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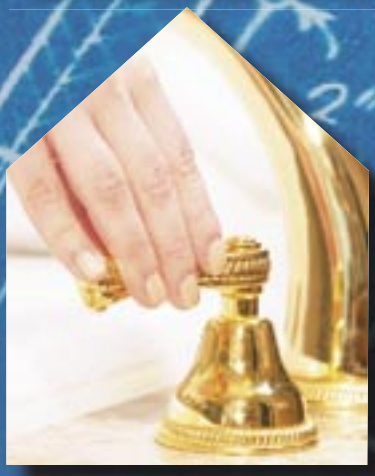
A Guide to Preserving the Value of Your Home

THE HOMEOWNER'S HANDBOOK



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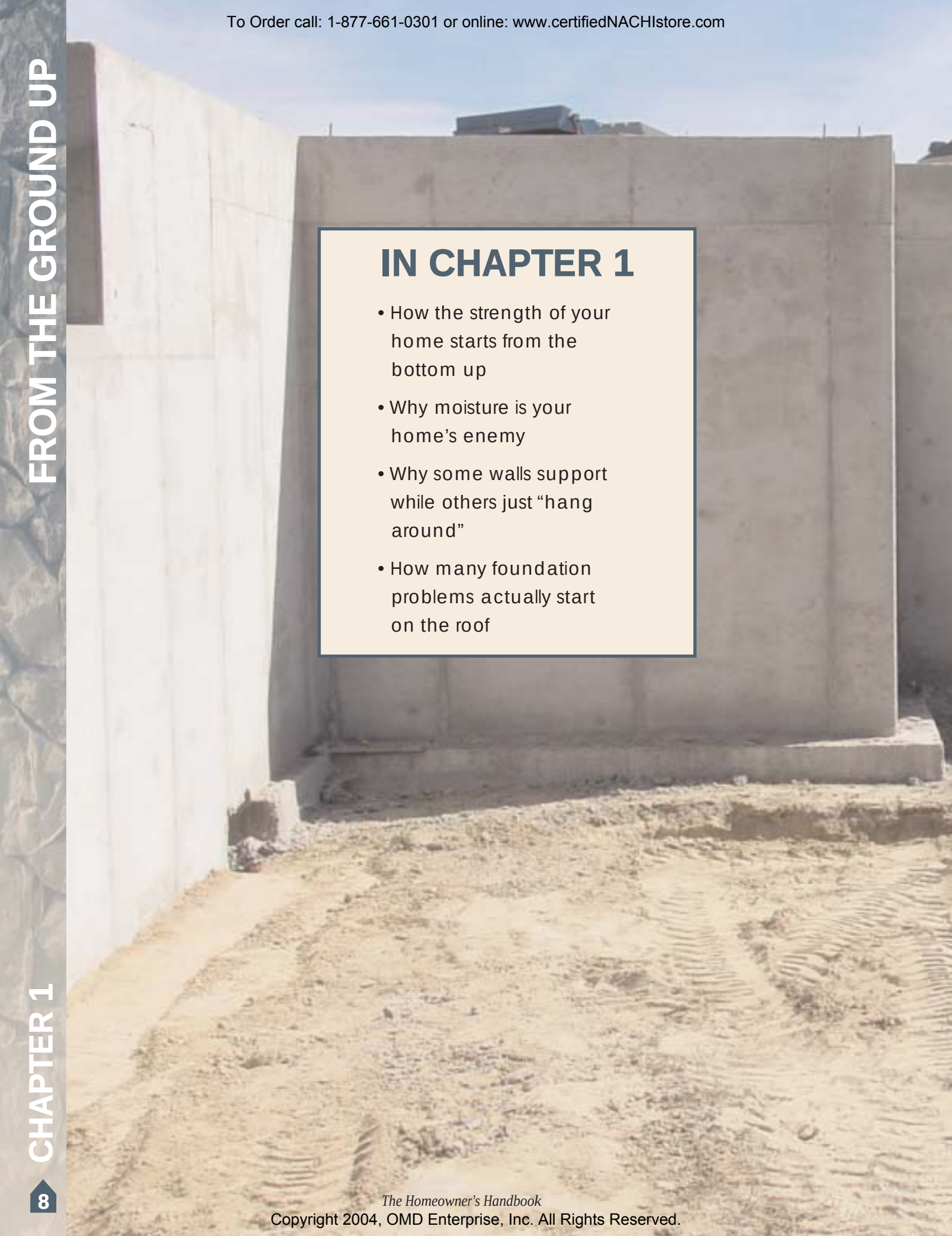


