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► 1.0 OBJECTIVES AND OVERVIEW

1.1 OBJECTIVES

During this Section you will learn –
- How to inspect floor systems, and their components
- About the various types of systems commonly found
- About the various materials used for columns, beams, floor joists and subfloors
- The common conditions found with floor structures
- To identify these conditions
- The causes and implications of these conditions

Not The Last Word

This program is not an in-depth Structure course and you should not assume that you have all the knowledge of a professional engineer, architect, designer, carpenter, mason, etc. after studying this material. This program does not qualify you to design or build homes. There are many places to go to learn more and we encourage you to continue expanding your knowledge.

1.2 OVERVIEW

INSTRUCTIONS

This is the second of the four sections of the Structure Module. There are five Study Sessions in this section. Each session should take 30 to 60 minutes to complete. The entire section, including Quizzes, Exercises, and the Final Test should take 10 to 15 hours. You should work at your own pace. It's all right if it takes more or less time than we have estimated. Don't rush or try to do more at one time than you can absorb.

WHAT'S IN HERE

This section covers common floor structure elements. It includes a description of the materials and how they should be installed. Common conditions are explained along with what causes them, their implications, and how to recognize them.

STUDY SESSIONS AND QUICK QUIZZES

Each session contains text and illustrations. At the end of each Study Session is a Quick Quiz to help you review what you have learned.

FIELD EXERCISES

We have included two Field Exercises designed to help you transfer what you have learned into real world experience. These are very important. If you don't do them, you are cheating yourself, and you won't be ready for the world of home inspections.

FINAL TEST

The last thing you'll do in every section is complete a multiple choice style test. Your answers are sent to us for marking, if you have chosen the Technical Support option.

TECHNICAL SUPPORT (IF CHOSEN)

You can call our 1-800-268-7070 number for technical assistance during regular business hours, fax your questions to us at 416-964-0683, E-mail them to us at info@carsondunlop.com or mail them to us at 120 Carlton Street, Suite 407, Toronto, Ontario M5A 4K2.

BEFORE YOU START

We encourage you to read section 5.0 of the Structure chapter of **The Home Reference Book**. It's only 16 pages and gives a brief overview about what we'll be talking about here.

HERE WE GO!

Structure

MODULE

STUDY SESSION 1

1. The first Session covers the Scope of the inspection as set out in the ASHI® Standards of Practice. This Session also includes some introductory comments about floors and a discussion on sills.
2. At the end of this Session you should be able to:

   • Understand what part of the ASHI® Standards apply to floors.
   • Understand the components of floor systems.
   • Understand the function of floor systems.
   • Understand the problems with wood-soil and wood-concrete contact.
   • Understand the function of sills and common sill problems.
3. To give you a general overview on Floor Structures, you should read pages 23 to 38 of the Structure Section of **The Home Reference Book**. The Exercises and Quizzes assume that you have read it. If you have not read these pages, read them now.
4. This Session may take you roughly 45 minutes to complete.

   Quick Quiz 1 will help you make sure you have understood and remembered the material.

Key Words:

- ***Sills***
- ***Columns***
- ***Beams***
- ***Joists***
- ***Subfloors***
- ***Probing***
- ***Bouncing***
- ***Measuring***
- ***Strength***
- ***Stiffness***
- ***Bending***
- ***Wood/concrete contact***
- ***Wood/soil contact***
- ***Nailing practices***
- ***Compression***
- ***Tension***
- ***Shear***
- ***Sill gasket***
- ***Mud sill***
- ***Anchor bolts***
- ***Rot***
- ***Insect damage***
- ***Sill crushing***

► 2.0 SCOPE AND INTRODUCTION

2.1 SCOPE

The following is the Structure Section of the ASHI® Standards of Practice, effective January 2000. We have not repeated the Purpose and Scope, General Limitations and Exclusions, and Glossary, which are included in the Footings and Foundations Section

3.0 STRUCTURAL SYSTEM

3.1 The *inspector* shall:

A. *inspect:*
1. the *structural components* including foundation and framing.
2. by probing a *representative number* of structural components where deterioration is suspected or where clear indications of possible deterioration exist. Probing is NOT required when probing would damage any finished surface or where no deterioration is visible.

