of their width.
- ✖ Studs may not be drilled and notched at the same location.

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HEADER SIZES

- ✖ A 24' wide single story house has an opening 9'-0" wide in an exterior bearing wall. Size the header and determine the number of jack studs required for each end of the girder.
- ✖ See Table R502.5(1). Find the section "Roof and ceiling".
- ✖ A double 2x12 header is OK for 9'-1" and requires 2 jack studs at each end.

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		TABLE R802.4(2) ORDER SPANS AND HEADER SPANS FOR EXTERIOR BEARING WALLS (Maximum spans for Douglas fir-larch, hem-fir, southern pine and spruce-pine-fir and redwood (number of joist studs) Minimum beam depth (in.)																							
ORDERED AND SUPPORTING	SIZES	30												36											
		10						12						14						16					
		Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b	Span ^a	Header ^b
Roof and ceiling	2x4	5.0	1	5.0	1	2.10	1	2.8	1	2.8	1	2.6	1	3.10	1	3.6	1	3.3	1	3.8	1	4.3	1	4.8	1
	2x6	5.5	1	5.5	1	2.2	1	3.0	1	3.0	1	2.8	1	3.3	1	3.8	1	3.5	1	4.0	1	4.5	1	5.0	1
	2x8	6.0	1	5.5	1	2.4	1	3.2	1	3.2	1	3.0	1	3.5	1	4.0	1	3.7	1	4.2	1	4.7	1	5.2	1
	2x10	6.5	1	6.0	1	2.6	1	3.4	1	3.4	1	3.2	1	3.7	1	4.2	1	3.9	1	4.4	1	4.9	1	5.4	1
	2x12	7.0	1	6.5	1	2.8	1	3.6	1	3.6	1	3.4	1	3.9	1	4.4	1	4.1	1	4.6	1	5.1	1	5.6	1
	2x14	7.5	1	7.0	1	3.0	1	3.8	1	3.8	1	3.6	1	4.1	1	4.6	1	4.3	1	4.8	1	5.3	1	5.8	1
	2x16	8.0	1	7.5	1	3.2	1	4.0	1	4.0	1	3.8	1	4.3	1	4.8	1	4.5	1	5.0	1	5.5	1	6.0	1
	2x18	8.5	1	8.0	1	3.4	1	4.2	1	4.2	1	4.0	1	4.5	1	5.0	1	4.7	1	5.2	1	5.7	1	6.2	1
	2x20	9.0	1	8.5	1	3.6	1	4.4	1	4.4	1	4.2	1	4.7	1	5.2	1	4.9	1	5.4	1	5.9	1	6.4	1
	2x22	9.5	1	9.0	1	3.8	1	4.6	1	4.6	1	4.4	1	4.9	1	5.4	1	5.1	1	5.6	1	6.1	1	6.6	1
Roof, ceiling and two spans bearing floors	2x4	4.0	1	4.0	1	2.0	1	2.0	1	2.0	1	1.8	1	2.2	1	2.2	1	2.0	1	2.4	1	2.4	1	2.2	1
	2x6	4.5	1	4.5	1	2.2	1	2.2	1	2.2	1	2.0	1	2.4	1	2.4	1	2.2	1	2.6	1	2.6	1	2.4	1
	2x8	5.0	1	5.0	1	2.4	1	2.4	1	2.4	1	2.2	1	2.6	1	2.6	1	2.4	1	2.8	1	2.8	1	2.6	1
	2x10	5.5	1	5.5	1	2.6	1	2.6	1	2.6	1	2.4	1	2.8	1	2.8	1	2.6	1	3.0	1	3.0	1	2.8	1
	2x12	6.0	1	6.0	1	2.8	1	2.8	1	2.8	1	2.6	1	3.0	1	3.0	1	2.8	1	3.2	1	3.2	1	3.0	1
	2x14	6.5	1	6.5	1	3.0	1	3.0	1	3.0	1	2.8	1	3.2	1	3.2	1	3.0	1	3.4	1	3.4	1	3.2	1
	2x16	7.0	1	7.0	1	3.2	1	3.2	1	3.2	1	3.0	1	3.4	1	3.4	1	3.2	1	3.6	1	3.6	1	3.4	1
	2x18	7.5	1	7.5	1	3.4	1	3.4	1	3.4	1	3.2	1	3.6	1	3.6	1	3.4	1	3.8	1	3.8	1	3.6	1
	2x20	8.0	1	8.0	1	3.6	1	3.6	1	3.6	1	3.4	1	3.8	1	3.8	1	3.6	1	4.0	1	4.0	1	3.8	1
	2x22	8.5	1	8.5	1	3.8	1	3.8	1	3.8	1	3.6	1	4.0	1	4.0	1	3.8	1	4.2	1	4.2	1	4.0	1
Roof, ceiling and one span bearing floors	2x4	3.0	1	3.0	1	1.5	1	1.5	1	1.5	1	1.3	1	1.8	1	1.8	1	1.6	1	2.0	1	2.0	1	1.8	1
	2x6	3.5	1	3.5	1	1.6	1	1.6	1	1.6	1	1.4	1	2.0	1	2.0	1	1.8	1	2.2	1	2.2	1	2.0	1
	2x8	4.0	1	4.0	1	1.8	1	1.8	1	1.8	1	1.6	1	2.2	1	2.2	1	2.0	1	2.4	1	2.4	1	2.2	1
	2x10	4.5	1	4.5	1	2.0	1	2.0	1	2.0	1	1.8	1	2.4	1	2.4	1	2.2	1	2.6	1	2.6	1	2.4	1
	2x12	5.0	1	5.0	1	2.2	1	2.2	1	2.2	1	2.0	1	2.6	1	2.6	1	2.4	1	2.8	1	2.8	1	2.6	1
	2x14	5.5	1	5.5	1	2.4	1	2.4	1	2.4	1	2.2	1	2.8	1	2.8	1	2.6	1	3.0	1	3.0	1	2.8	1
	2x16	6.0	1	6.0	1	2.6	1	2.6	1	2.6	1	2.4	1	3.0	1	3.0	1	2.8	1	3.2	1	3.2	1	3.0	1
	2x18	6.5	1	6.5	1	2.8	1	2.8	1	2.8	1	2.6	1	3.2	1	3.2	1	3.0	1	3.4	1	3.4	1	3.2	1
	2x20	7.0	1	7.0	1	3.0	1	3.0	1	3.0	1	2.8	1	3.4	1	3.4	1	3.2	1	3.6	1	3.6	1	3.4	1
	2x22	7.5	1	7.5	1	3.2	1	3.2	1	3.2	1	3.0	1	3.6	1	3.6	1	3.4	1	3.8	1	3.8	1	3.6	1
Roof, ceiling, and two spans bearing floors	2x4	3.0	1	3.0	1	1.5	1	1.5	1	1.5	1	1.3	1	1.8	1	1.8	1	1.6	1	2.0	1	2.0	1	1.8	1
	2x6	3.5	1	3.5	1	1.6	1	1.6	1	1.6	1	1.4	1	2.0	1	2.0	1	1.8	1	2.2	1	2.2	1	2.0	1
	2x8	4.0	1	4.0	1	1.8	1	1.8	1	1.8	1	1.6	1	2.2	1	2.2	1	2.0	1	2.4	1	2.4	1	2.2	1
	2x10	4.5	1	4.5	1	2.0	1	2.0	1	2.0	1	1.8	1	2.4	1	2.4	1	2.2	1	2.6	1	2.6	1	2.4	1
	2x12	5.0	1	5.0	1	2.2	1	2.2	1	2.2	1	2.0	1	2.6	1	2.6	1	2.4	1	2.8	1	2.8	1	2.6	1
	2x14	5.5	1	5.5	1	2.4	1	2.4	1	2.4	1	2.2	1	2.8	1	2.8	1	2.6	1	3.0	1	3.0	1	2.8	1
	2x16	6.0	1	6.0	1	2.6	1	2.6	1	2.6	1	2.4	1	3.0	1	3.0	1	2.8	1	3.2	1	3.2	1	3.0	1
	2x18	6.5	1	6.5	1	2.8	1	2.8	1	2.8	1	2.6	1	3.2	1	3.2	1	3.0	1	3.4	1	3.4	1	3.2	1
	2x20	7.0	1	7.0	1	3.0	1	3.0	1	3.0	1	2.8	1	3.4	1	3.4	1	3.2	1	3.6	1	3.6	1	3.4	1
	2x22	7.5	1	7.5	1	3.2	1	3.2	1	3.2	1	3.0	1	3.6	1	3.6	1	3.4	1	3.8	1	3.8	1	3.6	1
Roof, ceiling, and one span bearing floors	2x4	3.0	1	3.0	1	1.5	1	1.5	1	1.5	1	1.3	1	1.8	1	1.8	1	1.6	1	2.0	1	2.0	1	1.8	1
	2x6	3.5	1	3.5	1	1.6	1	1.6	1	1.6	1	1.4	1	2.0	1	2.0	1	1.8	1	2.2	1	2.2	1	2.0	1
	2x8	4.0	1	4.0	1	1.8	1	1.8	1	1.8	1	1.6	1	2.2	1	2.2	1	2.0	1	2.4	1	2.4	1	2.2	1
	2x10	4.5	1	4.5	1	2.0	1	2.0	1	2.0	1	1.8	1	2.4	1	2.4	1	2.2	1	2.6	1	2.6	1	2.4	1
	2x12	5.0	1	5.0	1	2.2	1	2.2	1	2.2	1	2.0	1	2.6	1	2.6	1	2.4	1	2.8	1	2.8	1	2.6	1
	2x14	5.5	1	5.5	1	2.4	1	2.4	1	2.4	1	2.2	1	2.8	1	2.8	1	2.6	1	3.0	1	3.0	1	2.8	1
	2x16	6.0	1	6.0	1	2.6	1	2.6	1	2.6	1	2.4	1	3.0	1	3.0	1	2.8	1	3.2	1	3.2	1	3.0	1
	2x18	6.5	1	6.5	1	2.8	1	2.8	1	2.8	1	2.6	1	3.2	1	3.2	1	3.0	1	3.4	1	3.4	1	3.2	1
	2x20	7.0	1	7.0	1	3.0	1	3.0	1	3.0	1	2.8	1	3.4	1	3.4	1	3.2	1	3.6	1	3.6	1	3.4	1
	2x22	7.5	1	7.5	1	3.2	1	3.2	1	3.2	1	3.0	1	3.6	1	3.6	1	3.4	1	3.8	1	3.8	1	3.6	1