IN CHAPTER 1

- How the strength of your home starts from the bottom up
- Why moisture is your home's enemy
- Why some walls support while others just "hang around"
- How many foundation problems actually start on the roof

Overview

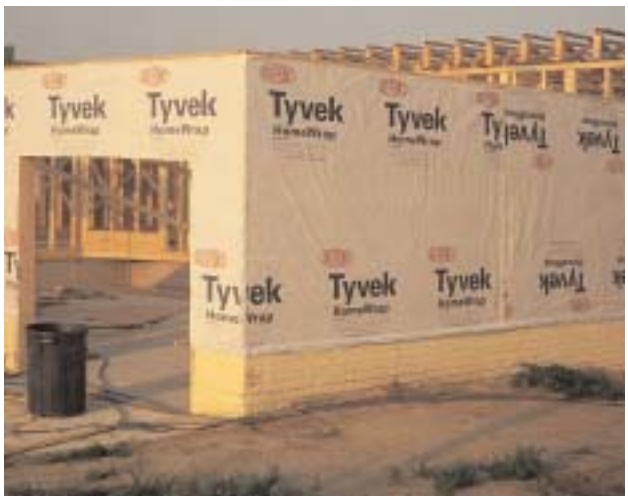
It is easy to fall in love with a home. Spacious rooms, a unique style, a pastoral setting—all can work their magic. A home may be the fulfillment of a dream; but a home is still a structure. This is why we are beginning "The Homeowner's Handbook" by discussing your home's main structural elements: the foundation, walls, and the roof.

Of all the chapters in this book, Chapter 1 can help save you the most money. The reason is simple: structural problems in a home are expensive. In fact, they can cost you tens of thousands of dollars in repairs! For example, did you know that too much moisture in your attic or crawl space could crack, rot, or warp parts of your house? This chapter will give you ideas for avoiding those problems and for maintaining your home's structure. By using the information in this chapter, you can keep your home sound, your bank account healthy, and your sleep peaceful.

All Homes are Composed of Three Basic Elements:

A Foundation

A System of Supporting (Bearing) and Non-Supporting (Partition) Walls



A Roof Structure

Section 1: The Foundation—Getting to the Bottom of It All

Let's start with your home's foundation—and the soil that surrounds the foundation. Buried in the ground and hidden behind finished walls, a foundation is the least visible part of your home. Chances are, however, that it required the most engineering because it supports your whole house on the load-bearing walls.

Before we continue discussing foundations, it may be helpful to understand the term "load-bearing wall." Imagine stacking two columns of blocks, three high, and connecting them on top with a wooden plank, Diagram A (below). In this simple illustration, you are building two load-bearing walls (the block columns) to support a load (the wooden plank).

In your home, the weight of the roof and the load that it carries (such as wind, rain, or snow) are supported by a system of bearing walls, Photo 1-01 (below). They make up the outside perimeter of your home. Bearing walls also appear inside your home in key areas. When a bearing wall is built on a strong foundation, it can support you, your furniture, appliances, and pets and still be strong enough to hold up the roof.

"A solid future begins with a solid foundation." This saying is also true for your home. In fact, the foundation is the most important part of your home's structure.

Many hours of engineering went into designing and constructing your home's foundation. Three main types of foundations are used in home construction, and your home has one of them. Just what type of foundation you have depends on factors such as (1) the weight of the home, and (2) the type of soil on which the house was built. The second factor, the soil, is especially important to a home's foundation. For example, if a home is built on soil that swells when it rains, the swelling could seriously damage the foundation, and the rest of the house.

This section will help you determine your home's type of foundation and why it was chosen. At the end of this chapter, we will discuss the steps you can take to protect your home's foundation and other structural parts.

Diagram A *– Load-bearing wall*

1-01 Load bearing walls supporting the roof

Perimeter Wall on Spread Footing Foundations

Diagram B (right) shows the basic parts of a spread footing foundation. Spread (or continuous) footings are used in areas where the soils are stable, well drained, and not likely to swell because of moisture from rain or snow. The width of the footing depends on the type of soil and the weight of the home. In other words, weak soils or heavy homes mean a wider footing, Photo 1-02 (below).

During harsh winters and in colder climates, the soil often will freeze from several inches to several feet below the surface. The bottom of the frozen layer is called the "frost line." When the ground freezes, it expands and can lift or move objects. Unfortunately, this means these expanding soils could damage your home's foundation.