B. *describe:*
1. the foundation and *report* the methods used to *inspect* the *under-floor crawl space*
2. the floor structure.
3. the wall structure.
4. the ceiling structure.
5. the roof structure and *report* the methods used to *inspect* the attic.

3.2 The *inspector* is NOT required to:

A. provide any *engineering service* or *architectural service*.
B. offer an opinion as to the adequacy of any *structural system* or *component*.

► NOTES ON THE STANDARDS

Components — Our inspection of the floor structure includes the sills, columns, beams, joists and subfloors.

Looking, Probing Bouncing, And Measuring — The inspection is performed from above and below the floor itself. It includes looking at the components, probing exposed wood members where damage is suspected (unless they are part of a decorative finish) and bouncing on the floors to get a sense of their stiffness. In some cases a measuring tape is helpful to verify member sizes or spans. Spirit levels can be used to qualify sagging or sloping floors.

Judgment Needed — There are many conditions that may affect performance. It is common to find minor deflection and/or springiness and good judgment and experience are needed to determine whether the situation is typical or not. Serious problems are rare but can be costly to correct. Structural problems are also life safety hazards in many cases.

Concealed

As with all other components, it's common to find much of the floor system concealed by finishes or other access restrictions. Let your client know if your inspection was limited by these factors.

2.2 INTRODUCTION

Materials

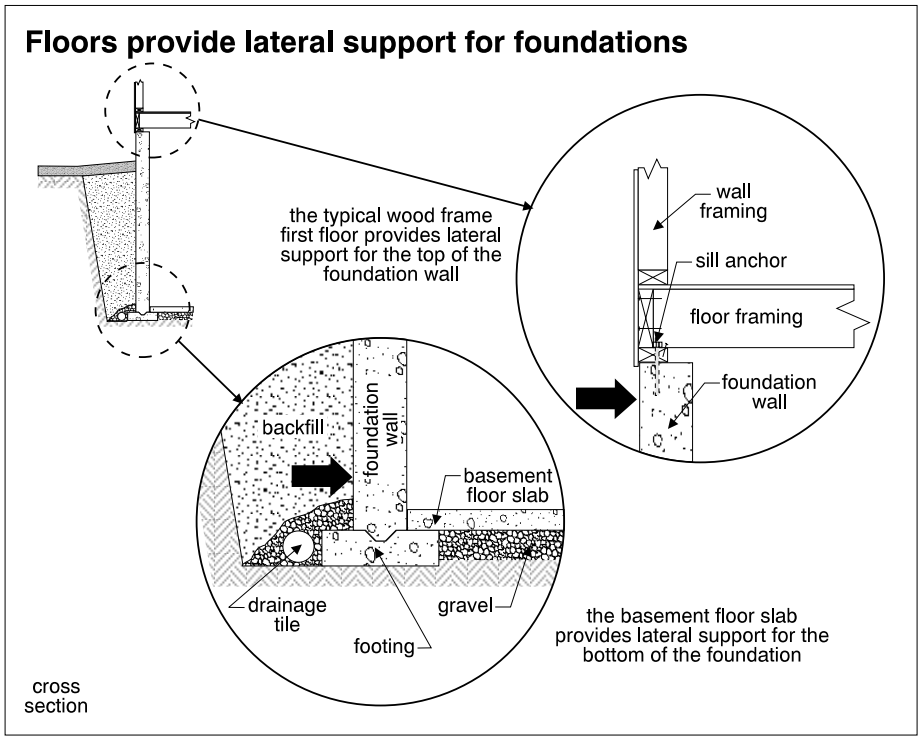
Most suspended floors are wood and most floors resting on the earth are concrete slabs. While there are other systems, we'll restrict our discussion to these.

Function

Floors transfer both live and dead loads to the foundations, footings and ultimately to the soil below the house. Floor systems also provide lateral support for foundation walls. In houses with basements, the concrete basement floor provides lateral support for the bottom of the foundation wall and the wood frame first floor typically supports the top of the foundation wall.