CEILING JOIST SIZES

- ✖ The same 24' wide house has a bearing wall down the centerline. Size the ceiling joist assuming a 10 psf dead load and limited attic storage. Use #2 SYP joists.
- ✖ See Table R802.4(2).
- ✖ 2x6 joists at 12" o/c are OK to 15'-6"
- ✖ 2x6 joists at 16" o/c are OK to 13'-6"
- ✖ 2x6 joist at 19.2" o/c are OK to 12'-3" (not shown on your table)

ROOF-CEILING CONSTRUCTION

TABLE R802.4(2)
CEILING JOIST SPANS FOR COMMON LAMBER SPECIES
(Unstabilized species with limited storage, live load = 10 psf, L2 or S40)

CEILING JOIST SUPPORTING (inches)	SPECIES AND GRADE	S = 4				S = 6				S = 8			
		Dead load = 10 psf		Maximum ceiling joist spans		Dead load = 10 psf		Maximum ceiling joist spans		Dead load = 10 psf		Maximum ceiling joist spans	
		(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	#5	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13
	Douglas fir-larch	#1	10-10	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Douglas fir-larch	#3	9-10	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Douglas fir-larch	#5	7-8	11-2	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Hem-fir	#5	9-10	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Hem-fir	#1	9-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0	10-0	10-0
	Hem-fir	#3	9-2	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13
	Hem-fir	#5	7-8	11-2	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Southern pine	#5	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13
	Southern pine	#1	10-10	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Southern pine	#2	9-10	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Southern pine	#3	8-2	10-2	10-3	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11
16	Spruce-pine-fir	#5	9-8	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Southern pine	#1	9-5	10-6	10-5	10-4	10-3	10-2	10-1	10-0	10-0	10-0	10-0
	Spruce-pine-fir	#2	9-5	10-9	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Spruce-pine-fir	#3	8-8	11-2	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Douglas fir-larch	#5	8-9	10-11	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0	10-0
	Douglas fir-larch	#1	8-5	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14
	Douglas fir-larch	#3	8-6	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Hem-fir	#5	8-11	10-11	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Hem-fir	#1	8-8	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Hem-fir	#3	8-4	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13
	Hem-fir	#5	6-8	9-8	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
	Southern pine	#1	9-4	10-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13
20	Southern pine	#2	8-11	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14
	Southern pine	#3	7-4	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14
	Spruce-pine-fir	#5	8-9	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17	10-18
	Spruce-pine-fir	#1	8-7	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16
	Spruce-pine-fir	#2	8-7	10-10	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Spruce-pine-fir	#3	8-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Spruce-pine-fir	#5	8-8	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Douglas fir-larch	#5	8-8	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Douglas fir-larch	#1	8-5	10-5	10-6	10-7	10-8	10-9	10-10	10-11	10-12	10-13	10-14
	Douglas fir-larch	#3	8-6	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17
	Hem-fir	#5	8-11	10-11	10-8	10-7	10-6	10-5	10-4	10-3	10-2	10-1	10-0
	Hem-fir	#1	8-8	10-8	10-9	10-10	10-11	10-12	10-13	10-14	10-15	10-16	10-17

(continued)

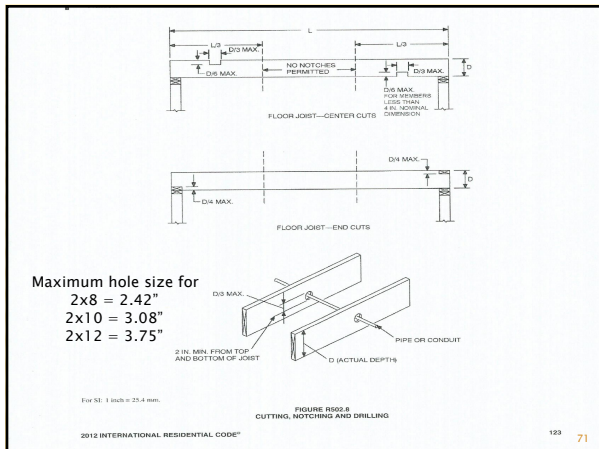
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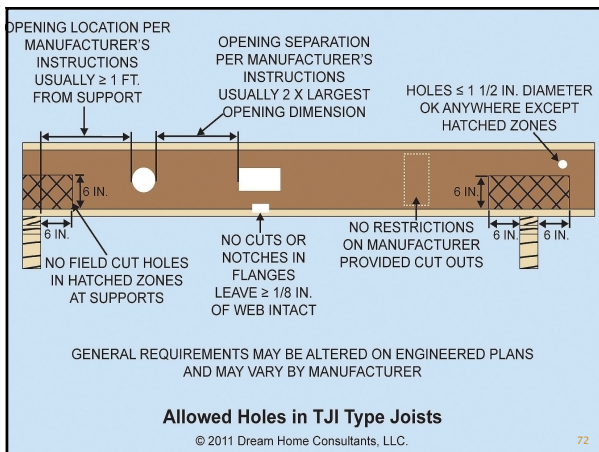
69

FLOOR AND CEILING JOIST NOTES

- ✦ Joists are to be lapped a minimum of 3" over supports and nailed together with a minimum of three 10d nails.
- ✦ Floor joists must have a rim joist or equal to keep them from turning over.
- ✦ Floor joists larger than 2x12 must have solid blocking or bridging every 8' along the span.

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RAFTER SIZES

- ✦ For the same house, size the rafters assuming that the rafters will be braced off of the centerline bearing wall at a 45° angle.
- ✦ The rafter "span" (always measured horizontally regardless of the roof slope) is about 6'.
- ✦ From Table R802.5.1(2) select 2x4 at 16" o/c (OK to 8'-11")

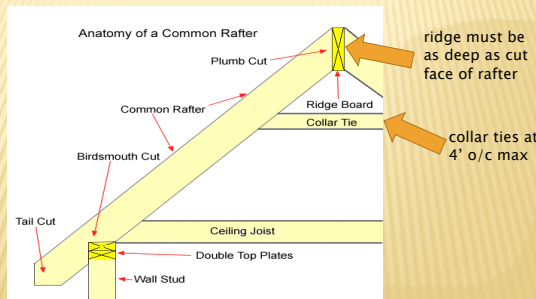
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RAFTER SIZES

RAFTER SLOPE		SPEEDS AND GRADES		TABLE R802.5.1 RAFTER SPANS FOR COMMON ROOFS (Rafter live load of 20 psf, unless otherwise specified, (1/2" x 8")															
				SPAN (feet) - 16 psf								SPAN (feet) - 20 psf							
				2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	2 x 4	2 x 6	2 x 8	2 x 10	2 x 12	
12	Unbraced for loads	5.0	10.0	15.0	20.0	25.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
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	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
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	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
16	Unbraced for loads	5.0	10.0	15.0	20.0	25.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
	Unbraced for loads	4.0	8.0	12.0	16.0	20.0	None	None	None	None	None	None	None	None	None	None	None	None	
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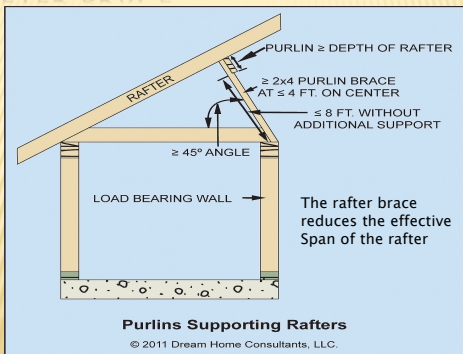
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ROOF FRAMING



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RAFTER BRACE

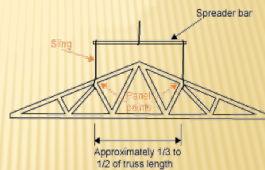
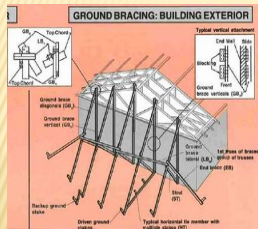


Purlins Supporting Rafters

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TRUSSES

- ✘ Do not cut or otherwise alter trusses.
- ✘ Follow the truss manufacturer's handling recommendations.
- ✘ Review the truss drawings to find out the temporary and permanent bracing requirements.
- ✘ Provide adequate bracing as the trusses are erected (sheathing makes the best truss bracing).



