Wisconsin Contractors Institute

Modular Construction

2 Hours

Course Approval Number: XXXXX

For more information: Website: www.WIContractorsInstitute.com

Email: questions@wicontractorsinstitute.com Phone: 262-293-6850

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Modular Construction

Introduction

After completing this course, you will be able to:

- Describe what modular construction is
- Summarize the history and evolution of modular
- Differentiate between modular, panelized, and manufactured housing
- Compare the benefits of modular construction to other construction methods
- Provide clients with alternatives to residential and commercial modular construction

What is Modular Construction?

- Building is constructed off-site
- Built under controlled plant conditions
- Uses the same materials as conventionally built facilities
- Designed using the same codes and standards as conventionally built facilities
- Built in half the time

Let's define what modular construction is according to the Modular Building Institute (MBI):

"Modular construction is a process in which a building is constructed off-site, under controlled plant conditions, using the same materials and designing to the same codes and standards as conventionally built facilities – but in about half the time. Buildings are produced in "modules" that when put together on site, reflect the identical design intent and specifications of the most sophisticated site-built facility – without compromise."

Often there is some confusion between modular construction, panelized construction, tiny homes, and manufactured homes and building units. We're going to take some time differentiating and distinguishing between these various types of construction and defining each one before we move further in the course.

Differentiator: Panelized Construction

- Structural components constructed in a factory, delivered, then finished on site
  - Includes walls, floors and roof systems
- Often referred to as prefab, since prefabricated in a factory
- Offers some time savings, but shipping costs need to be considered as they increase the total cost of the materials

First, let's discuss panelized construction. Panelized construction is a building system wherein the structural components of the home (the walls, floors, and roof systems) are constructed in a factory and delivered to the jobsite where it is finished, just like a stick-built home. With panelized construction one must consider the cost of shipping the units to the jobsite which may increase the overall cost of materials, but there may still be some time and labor savings. Frequently you will hear panelized building units referred to as prefab, indicating that the building components were prefabricated in a factory environment.

Differentiator: Tiny Homes

- A dwelling unit with 400 sq ft of floor area, excluding lofts.
- Seek to provide an eco-friendly solution
- Many of the units are self-contained living quarters that include all necessary amenities.
- They may be considered an accessory structure.
- Many tiny homes are considered a mobile modular unit.

According to the 2018 International Residential Code, a tiny house is "a dwelling unit with a maximum of 400 sq ft of floor area, excluding lofts." Most tiny homes seek to provide an eco-friendly solution to the existing housing industry. Many of the units are self-contained living quarters with all the necessary amenities. However, if any of the amenities that are required for a dwelling unit are not present then a tiny home would be considered an accessory structure

and must be placed on the same lot as a primary structure per the 2018 International Residential Code. Please note that many tiny homes are built on a wheeled chassis and therefore can be considered a mobile modular unit.

Tiny homes are built in different ways, and it is important to identify which types of tiny homes fall within the scope and application of building codes. Types of tiny homes include the following:

- Recreational vehicles
- Manufactured homes
- Modular dwellings
- Site- built dwellings

Regulations for each of these four types may vary from state to state and from jurisdiction to jurisdiction. Generally, building codes will apply only to tiny homes in the form of modular dwellings. They must also conform with the 2017 National Fire Protection Association standards for site-built dwellings. Those taking the form of recreational vehicles and manufactured homes are not regulated by building codes but are under the regulation of other codes and standards.

Tiny homes that can be set on a permanent trailer chassis with wheels are often referred to as tiny homes on wheels (THOW). Remaining in a mobile-ready state, they do not fall within the scope of building codes. They may fall within the scope of other laws or regulations, such as NFPA 1192, Standard on Recreational Vehicles, as well as rules established by the state Division of Motor Vehicles.

You may also hear a tiny home referred to as a "Park Model “. A Park Model is a vehicular-type unit that has a floor area of 400 square feet or less and meets the American National Standards Institute (ANSI) recreational standard A119.5, Park Model Recreational Vehicle Standard. Park Models are primarily designed for permanent or semi-permanent installation and are used as residences. Some suggest that a park model may not be used for permanent occupancy and may be intended for recreational or seasonal use only, but you will discover that they are often used as both.

Assessment Questions

1. All of the following statements regarding modular construction are accurate, **except**:

(a) Modular construction is a building or sections of a building built off-site.

(b) Modular construction is more expensive and takes longer than site-built construction

(c) Modular construction uses the same building components as site-built construction

(d) Modular construction and site work can take place simultaneously

2. The most significant difference between modular construction and panelized construction is:

(a) Panelized construction and modular construction are the same

(b) Panelized construction and modular both use standard building materials

(c) Panelized construction usually involves the building of wall components, floor components and roof components to speed construction; but modular indicates nearly completed modules are used

(d) Panelized construction is often referred to as prefab because components are prefabricated in a manufacturing facility

3. "Tiny homes" is a phrase that describes all of the following, **except**:

(a) Any home that is less than 1000 square feet

(b) A home that is 400 square feet or less

(c) A home that is customarily constructed on wheels and is transportable

(d) Are self-contained units that customarily include all of the necessary amenities

4. Examples of types of tiny homes include all of the following, **except**:

(a) Manufactured homes

(b) Site- built dwellings

(c) Modular dwellings

(d) Tree houses

5. Panelized construction is often referred to as _____.

(a) stick-built

(b) site-built

(c) prefab

(d) park model

6. True or false? According to the 2018 International Residential Code, a tiny house is “a dwelling unit with a maximum of 400 sq ft of floor area, including lofts.”