Vertical And Horizontal Loads

Floor systems see both vertical and horizontal loads, although most people think of the vertical loads when they think of floors.



To perform their functions, floors must have **strength** and **stiffness.**

Strength And Stiffness

Contrary to common understanding, strength refers to how much load can be applied before something breaks. Stiffness refers to how much bending or **deflection** takes place with a given load.

Strength

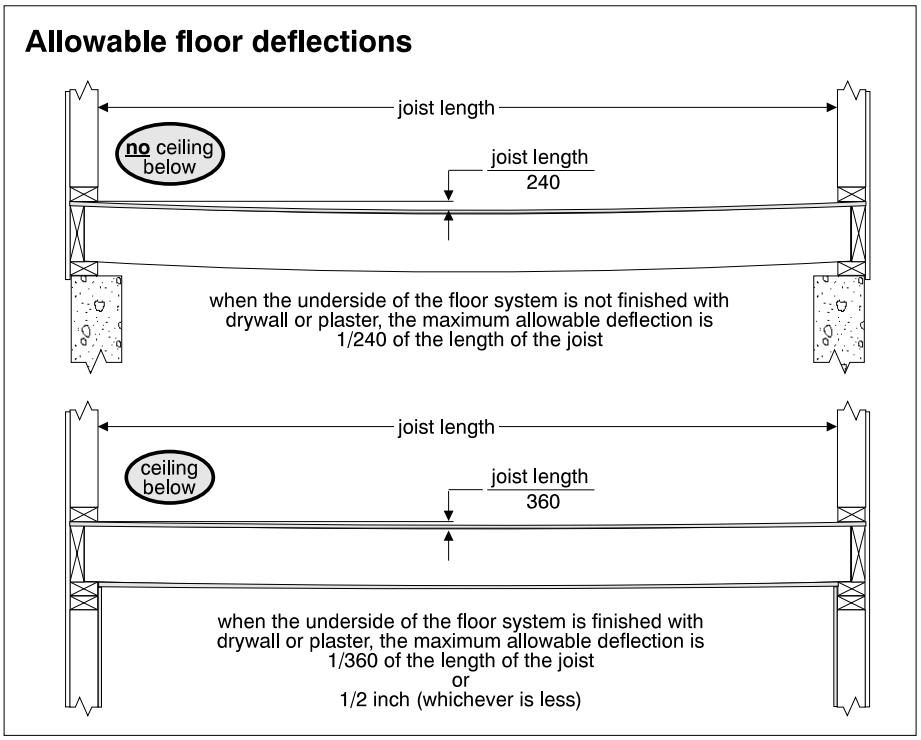
Floor systems must be strong enough to carry their loads. If the loads are excessive, the wood or concrete will break and the floors will collapse.

Stiffness

Floors also have to be stiff. This means that they have to limit the deflection that takes place when structural members respond to live loads. There will always be some deflection, but if the deflection is too great, damage to the interior finish will result. In some jurisdictions, the maximum allowable deflection is 1/360th of the length of the joist. This number is not magic, but comes from the amount of deflection that plaster and drywall will tolerate without cracking. Check what numbers are used in your area.

1/360th Of Length

Generally speaking, floors with ceilings below use this limiting factor. In some cases, the allowed deflection is either 1/360th of the length or one half inch, whichever is less.



1/240th Of Length

Where a plaster or drywall ceiling will not be attached on the underside (for example, the floor over a crawlspace), the maximum deflection may be allowed to be 1/240th of the length.

Limited By Bending

Floor systems in houses are designed with maximum bending, not strength, as the restricting factor. As a result, floors are usually much stronger than they need to be. It's rare for floor systems to fail catastrophically, unless they have been severely damaged by rot, insects or careless carpentry work.

Large Loads Transferred Through Center Of House

Many think that the perimeter foundation walls have a large vertical load to carry because they are below the outside walls. A typical house with wood siding and a central bearing beam actually has a greater percentage of its weight on the beams and posts than it does on the outside walls! That's because the foundation wall only sees floor loads from one side of the wall (the inside, of course). A beam running down the middle of the house sees floor loads from both sides.