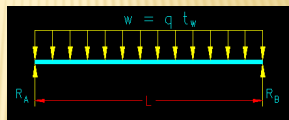
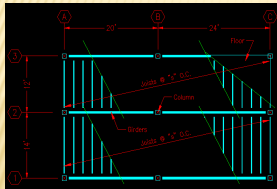
TRUSS ERECTION

WHY WE BRACE TRUSSES



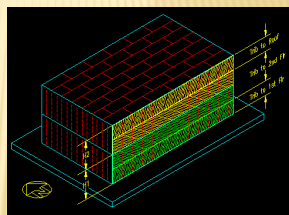
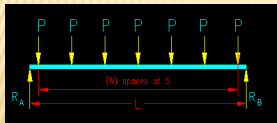
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LOAD PATH CONCEPTS



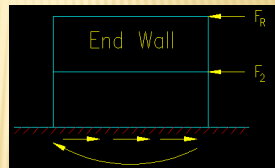
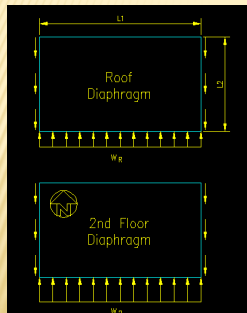
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LOAD PATH CONCEPTS



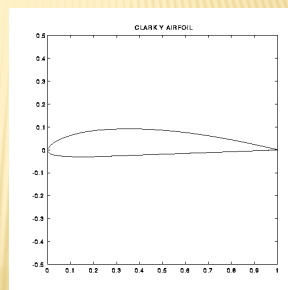
81

LOAD PATH CONCEPTS



82

LOAD PATH CONCEPTS



83

LOAD PATH CONCEPTS

- ✗ Wind blowing across the roof of a typical contemporary house (8 on 12 roof slope) increases the pressure on the upwind portion of the roof.
- ✗ Wind blowing across the roof of a typical contemporary house (8 on 12 roof slope) decreases the pressure on the downwind portion of the roof.

84

LOAD PATH CONCEPTS

- ✘ Wind moving across the roof of the structure creates lift.
- ✘ For stability, the lift forces must be resisted.
- ✘ Therefore, the entire structure from roof to foundation must be tied together.

85

LOAD PATH CONCEPTS

- ✘ I call this concept “vertical continuity”.
- ✘ The walls must be adequately tied to the foundation.
- ✘ The walls must be adequately tied together.

86

LOAD PATH CONCEPTS

- ✘ The roof decking must be adequately tied to the roof framing.
- ✘ The roofing must be adequately tied to the roof decking.

87

LOAD PATH CONCEPTS

- ✖ If the house has more than one story, the walls of the lower level must be adequately tied to the walls of the upper level.
- ✖ The roof framing must be adequately tied to the walls.

88

LOAD PATH CONCEPTS

- ✖ The load path is like a chain, it is only as strong as its weakest link.
- ✖ The load path can travel through structural members or assemblies as tension, compression or shear forces.
- ✖ Members can have different types of forces at different times.

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FOR ADDITIONAL HELP...

Take the NAHB Building Technology: Structure and Exterior Finishes course available through the Home Builders Association of Alabama.

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STAIR AND RAILING DETAILS

- ✦ Stairways must have a minimum clear width of 36" exclusive of handrails.
- ✦ Stairways must have a minimum clear headroom of 6'-8" measured from the leading edge of the tread.
- ✦ The vertical rise of a stairway between levels or landings may not exceed 12'.

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STAIR AND RAILING DETAILS

- ✦ The maximum allowable height of risers is 7 $\frac{3}{4}$ ".
- ✦ Riser heights within a flight of stairs may not vary more than $\frac{3}{8}$ ".
- ✦ The minimum tread depth is 10".
- ✦ Tread depths within a flight of stairs may not vary more than $\frac{3}{8}$ ".
- ✦ Open risers are permitted if the space between treads will not pass a 4" sphere.

92

STAIR AND RAILING DETAILS

- ✦ Railings are required on at least one side of any stairway with 4 or more risers.
- ✦ The top of the handrails must be between 34" and 38" above the leading edge of the tread.
- ✦ The grasping surface of the handrail must have a perimeter of between 4" and 6 $\frac{1}{4}$ " and with no dimension greater than 2 $\frac{1}{4}$ ".

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SECTION 4. MOISTURE CONTROL



COMMON SOURCES OF MOISTURE

- ✖ Crawlspace
- ✖ Roofs
- ✖ Roof/wall junctions
- ✖ Flashing issues
- ✖ Improper masonry details
- ✖ Wall openings
- ✖ Deck/wall junctions

95

CRAWLSPACE MOISTURE



96

CRAWLSPACE MOISTURE ISSUES

- ✖ Inadequate slope of exterior grade.
 - + Minimum of 6" fall in 10' outside foundation.
- ✖ Crawlspace lower than exterior grade.
 - + In areas with high groundwater, the interior level must be as high as the exterior or proper perimeter drainage must be provided.
- ✖ Missing/improper perimeter drains.
 - + Drains generally must have a gravel pack and a geotechnical fabric wrap.
 - + Drains must actually "drain".

97

CRAWLSPACE MOISTURE ISSUES

- ✖ Missing/improper foundation wall waterproofing.
 - + Waterproofing is required for habitable spaces below grade.
- ✖ Plumbing/HVAC leaks.
 - + Watch for condensate drains and T&P relief.
- ✖ Inadequate ventilation.
 - + 1 sf of free air space per 150 sf of crawlspace or
 - + 1 sf of free air space per 1,500 sf of crawlspace if vents within 3' of corners and proper vapor retarder.

98

ROOF ISSUES



99

ROOF ISSUES

- ✖ Shingle roofs require a minimum slope of 2/12.
- ✖ Shingle roofs between 2/12 and 4/12 require two layers of felt.
- ✖ All shingle roofs require drip edges at gables and eaves with the drip edge installed UNDER the felt at the eaves and OVER the felt at the gables.

100

ROOF ISSUES

- ✖ Valleys may be “open” or “closed”.
- ✖ Open valleys must be lined with 24” minimum width corrosion resistant metal or one 18” wide and one 36” wide layer of roll roofing.
- ✖ Closed valleys must be lined with one 36” wide layer of roll roofing or “peel and stick”.

101

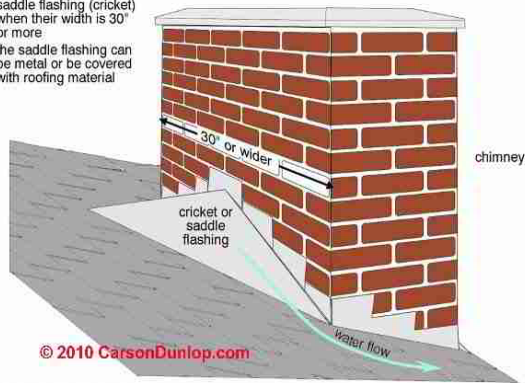
ROOF ISSUES

- ✖ Projections through the roof wider than 30” must have crickets.
- ✖ Shingles must be installed in accordance with the manufacturer’s application instructions.
- ✖ This includes starter course, hip and ridge shingles, nailing pattern etc.
- ✖ The nailing pattern is particularly important in high wind areas.

102

Chimney saddle flashings

chimneys require a saddle flashing (cricket) when their width is 30" or more
the saddle flashing can be metal or be covered with roofing material



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103

ROOF/WALL JUNCTIONS

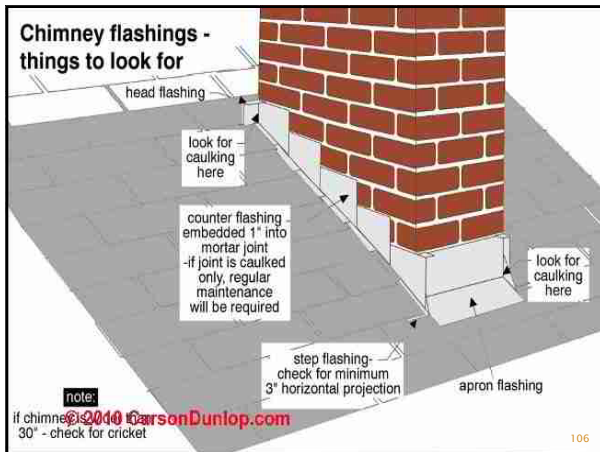
- ✖ Roof/wall junctions must have either continuous or step flashings.
- ✖ The flashing must have a minimum of 4" vertical and horizontal legs with a thickness of at least 26 gauge.
- ✖ Where the wall material is siding, the vertical leg of the flashing must extend behind the siding.