(a) True

(b) False

The Difference Between Modular and Manufactured Homes

Now that we have a clear understanding of the difference between prefab, panelized, and tiny homes let’s explore the difference between modular and manufactured homes. It can be confusing to tell the difference between a manufactured home, mobile home, and/or modular home. They can be very similar in appearance, and on top of that, many people use the terms interchangeably. So, let's try to clear it all up and get a better definition.

What are Modular Homes?

A modular home is any factory-built home that is constructed to a local (City or County), or state building code. In most cases, a state will have adopted one of the uniform construction codes (i.e. UBC, IRC, etc.). Modular homes will not have the red HUD Certification Label but will have a different label (often called a "UBC Label", or similar) attached to the home stating the code it complies with. Modular homes are, usually, only attached to private land, and not typically installed in manufactured (mobile) home parks.

What are Manufactured Building Units or Homes?

- Buildings that are built on a permanent metal chassis or frame and pulled to the site with axles and wheels
- Manufactured homes are built to comply with the United States Housing and Urban Development Code

What are Manufactured Homes?

Manufactured building units or homes are buildings that are built on a permanent metal chassis or frame and pulled to the site with axles and wheels. A manufactured home is any factory-built home in the United States that is built conforming to HUD Title 6 construction standards (commonly known as "the HUD-code"). The US Department of Housing and Urban Development establishes and enforces the national code for the construction, design, performance, and installation of manufactured homes in order to assure their quality, durability, affordability, and safety. The HUD-code was implemented and took effect starting June 15, 1976. A HUD-coded home will display documentation called the HUD Certification Label and the Data Plate. The red HUD Certification Label (sometimes called the "HUD Label") can be located on the tail end of each transportable section of the home (as shown here to the right). The Data Plate will be located inside of the home. A manufactured home is also built on a permanent chassis to ensure transportability. However, typically a manufactured home is not moved from its initial installed site. The home can then be placed on a HUD permanent foundation. HUD will require a foundation inspection and certification.

What are Mobile Homes?

A mobile home is similar to a manufactured home in that it is a factory-built home. However, it differs in that it is:

1) Built before June 15, 1976
2) Not built to any uniform construction code, including HUD, since the HUD code didn't come out until June 15, 1976

Every manufactured home has a chassis, or steel sub-floor frame. The beams and connecting “cross members”, as well as outriggers, of the chassis are welded steel. The chassis also incorporates a removable hitch, axles, and wheels. The chassis is the rigid foundational frame for the home. However, the hitch, axles, and wheels are most often removed upon mobile home delivery and installation to make way for siding and skirting. If the home is to be moved, the axles and wheels are re-attached.

Modular vs Manufactured Homes

A dictionary definition of modular simply states that it is “a method of employing or involving a module or modules as the basis of design or construction, for instance modular housing units.”

A modular home is a house that is built of prefabricated sections referred to as modules. They are constructed away from a building site, transported to the site, and fitted together.

They are built to the same code standards as any other site-built home, go through stringent quality control processes, and are becoming increasingly popular with new technologies. Ultimately it is a great construction method for your new home and a great solution to a housing market that is constantly in low supply.

Modular vs. Manufactured *Part 1*

Modular	Manufactured
• Key term is “module”	• Metal under-chassis and floor system; remains a part of the structure
• Built section by section	• Axles and wheels and tongue installed for towing
• Must comply with International Residential Code	• Floor System 2”x 4” or 2”x 6” 16” o.c. over steel chassis
• Permanent foundations	• Typical floor 40-76’ in length
• Just like site-built	• Width ranges 14-18’
• Customizable	• Predetermined selection of styles

There is a clear delineation between modular construction and manufactured homes. In the Modular vs. Manufactured *Part 1* Table, the column on the left reiterates that when discussing modular construction, the key term is *module.* This means that the sections of the building are built in individual modules and then assembled at the jobsite. Modular building units must comply with the international building code, uniform building code, or the applicable code in your individual jurisdiction. Modular units are intended to be placed on permanent foundations and are built just like a site-built home. Modular units can be customized in the same manner that a site-built home can.

Manufactured homes on the other hand are built specifically on a metal chassis that has axles, wheels, and a tongue. Additionally, the floor system is usually some form of wood framing over a steel chassis. Manufactured homes typically come in a length of 40 to 76 feet and can range in width from 14 to 18 feet for single wide units. In most cases the manufactured unit comes with a predetermined selection of styles and materials.