To avoid this problem, new building standards state that footings must be set at or below the point where the soil freezes during a normal winter. Diagram C (right) shows a footing placed below the frost line.

If your home was built between the 1920's and 1940's, it probably has a perimeter wall foundation around the entire edge of the home. In older homes, perimeter wall foundations are made with stone or brick masonry. Now, they are usually made with poured-in-place concrete. However, concrete cinderblocks, treated lumber, and even plywood sometimes are used.

Perimeter wall foundations remain popular because they allow for crawl spaces or basements under a home. Perimeter walls are also called stem wall foundations. Diagram D (right) shows a cross section of a cinderblock perimeter wall (right) and the "foundation's footprint" (left).

Diagram B *– Spread footing foundation*

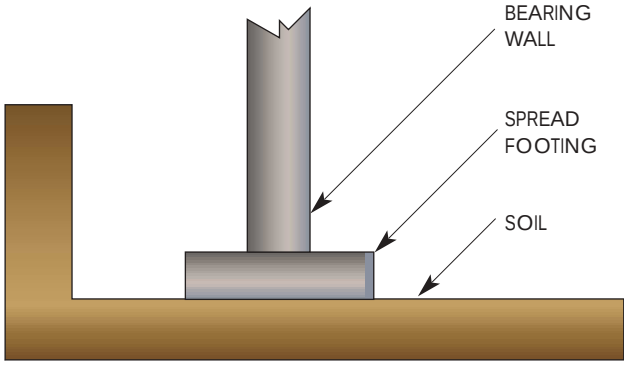


Diagram C *– Spread footing set below the frost line*

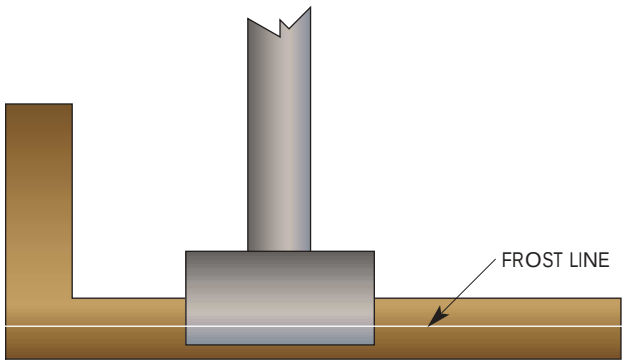
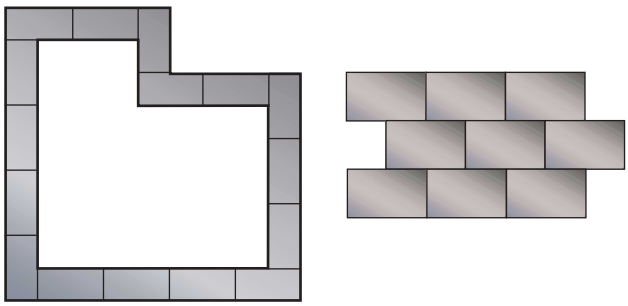


Diagram D *– Perimeter wall foundation*



1-02 Soil, climate, and the weight of the house dictate the type of foundation used. Shown here is a perimeter wall on spread footing.

1-03 A grade beam on caisson foundation

Grade Beam on Caisson (kaysahn)

The spread footing foundation and the perimeter wall foundation work well in stable soils. However, not all soils are stable. For example, soils that have a large amount of clay can swell when it rains or when snow melts. In fact, this soil can expand many times its original size and put a lot of pressure on a foundation. The problem is even greater if there is poor drainage away from the foundation.

Swelling soils could damage a foundation and cause a whole house to shift. In rare cases, swelling soils have made some homes so unstable that they had to be abandoned. However, even the problem of swelling soils can be managed if the right foundation is used.