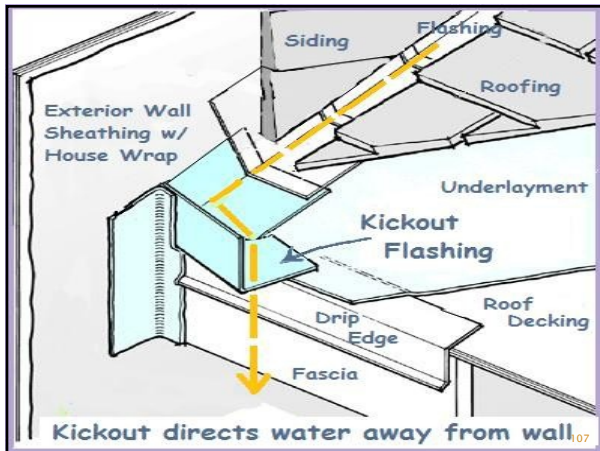
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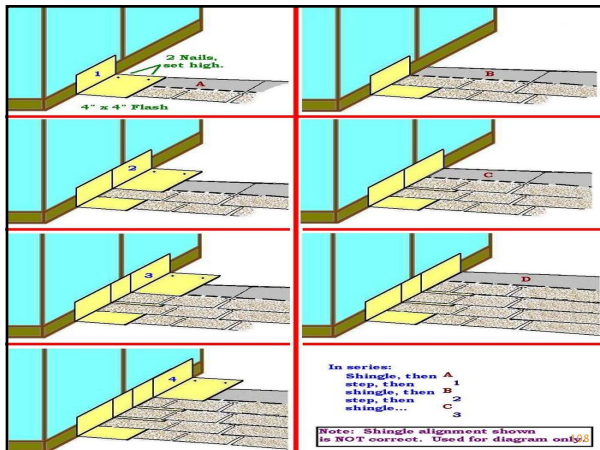
ROOF/WALL JUNCTIONS

- ✖ Where the wall extends past the eave line, install a kickout flashing.
- ✖ Where the wall material is brick, install step flashings.

105



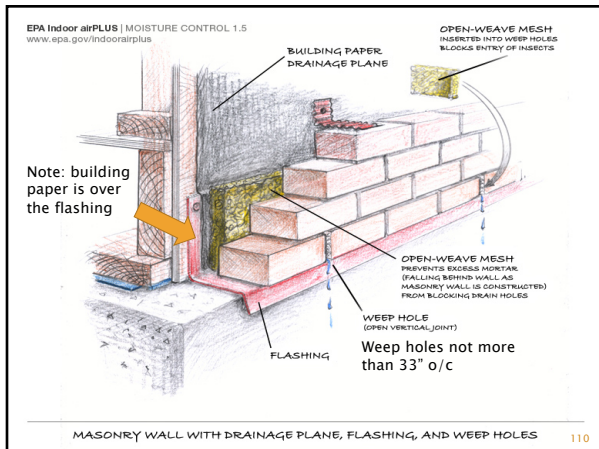




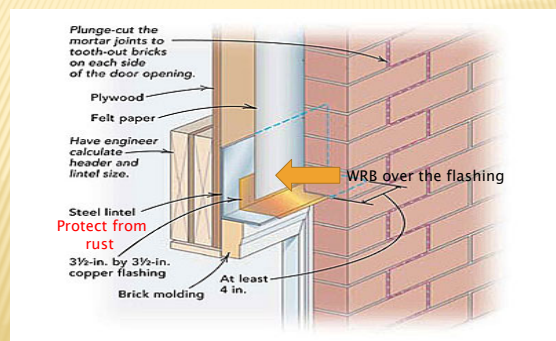
OTHER FLASHING ISSUES

- ✖ Base flashing at brick veneer walls
- ✖ Head flashing at doors and windows
- ✖ Sill flashing under windows

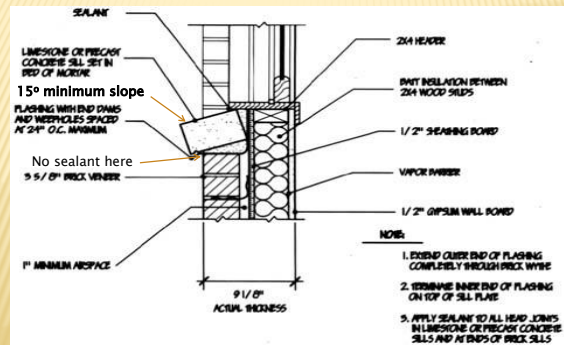
109



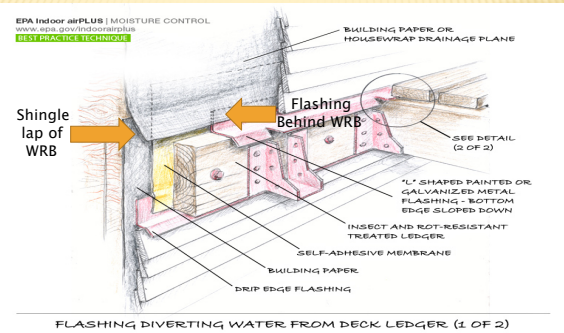
DOOR & WINDOW HEAD FLASHING



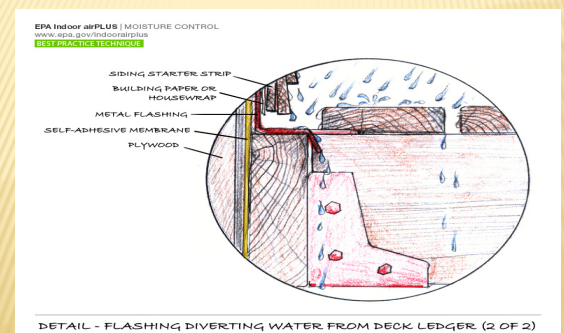
SILL FLASHING



DECK / WALL JUNCTIONS



DECK / WALL JUNCTIONS



FOR ADDITIONAL HELP...

Take the NAHB Building Technology: Structure and Exterior Finishes course available through the Home Builders Association of Alabama.

115

SECTION 5. ESTIMATING

- ✦ One of the primary reasons that construction companies fail is their inability to produce accurate cost estimates.
- ✦ Estimating is part art and part science.
- ✦ In order to produce an accurate cost estimate, you have to be able to “build it in your mind”.

116

ESTIMATING METHODS

- ✦ The “I’m thinking of a number” method,
- ✦ The Square Foot method,
- ✦ The Parametric method,
- ✦ The Assembly method,
- ✦ The Time and Materials method,
- ✦ The Detailed Quantity Survey and Pricing method, and
- ✦ The Combination method.

117

ESTIMATE ASSEMBLY

- ✦ Manual – pad and pencil
- ✦ Computer aided – spreadsheet templates
- ✦ Computerized – full blown computerized

118

FOR ADDITIONAL HELP...

Take the NAHB Estimating course available through the Home Builders Association of Alabama.

119

ALABAMA HOME BUILDERS TRAINING



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Alabama Home Builders Licensure Board

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1

ALABAMA HOME BUILDERS TRAINING

Course Goal: To assist you in operating your business in a manner that will help you to comply with the applicable regulations, to provide your customers with a valuable service and to enhance your reputation as a professional.

2

MAYBE YOU BUILD TRADITIONAL HOMES
OR MAYBE YOU BUILD MODERN ONES.



3

IN EITHER CASE, YOU WANT TO DO
YOUR JOB RIGHT!



4

ALABAMA HOME BUILDERS TRAINING



5

ALABAMA HOME BUILDERS TRAINING

- ✧ A bit about me
- ✧ Born into a construction family
- ✧ Worked on the jobsite from age 12
- ✧ Job assignments included laborer, framing carpenter, trim carpenter, backhoe operator, welder, roofer, crane operator, truck driver, forklift operator, paper hanger, painter, concrete finisher, company pilot, etc

6

ALABAMA HOME BUILDERS TRAINING

- ✦ 4 ½ years as Project Engineer for major chemical manufacturer (worked on projects in US, Canada, Mexico, Puerto Rico, Belgium and India)
- ✦ 8 years as Estimator and Project Manager for general contracting firm
- ✦ 8 years as President & CEO of engineering and construction firm

7

ALABAMA HOME BUILDERS TRAINING

- ✦ 18 years on faculty of Department of Building Science at Auburn University
- ✦ Teach courses through NAHB University of Housing
- ✦ Provide expert witness services for numerous law firms
- ✦ Provide construction mediation services

8

ALABAMA HOME BUILDERS TRAINING

- ✦ As a courtesy to others, please silence your cell phone
- ✦ Please feel free to ask questions or comment during the presentation
- ✦ I will stay after the session to grade the tests and answer the questions that you don't ask during the class

9

SECTION 6. BUSINESS PRACTICES

- ✦ Contracts
- ✦ Lien law provisions
- ✦ Change orders
- ✦ Business accounting
- ✦ Job accounting
- ✦ Insurance and Risk Management

10

SECTION 6. BUSINESS PRACTICES

- ✦ Supervision of subcontractors
- ✦ Scheduling
- ✦ Customer service
- ✦ Building permits
- ✦ Inspections
- ✦ Warranties

11

ELEMENTS OF A CONTRACT

- ✦ Offer
- ✦ Acceptance
- ✦ Consideration
- ✦ Legal purpose
- ✦ Competent parties

12

ELEMENTS OF A CONTRACT

- ✘ Note that a counteroffer extinguishes the original offer

13

CONTRACTS

- ✘ Advantages of a written contract
 - + Required by Home Builders licensure Board.
 - + Provides a record of the terms of the agreement.
 - + Enables you to Limit your risk.
 - + Enables you to transfer risks to other parties.
 - + Allows you to set a standard of quality.
 - + Allows you to provide for alternative dispute resolution methods.

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CONTRACTS

- ✘ Advantages of a written contract
 - + Permits you to itemize the project inclusions and exclusions,
 - + Can exclude prior negotiations,
 - + Avoids the “selective memory” syndrome,
 - + Increases your level of professionalism,
 - + Can be enforced in a court of law if necessary, and
 - + Eliminates any problem with the Statute of Frauds.