Modular vs. Manufactured *Part 2*	
Modular	**Manufactured**
• All wood/engineered wood products for structural framing	• Wall construction is 2” x 4” studs
• 2” x 10” floor joists	• Walls have 1”x 4” top and bottom plate
• All wall studs 2”x 4”	• Fire rated paneling or drywall
• Double top plate on walls	• Gusseted truss plate roof system
• 7/16” OSB wall sheathing	• No attic access
• Ceiling heights 8-9’	• Decorative ceiling board
• Same HVAC as site-built homes	• One-piece galvanized steel exterior roof (some have shingles)

To continue the comparison let’s take a look at the Modular vs. Manufactured *Part 2* Table. This table illustrates some of the detailed building specifications in both modular and manufactured homes. Again, viewing the column on the left you will see that modular units have structural components that are all comprised of wood or engineered wood products. Some manufacturers are beginning to employ metal studs and structural framing members. However, in most cases wood is used, and as you can see in nearly every instance the floor system is constructed using 2 x 10 floor joists, the walls are constructed of 2 x 4 studs, the walls have double top plates, wall and roof sheathing is customarily 7/16 OSB, ceiling heights are a minimum of 8 feet (but can be higher), and the HVAC system is comparable to site-built homes with an equal conditioned air distribution.

Manufactured homes normally have 2 x 4 stud walls, although in some cases 2 x 3 framing members are used. The walls have a single one-by-four top plate, and the interior is customarily a lighter weight paneling or a fire-rated drywall. The roof system is a rather shallow pitched cosseted trusts roof with no attic access. In order to achieve a lighter weight unit for transportation, a decorative ceiling board is frequently used instead of a drywall product. The exterior roof surface on the unit is frequently made of galvanized steel although in recent years more composite shingle roofing has been used.

Modular vs. Manufactured *Part 3*	
Modular	**Manufactured**
• Considered the same as single family site-built dwelling for loans and mortgages	• Windows and doors, meet fire and safety codes
• Not relocatable once placed on a permanent foundation	• Oftentimes windows are metal frames, new models have vinyl
• Building inspectors check all work	• Exterior siding normally prefinished aluminum, optional vinyl or composite
• Sometimes less expensive than site built	• Home must be anchored to assure stability against movement
• Are normally allowed in all communities	• All foundation must be approved by an approved HUD inspector

A few other significant differentiators between modular and manufactured construction are listed in the Modular vs. Manufactured *Part 3* Table.

Modular building units are considered the same as single-family site-built dwellings when it comes to obtaining a residential loan or mortgage. Modular units are normally not relocatable once they are placed on a permanent foundation at the building site. Building inspectors who are employed by the jurisdiction having authority over the location inspect all assembly and completion of the modular building units. Sometimes modular units are actually less expensive than site-built homes. A huge difference between modular and manufactured homes is the fact that modular building units are normally allowed in all communities.

Some additional differences between modular and manufactured buildings are the fact that manufactured units have window and doors that meet fire and safety codes. However, most of the time those windows are metal frames or very inexpensive vinyl windows. The exterior siding on less expensive manufactured units is often prefinished aluminum panels or as another option vinyl or composite siding. Another important fact about manufactured homes is the home must be anchored with “tie-downs” to assure stability against movement caused by strong winds and storms. All foundations and the associated tiedowns must be approved by a HUD inspector.

Assessment Questions

7. One of the most significant differences between modular homes and manufactured homes is that:

(a) There is no difference, modular and manufactured homes are the same, we simply use the terms interchangeably.

(b) Modular homes depreciate while manufactured homes hold their value.

(c) Modular and manufactured homes are constructed using the same codes and standards.

(d) Manufactured homes are built on metal chassis, with a tongue and wheels installed, while modular homes are built with the same components as site-built homes.

8. Building standards or "codes" used to construct **modular** homes are:

(a) Codes that are developed by the government agency know as HUD; an agency formally known as The Department of Housing and Urban Development.

(b) Determined solely by the local authority having jurisdiction over the project.

(c) By the same building codes that exist for site-built homes.

(d) By specifications developed by the manufacturer.

9. As a contractor, if you were constructing a **manufactured** home then the foundation will likely need to be inspected by:

(a) No one, most manufactured homes don't have foundations

(b) By the local inspections department and (most likely) a HUD approved inspector

(c) Due to the fact that the foundation consists of dry stacked masonry block no inspection is needed

(d) By the supplier who set-up the unit

10. Which of the following statement(s) about **modular** construction is NOT true?

(a) Modular homes require anchors and ties downs which must be inspected after the unit(s) are set

(b) Modular is considered the same as site-built dwellings for loans and mortgages

(c) Modular homes or building are normally accepted in all communities

(d) Building Inspectors or certifying agencies inspect all modular work

11. The easiest way to identify a manufactured home is:

(a) There is no easy way, sometimes they can look identical to a modular home

(b) Look for the HUD label that is required to be placed on the tail end of every manufactured home

(c) Look at the roof, if it's a shingle roof it must be a modular home, not manufactured

(d) Ask the owner if it was built in a factory and delivered to the site

12. The HUD-code was implemented and took effect starting _____.

(a) January 1, 1976

(b) June 1, 1970

(c) June 15, 1976

(d) June 30, 1977

13. True or false? **Manufactured** homes must be built with access to the attic.

(a) True

(b) False

14. Another difference between modular and manufactured buildings is the fact that **manufactured** units have window and doors that meet which of the following codes?