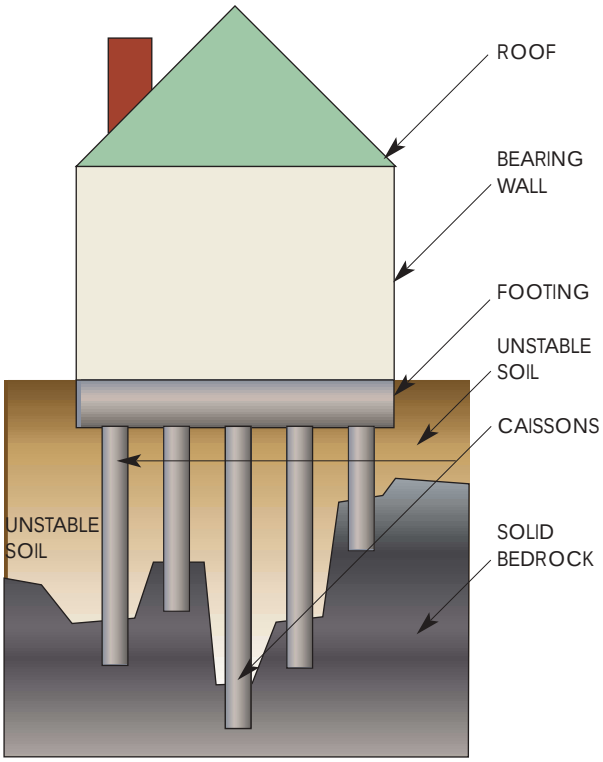
One modern foundation that works well in expanding soils is called grade beam on caisson (or grade beam on drilled pier), Photo 1-03 (above). With this type of foundation, the home is sitting on solid earth and not swelling clay, Diagram E (right). The following paragraphs describe how this is done.

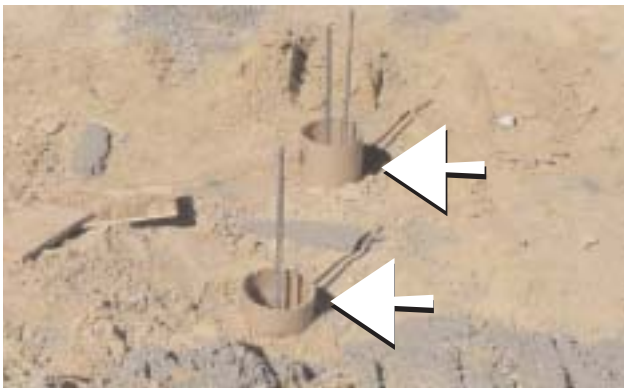
A grade beam on caisson foundation is started by using a truck-mounted drill rig to drill several holes into the bedrock. For most homes, a diameter of 10 inches is used. The depth of the holes can range from 5 to 25 feet or more below the foundation. The holes are drilled at each corner of the foundation "footprint" as well as about every 8 feet between the corners.

After the holes are drilled, a "cage" of reinforcing steel is placed into each hole before it is filled with ready-mixed concrete. The resulting columns are called "caissons." Photo 1-04 (right) shows the caissons shortly after they were poured.

The next step is to form and pour grade beams along the home's footprint. These beams, which

***Diagram E** – Home built on caissons*





1-04 Caissons shortly after being poured

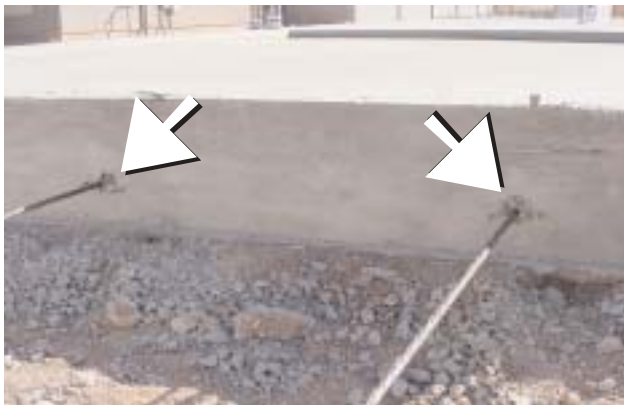
run horizontally from caisson to caisson, are made of ready-mix concrete with reinforcing steel rods. The grade beams look a lot like the perimeter wall foundation discussed earlier, but there is an important difference. The grade beams actually transfer the weight of the home to the caissons. In turn, the caissons transfer the weight to the bedrock.

Because the beams are used in areas with unstable soil, it is important to keep them separated from the soil. To accomplish this, a specific type of material is used. This material often is made of cardboard containing air pockets that give the soil room to expand. In this way, if the soil swells, the compressible material is crushed, but the beams and the home remain intact. One such material is called SureVoid® and is shown in Photo 1-05 (below), between the soil and the bottom of the grade beam .

As noted earlier, a grade beam on caisson foundation can look much like a perimeter wall foundation. If you are unsure about what foundation type you have, consult your qualified home inspector, licensed general contractor or engineer.