15

CONTRACT INTERPRETATION

- + Contract law is complicated (see the 15 volume set Corbin on Contracts).
- + Primary rule is what the parties intended when they entered into the contract.
- + Specific statements govern general statements.
- + Trade terms take trade meanings.
- + A simple interpretation prevails over a complicated interpretation.

16

CONTRACT INTERPRETATION

- + A contract is interpreted as a whole.
- + The parole evidence rule prevents extrinsic (outside) evidence except to interpret an ambiguity.
- + Actions taken by the parties are evidence of their intentions.
- + The final rule (tie breaker) is to interpret ambiguities against the drafter.

17

IMPLIED CONDITIONS

- ✘ The builder implicitly promises
 - + Reasonable quality in materials and workmanship,
 - + Prompt payment of employees, subcontractors and vendors,
 - + Conformity to the applicable building code, (except when the construction documents are furnished by the owner), and
 - + Reasonable adherence to the construction schedule.

18

IMPLIED CONDITIONS

- ✖ The owner implicitly promises
 - + Cooperation and freedom from interference,
 - + Reasonable access to the site,
 - + Unbiased interpretation of the construction documents (if owner furnished),
 - + Adequacy of the construction documents (if owner furnished), Spearin Doctrine
 - + Accuracy of owner furnished information, and
 - + Timely disclosure of pertinent information.

19

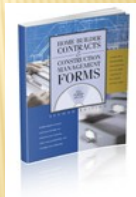
IMPLIED CONDITIONS

- ✖ The design professional implicitly promises
 - + Unbiased interpretation of the construction documents (if owner furnished),
 - + Adequacy of the construction documents,
 - + Prompt administration of the construction documents, and
 - + Performance comparable with similar professionals in the area.

20

YOU DON'T HAVE TO RE-INVENT THE WHEEL

- ✖ Home Builder Contracts and Construction Management Forms
- ✖ Nearly 100 forms for you to customize for your business
- ✖ \$59.95 to NAHB members, \$75.00 to others
- ✖ Order from Builder Books 1-800-223-2665



21

ALABAMA LIEN LAW PROVISIONS

- ✖ Applicable if you make "improvements" to real property.
- ✖ You MUST file the claim within 6 months of the last labor or material incorporated into the project.
- ✖ You must supply a verified statement (using the statutory form is a good idea),
- ✖ The time limit is STRICTLY enforced.

22

It shall be the duty of every person entitled to such lien to file in the office of the judge of probate of the county in which the property upon which the lien is sought to be established is situated, a statement in writing, verified by the oath of the person claiming the lien, or of some other person having knowledge of the facts, containing the amount of the demand secured by the lien, after all just credits have been given, a description of the property on which the lien is claimed in such a manner that same may be located or identified, a description by house number, name of street, and name of city or town being a sufficient description where the property is located in a city or town, and the name of the owner or proprietor thereof; but no error in the amount of the demand or in the name of the owner or proprietor, shall affect the lien. Unless such statement is so filed the lien shall be lost. Said verified statement may be in the following form, which shall be deemed sufficient:

State of Alabama, County of _____

_____ files this statement in writing, verified by the oath of _____, who has personal knowledge of the facts herein set forth. That said _____ claims a lien upon the following property, situated in _____ county, Alabama, to wit:

This lien is claimed, separately and severally, as to both the buildings and improvements thereon, and the said land.

That said lien is claimed to secure an indebtedness of \$_____ with interest, from to wit _____ day of _____ 20____ to _____

The name of the owner or proprietor of the said property is _____

Claimant.

Before me, _____, a notary public in and for the county of _____, State of _____, personally appeared _____, who being duly sworn, doth depose and say: That he has personal knowledge of the facts set forth in the foregoing statement of lien, and that the same are true and correct to the best of his knowledge and belief.

Affiant.

Subscribed and sworn to before me on this the _____ day of _____ 20____, by said affiant.

Notary Public.

23

FOR ADDITIONAL INFORMATION

Take the NAHB Construction Contracts and Law class available through the Home Builders Association of Alabama.

24

CHANGE ORDERS

- ✦ A revision in the contract scope of work.
- ✦ Just as the contract should be written, the change order should be written too.
- ✦ Execute the change order before doing the work covered by the change order.
- ✦ Request payment for additive change orders in advance.
- ✦ If your contract has a GMP, you will likely have to adjust the GMP.

25

CHANGE ORDERS

- ✦ Manage the change order as a “project within the project”.
- ✦ Don’t forget to consider the impact that the change order has on the schedule.
- ✦ When change orders interlock or overlap, the effect that one may have upon another may not be obvious.

26

DELAYS

- ✦ Excusable – defective documents, unusually severe weather, owner interference, unavailable materials, action by governments (you get additional days)
- ✦ Non- Excusable – defective work, code violations, poor planning (you don’t get additional days)

27

DELAYS

- ✦ Compensable – you get additional payment
- ✦ Non-Compensable – you don’t get additional payment
- ✦ In any case, you must make a claim for the delay if you want days, dollars or both

28

CONSTRUCTIVE CHANGE

- ✦ An excusable delay where the additional days are not awarded
- ✦ Rejection of “or equal” materials
- ✦ Rejection of construction meeting project requirements
- ✦ Over inspection

29

FOR ADDITIONAL INFORMATION

Take the NAHB
Construction Contracts and
Law class available through
the Home Builders
Association of Alabama.

30

BUSINESS ACCOUNTING

- ✖ Accounting is the setting up, maintaining and auditing the books of a firm.
- ✖ Without an adequate accounting system, you may know your checkbook balance but not...
 - + How much you still owe on each project,
 - + How much is still due on each project,
 - + How much profit you will make on each project,
 - + What your balance sheet looks like, or
 - + What your income statement looks like.

31

THE 5 Cs OF FINANCIAL MANAGEMENT

- +CREATE cost accounts and reporting systems.
- +COLLECT cost data.
- +COMPILE data into specific reports.
- +COMPARE actual data to estimated data.
- +CORRECT the challenges and obstacles .

32

THE BALANCE SHEET

- ✖ Assets = what you own
- ✖ Liabilities = what you owe
- ✖ Equity = your net worth
- ✖ Assets - Liabilities = Equity
- ✖ The balance sheet shows the condition of your company as of a particular moment.
- ✖ Comparing balance sheets from different times will show if your company's financial situation is improving.

33

NOTICE!

The balance sheet shows your company's financial condition as of a particular moment in time



34

THE INCOME STATEMENT

- ✖ Income = receipts for a given period
- ✖ Expense = cost of doing business for the same period
- ✖ Profit = Income - Expense
- ✖ The income statement shows the condition of your company for a given period of time.

35

NOTICE!

The income statement shows your company's financial condition for a particular period of time



36

CHART OF ACCOUNTS

- ✦ A system of identifiers (usually numbers) used to organize the accounting system.
- ✦ Your chart of accounts can be customized to suit your business.
- ✦ NAHB has a set that you can use or adapt to best fit your business.

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NAHB CHART OF ACCOUNTS

- ✦ 1000 – 1999 Assets
- ✦ 2000 – 2999 Liabilities and equity
- ✦ 3000 – 3999 Sales, revenues & sales cost
- ✦ 4000 – 4999 Indirect construction costs
- ✦ 5000 – 5999 Financing costs

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NAHB CHART OF ACCOUNTS

- ✦ 6000 – 6999 Sales & marketing expense
- ✦ 7000 – 7999 Operating & management expenses, rental expense
- ✦ 8000 – 8999 General & Administrative expenses
- ✦ 9000 – 9999 Other income & expenses

39

UNDERSTANDING OVERHEAD

- ✦ Overhead is the cost of doing business in excess of the direct cost of the work at the job site.
- ✦ Examples of overhead include: home office expenses (salaries, fringe benefits, utilities, insurance, legal expenses, vehicle expense, etc.).
- ✦ Each project must cover a portion of the total overhead (your mark-up must cover the overhead just to break even).

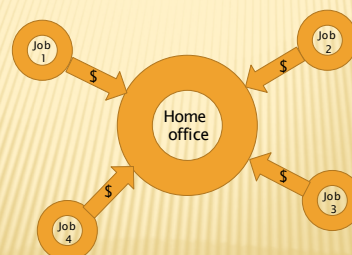
40

UNDERSTANDING OVERHEAD

- ✦ Generally, the smaller the company, the larger the overhead as a percentage of the gross income.
- ✦ Remodeling work generally has a higher overhead rate than new construction.
- ✦ As your company volume goes down, the overhead as a percentage of the income goes up.

41

OVERHEAD



42

BUSINESS ACCOUNTING ESSENTIALS

- ✦ To compete in today's market you **MUST** be able to properly manage your company finances!
- ✦ To manage your finances, you **MUST** have an adequate accounting system!
- ✦ To manage more than one project at a time, you **MUST** keep the finances separate For each project!

43

FOR ADDITIONAL HELP...

Take the NAHB Business Accounting and Job Cost, Financial Management and Business Management for Building Professionals courses available through the Home Builders Association of Alabama.

44

JOB ACCOUNTING (AKA JOB COST)

- ✦ Job accounting generally begins with a project budget (unless it is a cost plus project with no GMP).
- ✦ All job "costs" **MUST** be identified and charged to the individual project.
- ✦ All change orders **MUST** be documented..
- ✦ Actual job costs **MUST** be compared with the individual budget line items (not just the bottom line).
- ✦ All variances **MUST** be reconciled.