(a) building envelope codes

(b) electrical codes

(c) energy codes

(d) fire and safety codes

15. Another important fact about manufactured homes is the home must be anchored with _____ to assure stability against movement caused by strong winds and storms.

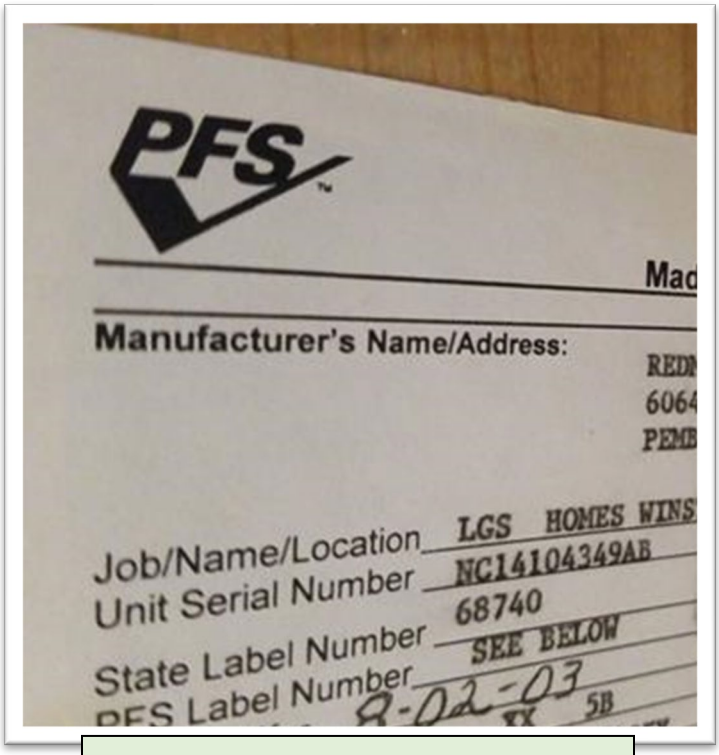
(a) "tie-downs"

(b) dry masonry block

(c) installed skirting

(d) all of the above

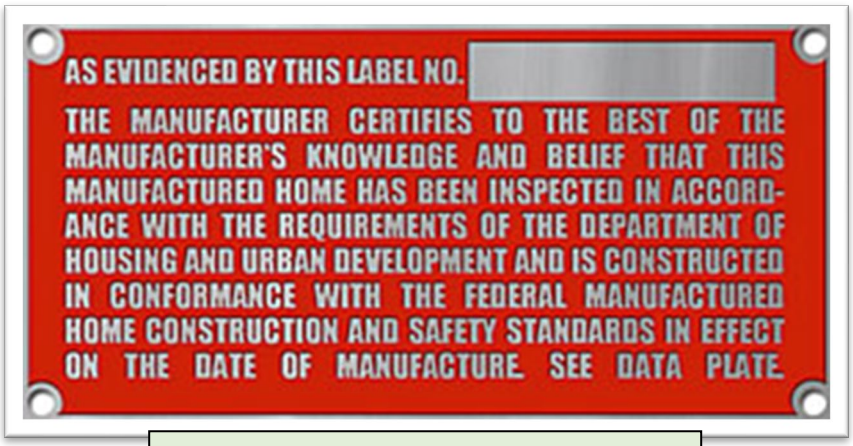
Modular Home Compliance Certificate



Modular Home Compliance Certificate

Let's take a few minutes to look at some items that may give you a clear indicator as to which units would be considered modular units and which units might be considered manufactured homes. A very clear indicator is the type of labeling you may find on the interior of the building unit or on the exterior. The photo labeled *Modular Home Compliance Certificate* indicates a modular building unit because as you can see it list the manufacturer of the unit and shows the state in which the unit was constructed along with a stamp that is issued by the state showing that the unit conforms with the then current building code.

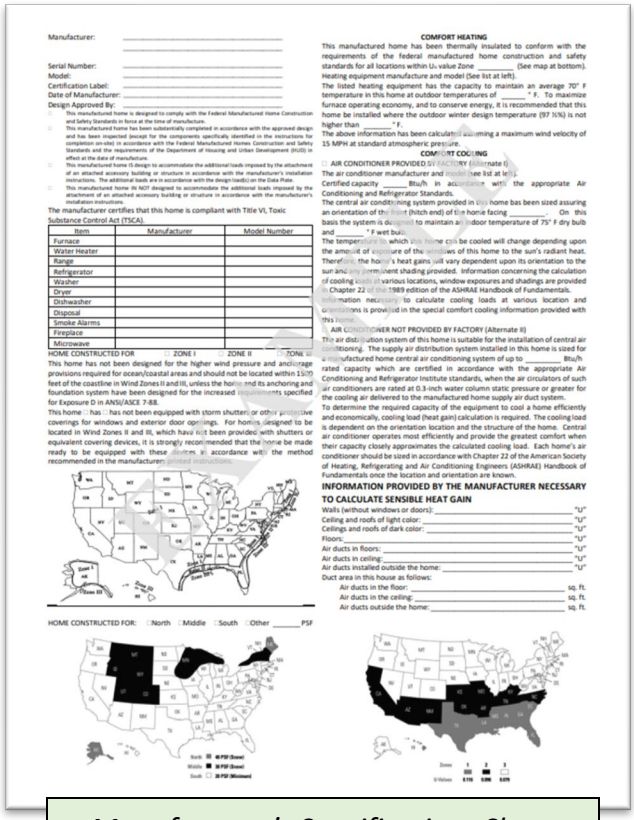
Manufactured Homes Compliance Documentation