Slab-on-Grade Foundations

The term “slab on grade” simply means that a large block of concrete is poured upon the ground and serves as the home’s foundation. The positive side of this type of foundation is that it is less expensive than other foundations; the negative side is that you give up the option of a crawl space or basement. With slab on grade, Photo 1-06 (below), the foundation and floor were poured at the same time. This foundation is useful in areas with milder winter climates where frost and soil expansion are unlikely to occur. It also can be a good choice for areas that have high groundwater levels.



1-06 Slab on grade with tensioning cables

1-05 Compressible void material

If the slab is to be used in areas where soil swelling is known to occur, the foundation is reinforced. Reinforcement usually means metal cables or rods are placed in a grid pattern throughout the slab. Photo 1-07 (below) shows the reinforcement materials in place and ready for the concrete pour.

Photo 1-08 (right) shows a home being built on a slab. The reinforcing cables and rods shown in this photo are inside a light blue plastic tube. The tube prevents the cables and rods from bonding to the surrounding concrete when it sets or "cures." After the concrete slab has cured, jacks will be connected to the rods that extend beyond the edge of the slab. These jacks actually pull on the rods and squeeze the concrete slab together. Because the slab is one piece, it can resist cracking when the soil below it shifts or settles. The photo also shows how the plumbing drain, waste lines, and water supply piping extend above the finished slab.

Photo 1-09 (right) shows a similar slab foundation after it was formed and poured.

Just like any foundation, a slab-on-grade foundation must support the weight of the home above. The load-bearing walls are supported utilizing one of two options. The first option is to thicken the areas of the slab to better support the load-bearing walls. As seen in Photo 1-10 (below), the thickened areas are often twice as thick as the rest of the slab.

The second option is to form and pour a separate perimeter wall. After the wall is built, the slab is poured independently inside of the foundation. Photo 1-11 (below) shows a slab-on-grade foundation where the perimeter walls are independent from the floor slab.

Thoughts About Foundations...

Understanding your home's foundation can help you can preserve its strength for years to come. At the end of this chapter, we will detail more steps you can take to protect your home's foundation and other major structures.

1-08 Form work set up for a poured-in-place foundation

1-09 A slab foundation, after it has been formed and poured

1-10 The perimeter may be twice as thick as the rest of the slab

1-07 Form work and tensioning cables ready for concrete pour

1-11 Perimeter wall with the slab independent of the foundation

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The Homeowner's Handbook was created to help you understand how your house was built and to preserve its value. It contains basic construction concepts for your home, identifies steps you can take to prevent problems, develops a schedule for routine maintenance, and suggests equipment that can safeguard you and your home.

From the Ground Up

Foundations, Bearing and Non-Bearing Walls, Roofs. How to identify what types you have and how this information can save you thousands of dollars.

Exterior Weather Shell

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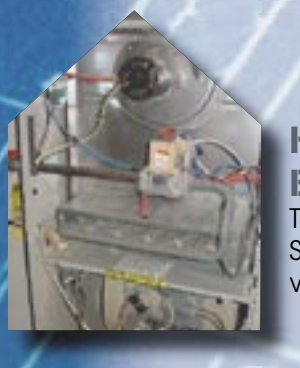

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Central Air, Evaporative Cooling, and Whole House Fans. Which to use in your area and maintenance tips.

Caring for Interior Components

Walls, Doors, Floors and more. Maintaining your interior as your house matures.

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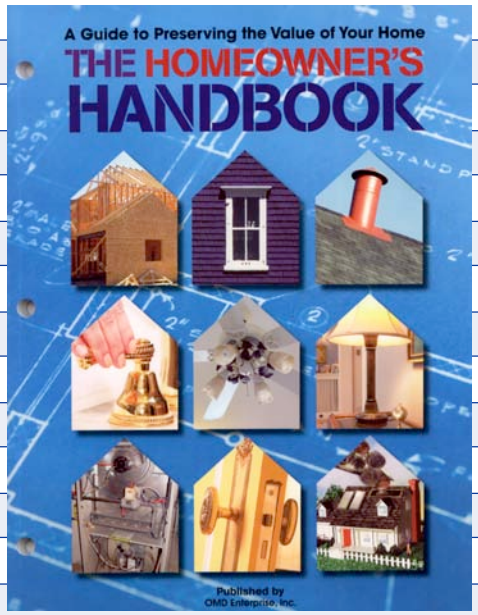 **The Homeowners Handbook** (22 per case / full cases only) 6.45 each		141.90 / case	
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