45

JOB ACCOUNTING (AKA JOB COST)

- ✦ Labor burden **MUST** be accounted for as a job cost.
- ✦ Job cost **MUST** include labor, labor burden, materials and sales taxes, subcontract expense, builder's risk insurance, operation of rented or owned equipment, building permit cost, job site utilities, toilet and dumpster rental, etc.

46

FOR ADDITIONAL HELP...

Take the NAHB Business Accounting and Job Cost course available through the Home Builders Association of Alabama.

47

INSURANCE and RISK MANAGEMENT

- ✦ Operating a construction company is a risky business.
- ✦ Some of those risks we retain.
- ✦ Some of those risks we avoid.
- ✦ Some of those risks we transfer to subcontractors.
- ✦ The rest of the risks we transfer to insurers.

48

INSURANCE and RISK MANAGEMENT

- ✦ Operating a construction business requires that we **MANAGE** the risks.
- ✦ No risk can be managed unless that risk is first identified.
- ✦ Once the risk is identified, we then decide whether to retain it ourselves, avoid it altogether or transfer it to others either by means of contract or insurance.

49

INSURANCE and RISK MANAGEMENT

- ✦ Insurance is an agreement to accept a specified risk in exchange for a fee.
- ✦ Insurance companies evaluate the risk in a process called underwriting.
- ✦ Just like you, insurance companies may decide to avoid a particular risk. (How about New Orleans after Katrina?)

50

INSURANCE and RISK MANAGEMENT

- ✦ Commercial General Liability
 - + Premises and ongoing operations
 - + Completed operations
- ✦ Professional liability (if you furnish design)
- ✦ Builder's risk
 - + Broad Form (covers most risks)
 - + Named Peril (covers ONLY the named perils)

51

FOR ADDITIONAL HELP...

Take the NAHB Risk Management and Insurance for Building Professionals course available through the Home Builders Association of Alabama.

52

SUPERVISION of SUBCONTRACTORS



- ✦ Why does an orchestra need a conductor?
- ✦ Wouldn't it be OK just to let everyone just play their part at their own tempo?
- ✦ How would that sound to the audience?
- ✦ What if you run your business that way?

53

SUPERVISION of SUBCONTRACTORS



At the jobsite, you are the conductor!

54

SUPERVISION of SUBCONTRACTORS

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract...

AIA A201 –2007

55

SUPERVISION of SUBCONTRACTORS

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

AIA A201 –2007

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FOR ADDITIONAL HELP...

Take the NAHB Project Management course available through the Home Builders Association of Alabama.

57

SCHEDULING

- ✦ A plan for performing work or achieving an objective, specifying the order and allotted time for each part.
- ✦ Plan your work and work your plan.
- ✦ A management and communication tool used to coordinate the work and improve productivity.

58

SCHEDULING EXAMPLE



Assume that you have the 1000 piece puzzle still in the box. List the steps in order that you would use to assemble the puzzle.

Then assign your estimate of the time required to complete each item.

Finally, add up all of the Individual times to get a total time for the project.

59

SCHEDULING EXAMPLE

1. Open the box. (1 minute)
2. Dump out the pieces. (1 minute)
3. Turn all pieces face up. (3 minutes)
4. Find and assemble the edges and corners. (15 minutes)
5. Fill in the interior. (4 hours)
6. Brag about what a good job that you did on your puzzle. (40 minutes)
7. Total project duration. (5 hours)

60

IF YOU DON'T LEARN ANYTHING ELSE...

1. Understand your boundaries and...
2. Don't forget to look at the big picture!

61

FOR OUR SCHEDULING EXAMPLE...

- ✦ Would it help if you had a good sturdy table of adequate size?
- ✦ How about sufficient lighting?
- ✦ Could you reduce the total project duration if you had some good help?
- ✦ Is there a limit on the number of helpers that you could efficiently use?
- ✦ All of these are examples of resources.

62

SCHEDULING TYPES

- ✦ Calendar pages
- ✦ Bar charts
- ✦ Critical path method
- ✦ Nike method

63

SCHEDULE COMPONENTS

- ✦ Tasks
- ✦ Durations
- ✦ Milestones
- ✦ Resources
- ✦ Dependency relationships

64

SCHEDULING SIMPLIFIED

- ✦ Secure three colors of post-it notes.
- ✦ Use one color for tasks that have to be completed to achieve dry in.
- ✦ Use a second color for those tasks that can only be done after dry in.
- ✦ Use the final color for tasks independent of dry in.
- ✦ Write the name of a single task on each post-it note.

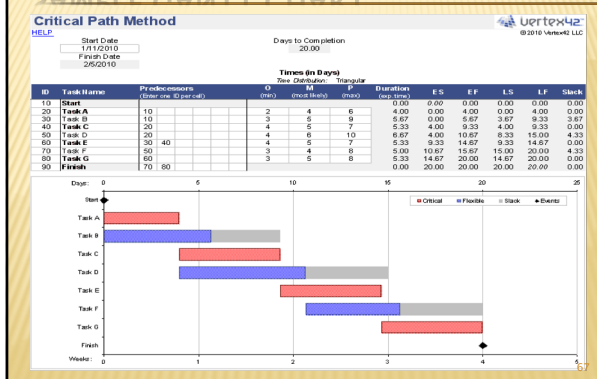
65

SCHEDULING SIMPLIFIED

- ✦ Remember that for a house, it takes about the same length of time to achieve dry in as it does to finish the house once dry in is achieved.
- ✦ Assemble your schedule on a wall.
- ✦ Transfer the schedule to the appropriate medium.
- ✦ Communicate the schedule to all parties.
- ✦ Revise the schedule as necessary.

66

SAMPLE GANTT CHART



SCHEDULING SOFTWARE

www.virtualboss.net
less than \$ 300 for a
single station – free trial

68

FOR ADDITIONAL HELP...

**Take the NAHB
Scheduling course**
available through the
Home Builders
Association of
Alabama.

69

CUSTOMER SERVICE

- ✘ How many bad examples of customer service can you name?
- ✘ Why do you think that the customer service was so bad?
- ✘ Does poor customer service invite customer loyalty and positive referrals?

70

CUSTOMER SERVICE

- ✘ How many good examples of customer service can you name?
- ✘ Why do you think that the customer service was so good?
- ✘ Does good customer service invite customer loyalty and positive referrals?

71

CUSTOMER SERVICE

- ✘ Your customer doesn't care how much you know until they know how much you care.
~ *Damon Richards*
- ✘ Customers don't expect you to be perfect. They do expect you to fix things when they go wrong. ~ *Donald Porter*
- ✘ Loyal customers, they don't just come back, they don't simply recommend you, they insist that their friends do business with you. ~ *Chip Bell*

72

CUSTOMER SERVICE

- ✦ Being on par in terms of price and quality only gets you into the game. Service wins the game. ~ *Tony Allesandra*
- ✦ The customer's perception is your reality. ~ *Kate Zabriskie*
- ✦ The longer you wait, the harder it is to produce outstanding customer service. ~ *William H. Davidow*

73

CUSTOMER SERVICE

- ✦ The purpose of a business is to create a customer who creates customers. ~ *Shiv Singh*
- ✦ There are no traffic jams along the extra mile. ~ *Roger Staubach*
- ✦ Customer service is not a department, it's everyone's job. ~ *Anonymous*

74

FOR ADDITIONAL HELP...

Take the NAHB Project Management course available through the Home Builders Association of Alabama.

75

BUILDING PERMITS

- ✦ Required in most areas.
- ✦ Generally, the permit can be "pulled" by the builder or the owner.
- ✦ Obtaining the permit may be difficult in some jurisdictions.
- ✦ Some jurisdictions require seals from architects or engineers as a condition of issuing the permit.
- ✦ Submission of energy data may be required.

76

BUILDING PERMITS

- ✦ Visit the building department in advance to find out their requirements.
- ✦ Don't start construction without the permit in hand.
- ✦ Building permits generally lapse 180 days after the date of filing.
- ✦ The duration of building permits can be extended past the 180 limit upon written application.

77

BUILDING PERMITS

- ✦ The work must be commenced within 180 days of the issuance otherwise, the permit expires.
- ✦ The building permit can be revoked if the filing information is false or if the work does not meet the applicable code.
- ✦ The building permit must be kept on site for the duration of the project.

78

INSPECTIONS



79

INSPECTIONS

- ✗ Find out what inspections are required in the jurisdiction.
- ✗ The Building Official is authorized to accept the inspection of qualified third parties.
- ✗ Don't proceed without the required inspections.

80

WARRANTIES

- +Express (stated in words)
- +Implied (not stated but carrying the same force as if stated)
- +Disclaimed (using a statement to offset implied warranties)
- +Implied warranties generally apply unless disclaimed

81

IMPLIED WARRANTIES

- +Implied warranty of merchantability (fit for ordinary purposes),
- +Implied warranty of fitness for a particular purpose (fit for a special purpose that is different from the ordinary), and
- +Implied warranty of habitability (fit to live in).

82

WARRANTY CLAIMS

- ✗ Provide a written warranty booklet to your potential customer at the first contact. (The warranty then becomes a part of the bargain.)
- ✗ Reference the warranty in the contract.
- ✗ Require written warranty claims and furnish forms to the customer.
- ✗ Respond promptly to warranty claims.