HUD Certification Label

As mentioned previously, a manufactured home would have a HUD certification label affixed to the taillight end of each section of the manufactured home.

A manufactured home would also have a sheet mounted inside the unit which details the manufacturer of the unit and the building specifications that it was designed to. Anytime you see a unit placed on a foundation that has this red HUD label it clearly indicates that it is in fact a manufactured home and not a modular home.



Manufacturer:

Serial Number:
Model:
Certification Label:
Date of Manufacturer:
Design Approved By:

☐ This manufactured home is designed to comply with the Federal Manufactured Home Construction and Safety Standards in force at the time of manufacture.

☐ This manufactured home has been substantially completed in accordance with the approved design and has been inspected (except for the components specifically identified in the instructions for completion on-site) in accordance with the Federal Manufactured Homes Construction and Safety Standards and the requirements of the Department of Housing and Urban Development (HUD) in effect at the date of manufacture.

☐ This manufactured home IS design to accommodate the additional loads imposed by the attachment of an attached accessory building or structure in accordance with the manufacturer's installation instructions. The additional loads are in accordance with the design load(s) on the Data Plate.

☐ This manufactured home IN NOT designed to accommodate the additional loads imposed by the attachment of an attached accessory building or structure in accordance with the manufacturer's installation instructions.

The manufacturer certifies that this home is compliant with Title VI, Toxic Substance Control Act (TSCA).

Item	Manufacturer	Model Number
Furnace		
Water Heater		
Range		
Refrigerator		
Washer		
Dryer		
Dishwasher		
Disposal		
Smoke Alarms		
Fireplace		
Microwave		

HOME CONSTRUCTED FOR ☐ ZONE I ☐ ZONE II ☐ ZONE III

This home has not been designed for the higher wind pressure and anchorage provisions required for ocean/coastal areas and should not be located within 1500 feet of the coastline in Wind Zones II and III, unless the home and its anchoring and foundation system have been designed for the increased requirements specified for Exposure D in ANSI/ASCE 7-88.

This home ☐ has ☐ has not been equipped with storm shutters or other protective coverings for windows and exterior door openings. For homes designed to be located in Wind Zones II and III, which have not been provided with shutters or equivalent covering devices, it is strongly recommended that the home be made ready to be equipped with these devices in accordance with the method recommended in the manufacturer's printed instructions.

HOME CONSTRUCTED FOR: ☐ North ☐ Middle ☐ South ☐ Other _____ PSF

COMFORT HEATING

This manufactured home has been thermally insulated to conform with the requirements of the federal manufactured home construction and safety standards for all locations within U_o value Zone _____ (See map at bottom).

Heating equipment manufacture and model (See list at left).

The listed heating equipment has the capacity to maintain an average 70° F temperature in this home at outdoor temperatures of _____ ° F. To maximize furnace operating economy, and to conserve energy, it is recommended that this home be installed where the outdoor winter design temperature (97 ½%) is not higher than _____ ° F.

The above information has been calculated assuming a maximum wind velocity of 15 MPH at standard atmospheric pressure.

COMFORT COOLING

☐ AIR CONDITIONER PROVIDED BY FACTORY (Alternate I)

The air conditioner manufacturer and model (see list at left).

Certified capacity _____ Btu/h in accordance with the appropriate Air Conditioning and Refrigerator Standards.

The central air conditioning system provided in this home has been sized assuring an orientation of the front (hitch end) of the home facing _____. On this basis the system is designed to maintain an indoor temperature of 75° F dry bulb and _____ ° F wet bulb.

The temperature to which this home can be cooled will change depending upon the amount of exposure of the windows of this home to the sun's radiant heat. Therefore, the home's heat gains will vary dependent upon its orientation to the sun and any permanent shading provided. Information concerning the calculation of cooling loads at various locations, window exposures and shadings are provided in Chapter 22 of the 1989 edition of the ASHRAE Handbook of Fundamentals.

Information necessary to calculate cooling loads at various location and orientations is provided in the special comfort cooling information provided with this home.

☐ AIR CONDITIONER NOT PROVIDED BY FACTORY (Alternate II)

The air distribution system of this home is suitable for the installation of central air conditioning. The supply air distribution system installed in this home is sized for a manufactured home central air conditioning system of up to _____ Btu/h rated capacity which are certified in accordance with the appropriate Air Conditioning and Refrigerator Institute standards, when the air circulators of such air conditioners are rated at 0.3-inch water column static pressure or greater for the cooling air delivered to the manufactured home supply air duct system.

To determine the required capacity of the equipment to cool a home efficiently and economically, cooling load (heat gain) calculation is required. The cooling load is dependent on the orientation location and the structure of the home. Central air conditioner operates most efficiently and provide the greatest comfort when their capacity closely approximates the calculated cooling load. Each home's air conditioner should be sized in accordance with Chapter 22 of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals once the location and orientation are known.

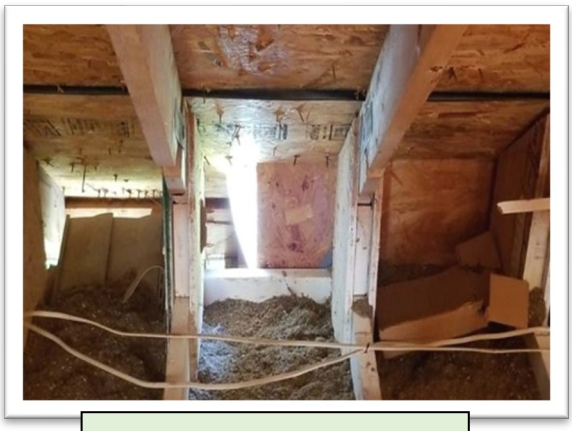
INFORMATION PROVIDED BY THE MANUFACTURER NECESSARY TO CALCULATE SENSIBLE HEAT GAIN

Walls (without windows or doors): _____ "U"
Ceiling and roofs of light color: _____ "U"
Ceilings and roofs of dark color: _____ "U"
Floors: _____ "U"
Air ducts in floors: _____ "U"
Air ducts in ceiling: _____ "U"
Air ducts installed outside the home: _____ "U"
Duct area in this house as follows:
Air ducts in the floor: _____ sq. ft.
Air ducts in the ceiling: _____ sq. ft.
Air ducts outside the home: _____ sq. ft.

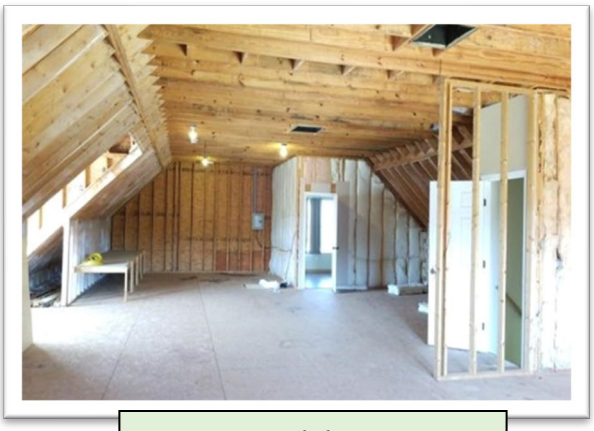
Manufacturer's Specifications Sheet

Modular Home Construction

On the other hand, a couple of visible indicators that a home is a modular home can be seen in the photos labeled *Modular 1* and *Modular 2* below. A critical eye could easily identify what building units are modular and what might be manufactured. In the photos shown below you will see a typical modular roof system. You'll notice in the *Modular 1* photo that the roof system is hinged at the eve and overhang where the overhang can fall down, and the roof system can be lifted upward. The *Modular 2* photo shows a typical modular roof system and the home with an unfinished second level. You'll notice as the roof rafters rise upward toward the ridge that there is a break in the rafters, this is a location where the roof system was hinged in order to be successfully transported from the manufacturing facility to the jobsite.



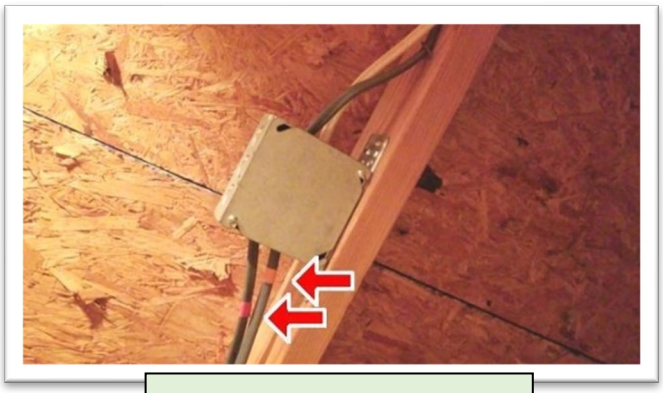
Modular 1



Modular 2

Another indicator of a modular home is reflected in photos *Modular 3* and *Modular 4* below. In the *Modular 3* photo you'll see where the two sections of a modular home were joined together. This mating/marriage wall is actually the roof system of two individual units that are pushed together prior to having the roof system and roof covering completed. The *Modular 4* photo shows an electrical junction box where branch circuit wiring was clearly marked or color-coded so that the electrician was easily able to identify the individual circuits and to properly join them together in an approved junction box with a cover installed. These on- site connections would later be inspected by a municipal building inspector.

Modular 3



Modular 4

The *Modular 5* and *Modular 6* photos below show a modular home roof system in more detail.