83

WARRANTY CLAIMS

- ✗ Clearly state in your warranty booklet that non-emergency claims will be handled during normal business hours.
- ✗ If the claim is valid, handle it promptly and do it right the first time.
- ✗ If the claim is not valid, handle it anyway as a "good will" gesture or tactfully decline giving your reason.
- ✗ Don't ignore it!

84

FOR ADDITIONAL HELP...

Take the NAHB Project Management course available through the Home Builders Association of Alabama.

85

SECTION 7. ALABAMA ENERGY CODE



86

ALABAMA ENERGY CODE

- ✦ Climate Zone 2 includes Baldwin and Mobile Counties.
- ✦ Climate Zone 3 includes the balance of the state.
- ✦ Note that the south half of Climate Zone 3 has a different requirement for basement wall insulation only.

87

ALABAMA ENERGY CODE

- ✦ Slab edge insulation is not required unless the slab is heated.
- ✦ If the slab is heated, a minimum of R5 perimeter insulation is required the depth of the footing or 2 feet, whichever is less.
- ✦ A minimum of R5 continuous basement wall insulation is required for the northern half of Alabama.

88

ALABAMA ENERGY CODE

- ✦ Except in Baldwin and Mobile Counties, **unvented crawl space walls** must have a minimum of R5 insulation. The insulation must be permanently attached to the foundation walls and extend from the floor to the finished grade plus an additional 24 inches minimum vertically or horizontally.

89

ALABAMA ENERGY CODE

- ✦ In Baldwin and Mobile Counties, **unvented crawl space walls** are not required to be insulated.

90

ALABAMA ENERGY CODE

- ✦ In Baldwin and Mobile Counties, houses with **vented crawl spaces** must have a minimum of R13 floor insulation between the wood floor joists. In the balance of the state, the floor insulation must be a minimum of R19
- ✦ All crawl spaces must have a vapor retarder rated at not more than 0.1 perm with sealed joints and turned up the walls at least 6 inches and sealed.

91

ALABAMA ENERGY CODE

- ✦ Studwall insulation must be a minimum of R13 for the entire state.
- ✦ Insulation and a sealed air barrier must be installed behind tubs and showers in exterior walls.
- ✦ All holes through insulated walls, floors and ceilings must be sealed to be air tight.

92

ALABAMA ENERGY CODE

- ✦ In Baldwin and Mobile Counties, doors and windows must have U-factors not greater than 0.65. (0.75 if impact rated)
- ✦ For the balance of the state, doors and windows must have U-factors not greater than 0.50. (0.65 if impact rated)
- ✦ Up to 15 square feet of windows and skylights and up to 24 square feet of doors do not have to meet this requirement.

93

ALABAMA ENERGY CODE

- ✦ The Solar Heat Gain Coefficient (SHGC) for glazed windows, doors and skylights must not be greater than 0.30.
- ✦ Up to 15 square feet of glazed openings do not have to meet this requirement.
- ✦ Factory built windows, skylights and sliding glass doors must not have air leakage greater than 0.3 cfm/sf when subjected to the standard test.

94

ALABAMA ENERGY CODE

- ✦ Site built windows, skylights and sliding glass doors do not have to meet the air leakage standard.
- ✦ Factory built swinging door units must not have air leakage greater than 0.5 cfm/sf when subjected to the standard test.
- ✦ Site built door units do not have to meet the air leakage standard.

95

ALABAMA ENERGY CODE

- ✦ Gaps between door and windows and their rough openings must be sealed with low expansion foam or backer rod.
- ✦ Walls and ceilings separating garages from the conditioned space must be air sealed.
- ✦ Bottom plates of walls between conditioned and unconditioned spaces must be sealed to the subfloor.

96

ALABAMA ENERGY CODE

- ✦ Top plates of walls between conditioned and unconditioned spaces must be sealed to the ceiling.
- ✦ Upper and lower edges of the band joists must be sealed to the plates.
- ✦ All joints, seams and penetrations in the exterior sheathing must be sealed.
- ✦ All utility penetrations from conditioned to unconditioned areas must be sealed.

97

ALABAMA ENERGY CODE

- ✦ Attics above conditioned spaces must have a minimum of R30 insulation.
- ✦ For blown-in attic insulation, a ruler is required every 300 square feet of attic space.
- ✦ Attic pull-down stair openings must be insulated with a minimum of R30.
- ✦ Attic knee walls and doors in knee wall openings must be insulated with a minimum of R13.

98

ALABAMA ENERGY CODE

- ✦ Ducts and air handling units that are not within the conditioned space must be tested for leakage.
- ✦ When tested in the rough-in stage without the air handler, the leakage must be not more than 4%.
- ✦ When tested in the rough-in stage with the air handler, the leakage must be not more than 6%.

99

ALABAMA ENERGY CODE

- ✦ When tested in the completed stage, the leakage to the exterior must be not more than 8%.
- ✦ When tested in the completed stage, the total leakage must be not more than 12%.
- ✦ The total building must be either tested with a blower door or the entire system must be rigorously tested per Table N1102.4.2 of the 2009 IRC.

100

ALABAMA ENERGY CODE

- ✦ When tested in the completed stage, the leakage to the exterior must be not more than 8%.
- ✦ When tested in the completed stage, the total leakage must be not more than 12%.
- ✦ The total building must be either tested with a blower door or the entire system must be rigorously tested per Table N1102.4.2 of the 2009 IRC.

101

BLOWER DOOR TEST



102

ALABAMA ENERGY CODE

- ✘ Attic supply ducts must have a minimum of R8 insulation.
- ✘ Attic return ducts and supply and return ductwork in unconditioned basements and crawl spaces must have a minimum of R6 insulation.
- ✘ All joints and seams in ductwork, air handlers, and building cavities used as ductwork must be sealed with UL-181 tape, mastic, or mastic tape.

103

FLEX DUCT



104

HOW NOT TO DO FLEX DUCT



105

HOW NOT TO DO FLEX DUCT



106

ALABAMA ENERGY CODE

- ✘ Building cavities may not be used as supply ducts.
- ✘ All supply ducts must be lined with metal, flex duct, ductboard or other material approved in section M1601 of the IRC.
- ✘ Recessed lighting fixtures must be air-tight and IC-rated in areas with insulation and have a gasket or caulk applied between the fixture housing and the interior finish of the space.

107

ALABAMA ENERGY CODE

- ✘ HVAC system piping capable of carrying fluids above 105°F or below 55°F must be insulated.
- ✘ Circulating hot water piping must be insulated. All pumps must also have either automatic controls or a manual control that is readily accessible to turn off the system when not in use.

108

ALABAMA ENERGY CODE

- ✧ All outdoor intake and exhaust openings must have either gravity (self-closing) or automatic dampers that will close when the system associated with the air intake or exhaust is not functioning. To ensure that dampers close correctly, direction of airflow must be taken into account when installed.

109

ALABAMA ENERGY CODE

- ✧ Framed spaces that connect conditioned areas to unconditioned areas above and below the chase (including attics, unconditioned basements, or vented crawl spaces) must be air-sealed (e.g., using sheet material and appropriate sealant). These areas include chases for plumbing, duct work, chimneys, and flues. Dropped ceilings/soffits between conditioned areas and the attic must also be air-sealed.

110

ALABAMA ENERGY CODE

- ✧ At least ½ of all bulbs must be of high efficiency type (LED, compact fluorescent or type T5 or T8 linear fluorescent).



111

ALABAMA ENERGY CODE

- ✧ Heat pumps must have thermostats that prevent strip heat operation when the demand can be satisfied by the heat pump alone.
- ✧ Site built masonry fireplaces must have an outside combustion air supplies and gasketed doors.

112

ALABAMA ENERGY CODE

- ✧ Heated swimming pools with water temperatures greater than 90° F must have vapor retardant covers, a R12 blanket and timers to control the pool heaters and recirculation pumps.



113

ALABAMA ENERGY CODE

- ✧ If a plan review is required, a complete set of drawings, specifications and energy code compliance documentation must be submitted.



114

ALABAMA ENERGY CODE

- ✘ A permanent certificate is permitted (but not required in Alabama) on or in the electrical supply panel.
- ✘ The certificate must not interfere with the operation of the panel or its components.

115

SAMPLE ENERGY CERTIFICATE

ENERGY EFFICIENCY CERTIFICATE OF COMPLIANCE

Address: _____

Parcel #: _____

RESIDENTIAL COMPLIANCE PATH
 Prescriptive R-Value ☐ Prescriptive U-Value ☐
 Prescriptive R-Value ☐ Prescriptive U-Value ☐

Component Values

Building Envelope Air Leakage: _____ Air Changes Per Hour (Max. 3) _____

Ceiling R or U-value: _____

Window Frame/Wall R or U-value: _____

Mass/Wall R or U-value: _____

Floor R or U-value: _____

Slab R-value: _____ Depth: _____

Crawl Space R-value: _____

Foundation U-value: _____ SHGC: _____

Skylight U-factor: _____

Duct Outside of Thermal Envelope R-value: Supply R-6 ☐ Other R-6 ☐

Duct System Air Leakage: _____ cfm per 100ft

Hot Construction Testing: ☐ Rough-in Testing: ☐

Heating System Efficiency: _____

Cooling System Efficiency: _____

Water Heating Efficiency: _____

Basement Wall R-value: _____

Crawl Space R-value: _____

Gas Fired Unvented Room Heater: ☐

Electric Furnace: ☐

Backward Electric Heat: ☐

I certify the information contained on this certificate is true and complete.