The *Modular 5* photo shows hinged sections of the web or cripple wall which supports the roof rafters. These components fold into position to support the roof system once it has been lifted into position. The *Modular 6* photo shows the hinge points where the roof system can be moved from a down position to its finished upward position as the building is completed. We will look at these processes in more detail later in the course.

Modular 5

Modular 6

Manufactured Home Construction

Let's take a quick look at some of the things that can help us recognize a manufactured home and differentiate it from a modular home. In photo *Manufactured 1,* you can see a typical manufactured home park. Many individuals might refer to this as a mobile home park. But as you can see, these are actually manufactured units placed in a park-like residential setting with skirting around the bottom of each unit instead of permanent foundations placed around the base of the buildings. Installed skirting around the buildings is a clear indicator that it is a manufactured home.

Manufactured 1

If you look under a manufactured home, you will observe a metal chassis and be able to identify locations where the axle springs and wheels were removed from the unit. In photos *Manufactured 2 and Manufactured 3,* you can see how this unit demonstrates where the foundation consists of dry stacked masonry block with the manufactured unit being placed on top of the piers.

Another item that is important to note is the fact that rust is beginning to develop on the metal frame. This rust and corrosion can lead to eventual structural deterioration of the manufactured unit. Due to this deterioration the unit will likely depreciate, unlike most modular buildings.

Manufactured 2

Manufactured 3

Assessment Questions

16. A modular home compliance certificate indicates a modular building unit because it lists which of the following?

(a) The manufacturer of the unit

(b) The state in which the unit was constructed

(c) A stamp showing that the unit conforms with the then current building code

(d) All of the above

17. What color is the HUD certification label that must be affixed to the taillight end of each section of a manufactured home?

(a) Black

(b) Red

(c) Yellow

(d) Green

18. In the *Modular 1* photo you can see that the roof system is hinged at which of the following places?

(a) The eve

(b) The overhang

(c) The rafters

(d) Both a and b

19. The *Modular 5* photo shows hinged sections of the _____ wall which supports the roof rafters.

(a) web

(b) cripple

(c) Both a and b

(d) None of the above

20. True or false? Installed skirting around the buildings is a clear indicator that it is a **manufactured** home.

(a) True

(b) False

21. If you look under a **manufactured** home, you will observe which of the following?

(a) A metal chassis

(b) Locations where the axle springs were removed from the unit

(c) Locations where the wheels were removed from the unit

(d) All of the above

22. True or false? The rust and corrosion on the metal frame of a **modular** unit can lead to eventual structural deterioration of the unit.

(a) True

(b) False

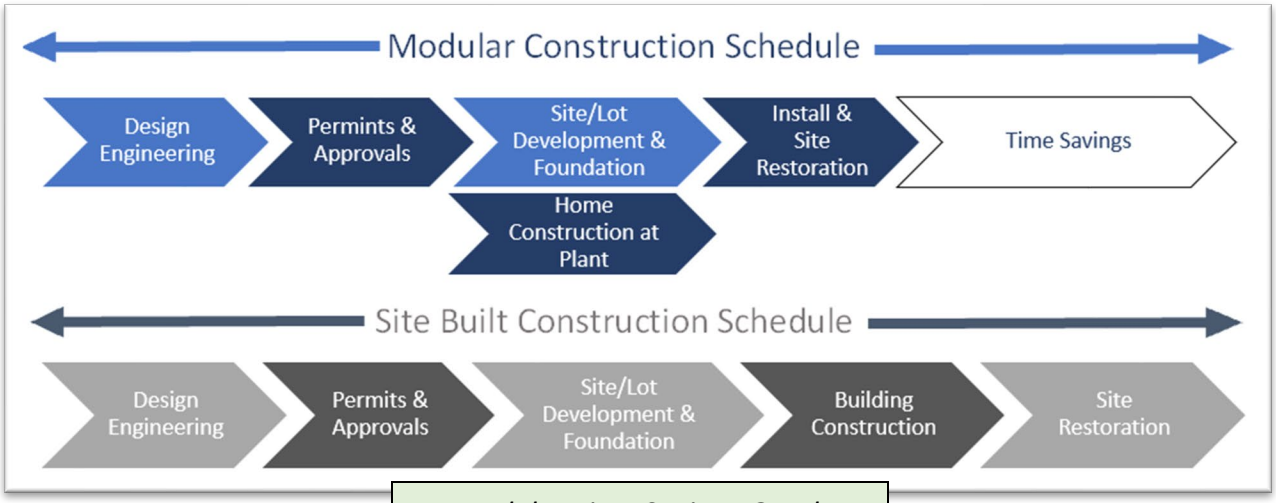
Benefits of Modular Construction

Let's shift gears and consider some of the benefits of modular construction over typical site-built construction. You'll note that in this course we use the terms "modular" and "site-built", and not the common term "stick-built". We do this because both modular units and site-built units are stick-built.

We'll begin by looking at many of the benefits that can be achieved by a contractor when they employ modular construction.