Builder/Designer: _____ Signature: _____ Date: _____

116

SECTION 8. BUILDING CODES

- ✘ How do you determine which building code applies in the area in which you build?
 - + Contact the local building department (city or county).
 - + If no city or county building department, the 2009 International Residential Code applies in Alabama (adopted by the State Fire Marshal effective November 22, 2010).

117

COMMON BUILDING CODE VIOLATIONS

- ✘ Improper sill to foundation anchoring,
- ✘ Improper notching or drilling of joists,
- ✘ Tampering with trusses,
- ✘ Foundations on uncompacted soil,
- ✘ Framing or siding too close to grade,
- ✘ Inadequate height in crawl space,
- ✘ Handrail balusters too far apart (4" max),

118

COMMON BUILDING CODE VIOLATIONS

- ✘ Inadequate window egress in bedrooms,
- ✘ Joists and rafters too small for the span,
- ✘ Untreated lumber in contact with concrete,
- ✘ Wood framing too close to chimneys,
- ✘ Insufficient insulation,
- ✘ Backfill too high against foundation walls,

119

COMMON BUILDING CODE VIOLATIONS

- ✘ Insufficient headroom at stairs (6'-8" min),
- ✘ Missing access panels at tubs,
- ✘ Inadequate chimney height above roof,
- ✘ Missing access to attic areas,
- ✘ Inadequate crawl space ventilation,
- ✘ Inadequate attic ventilation,
- ✘ Missing bridging and/or firestopping,

120

COMMON BUILDING CODE VIOLATIONS

- ✘ Stair riser heights in excess of 7 $\frac{3}{4}$ ",
- ✘ Irregular riser heights,
- ✘ Stair treads less than 10" deep,
- ✘ Irregular tread depths,
- ✘ Handrails with improper grasping surfaces, and
- ✘ Handrails less than 34" or greater than 38" above the leading edge of the tread.

121

FOR ADDITIONAL HELP...

Take the NAHB Building Codes, Standards and Guidelines course available through the Home Builders Association of Alabama.

122

SECTION 9. HBLB LAW AND RULES

- ✘ All residential home builders are required to be licensed by the Home builders licensure Board.
- ✘ Licenses are issued or renewed annually upon payment of the license fee.

123

SECTION 9. HBLB LAW AND RULES

- ✘ The term "Residential Home Builder" includes:
- ✘ New construction, remodeling or repair in excess of \$10,000
- ✘ Roofing in excess of \$2,500

124

HBLB LAW AND RULES

- ✘ A license is valid for the calendar year and expires on December 31st.
- ✘ Licenses can be renewed beginning October 1st.

125

HBLB LAW AND RULES

- ✘ License renewals not postmarked by November 30th require the payment of the licensing fee plus a late fee of \$50.

126

HBLB LAW AND RULES

- ✘ License renewals not renewed by December 31st are expired and require the filing of an expired license application and the payment of the licensing fee plus an expired application fee of \$350.
- ✘ *Must be post marked by NOV 30.*

127

HBLB LAW AND RULES

- ✘ You must operate your construction business in the same manner that you are licensed.
- ✘ For example, if you are licensed as an individual, you must operate your business as an individual.

128

HBLB LAW AND RULES

- ✘ Licenses are issued to individuals, partnerships, corporations, LLCs and to not for profit organizations.
- ✘ The individual or organization applying for the license must meet all of the requirements.

129

HBLB LAW AND RULES

- ✘ An organization applying for a license must designate a qualifying representative that is a general partner, officer, member or manager and is an individual license holder or is qualified by experience and ability.

130

HBLB LAW AND RULES

- ✘ The name of the qualifying representative and the name of the organization must appear on the license.

131

HBLB LAW AND RULES

- ✘ If the qualifying representative ceases to be a partner, officer, member or manager for any reason, including but not limited to death, the entity must notify the Board immediately.

132

HBLB LAW AND RULES

- ✘ Unless that person is replaced with another qualifying representative within 45 days, the license will be revoked.

133

HBLB LAW AND RULES

- ✘ If the name or address of the license holder changes, the Board must be notified within 60 days.
- ✘ If the notice is not given, the license expires 60 days after the name or address change.

134

HBLB LAW AND RULES

- ✘ After the Board receives the application, the Board may examine the applicant with respect to experience, ability, character, business-related financial condition, ability and willingness to serve the public and any other pertinent information the Board may require.

135

HBLB LAW AND RULES

- ✘ A home builder license may be issued with limitation or without limitation.
- ✘ A with limitation license is limited to the “repair, improvement or reimprovement” of a residence or structure.

136

HBLB LAW AND RULES

- ✘ “Repair, improvement or reimprovement” of a residence or structure means residential work in excess of \$10,000 that does not involve structural integrity or the work of more than one trade.

137

HBLB LAW AND RULES

- ✘ A without limitation license allows for residential construction not more than 3 stories in height and having not more than 4 units.
- ✘ A Residential Roofer license is needed for roofing work in excess of \$2,500.

138

HBLB LAW AND RULES

- ✘ An individual or firm with an Alabama General Contractor License number 18,907 or lower may perform residential construction without holding a Home Builder license.

139

HBLB LAW AND RULES

- ✘ The term “RESIDENTIAL HOME BUILDER” includes the category of “RESIDENTIAL ROOFER” when the cost of the roof covering work exceeds \$2,500.
- ✘ Anyone advertising or otherwise promoting their firm as a home builder, is deemed to be engaged in residential home building.

140

HBLB LAW AND RULES

- ✘ A licensee may, while properly licensed, file with the Board an application for Inactive status.
- ✘ The Inactive status serves as a “place holder” during the time that the licensee is inactive as a home builder.

141

HBLB LAW AND RULES

- ✘ The application must be accompanied by the payment of the required fees.
- ✘ The licensee must reactivate the license before entering into a contract where the license is required.

142

HBLB LAW AND RULES

- ✘ Each licensee must notify the Board in writing within 10 days of the notice of the rendering of a felony criminal charge against him or her or that a criminal charge has been dismissed.

143

HBLB LAW AND RULES

- ✘ The notifications must be sent by certified mail and include a copy of the complaint or criminal charge.

144

HBLB LAW AND RULES

- ✘ Licensees must immediately notify the Board of any change in their address or phone number.

145

HBLB LAW AND RULES

- ✘ Licensees must use valid written construction contracts when engaging in home building.
- ✘ The contract must include both “offer” and “acceptance” and be signed by both parties.

146

HBLB LAW AND RULES

- ✘ The contract should be written to express the “meeting of the minds”.
- ✘ Licensees should use written change orders (written ones are better).

147

HBLB LAW AND RULES

- ✘ Home builders are required to provide written notice to the owner as to the status of their liability insurance.

148

HBLB LAW AND RULES

- ✘ Home builders are also required to provide written notice to the owner as to the enhanced resiliency of the structure (beyond that required by the Code) prior to commencement of construction work.

149

HBLB LAW AND RULES

- ✘ Incompetence is defined as when a licensee fails to perform in a reasonable manner and below the community’s home building standards including the lack of proper supervision of subcontractors.

150

HBLB LAW AND RULES

- ✘ Misconduct is defined as intentionally making assertions that are fraudulent, deceitful or misleading to a homeowner.

151

NEW SLIDE

HBLB LAW AND RULES

- ✘ Misconduct also includes using your license to assist unlicensed home builders, including but not limited to obtaining building permits on their behalf.

152

HBLB LAW AND RULES

- ✘ Before construction begins a licensee should obtain and use a set of construction plans.
- ✘ A licensee must purchase the necessary city/county permits for the work.

153

HBLB LAW AND RULES

- ✘ A licensee should identify the building code to which construction must comply.
- ✘ A licensee must call for all necessary inspections in a timely manner.

154

HBLB LAW AND RULES

- ✘ If you are in the business of constructing or assisting on-site in the construction of new single-family, detached residential dwellings, the Alabama Workers' Compensation Law requires you to have workers' compensation insurance coverage for all of the employees on the job site.

155

HBLB LAW AND RULES

- ✘ The Board may revoke or suspend the license in case of fraud or deceit in obtaining the license.
- ✘ The Board may revoke or suspend the license in case of gross negligence, incompetence or misconduct.

156

HBLB LAW AND RULES

- ✘ In the event of any such actions by the licensee, the Board may impose and collect the actual costs of the hearing.
- ✘ The Board may also require the licensee to complete educational requirements in addition to fines of up to \$5,000 for each violation.

157

HBLB LAW AND RULES

- ✘ Homeowners may recover economic damages (not interest or court costs) due to violation of the rules and regulations by a licensee.
- ✘ Total payments for all claims against any licensee may not exceed \$60,000.

158

HBLB LAW AND RULES

- ✘ No individual claim may exceed \$20,000.
- ✘ If any amount is paid from the homeowner's recovery fund, the Board may terminate the license.

159

HBLB LAW AND RULES

- ✘ The Board may refuse to issue a new license to the licensee until the amount is repaid plus 12% interest.
- ✘ Bankruptcy of the licensee will not relieve the licensee from this repayment.

160

CELEBRATE! WE'RE THROUGH!



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