<u>Time Savings</u>

The greatest benefit for contractors is the benefit of time savings. As you can see in the *Modular Time Savings Graph,* when comparing site-built construction to modular construction there is a significant time savings of approximately 30 to 50%. The greatest benefit is achieved when you consider that the home is being constructed in a manufacturing plant simultaneously with the site and lot being developed and the foundation being built.

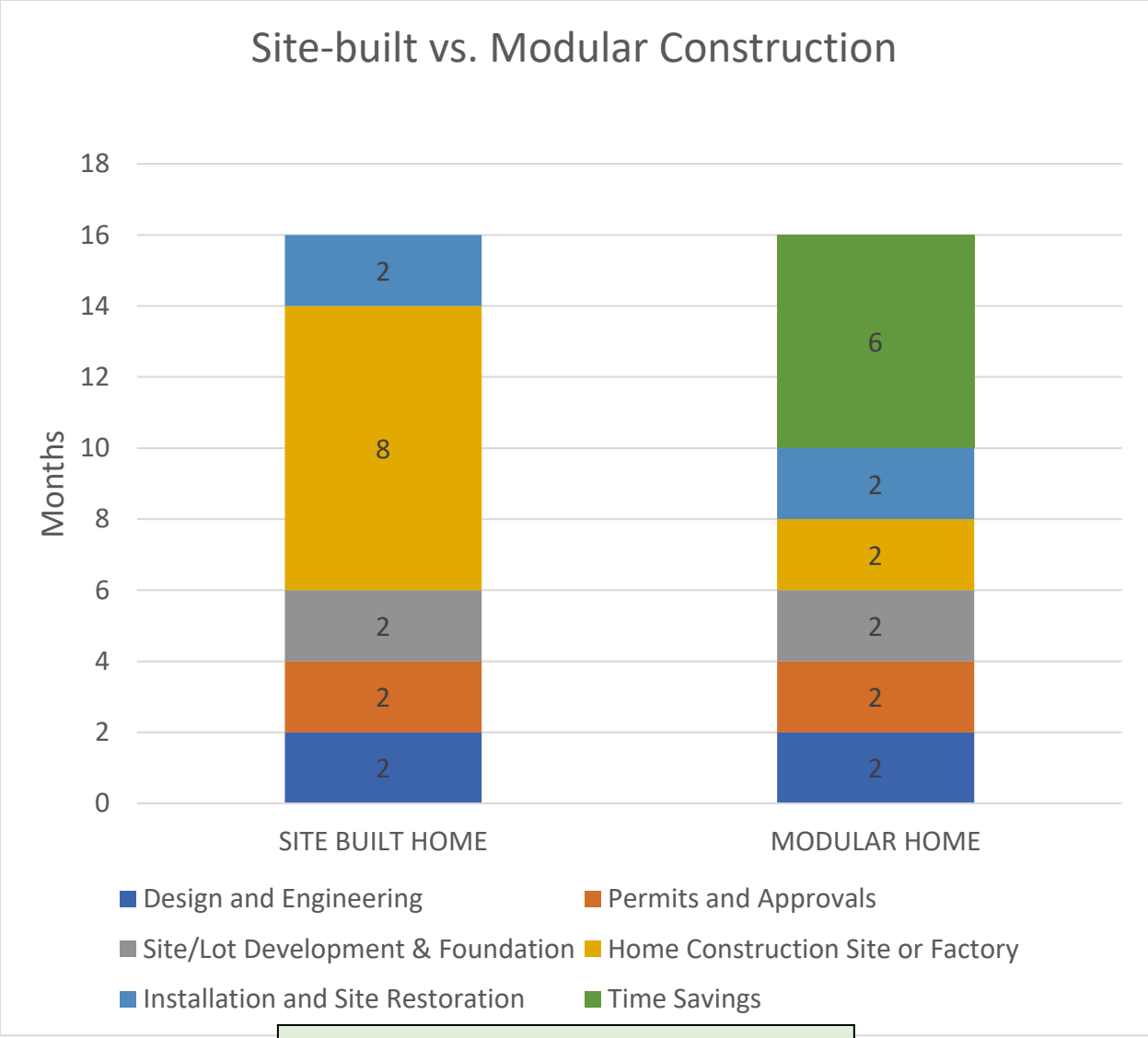


Modular Time Savings Graph

To further reinforce this point, let's look at the *Site-built vs Modular Construction Chart*. You have probably heard it said that "time is money", which is especially true if you are a contractor constructing a home using a construction loan and paying interest on that money from month-to-month. Even if you do not use lender financing you must consider the opportunity value of your money and the fact that it may be tied up longer when building a site-built home versus a modular home.

In viewing the *Site-built vs Modular Construction Chart* you'll see the time schedule for a typical home that takes 14 months to build. The column on the left of this chart is for a site- built home, and the column on the right is for a modular home. You'll notice that many of the stages will take approximately the same amount time whether it's the design and engineering phase, getting the permits and approvals for construction, or whether it is site clearing and development and construction of the foundation.

However, that is really where the similarities end. While a site-built home is being constructed on the jobsite, the modular home is being constructed in a climate-controlled factory in an assembly line fashion. The largest benefit is that while the site is being developed and the foundation is being constructed the modular home is being built concurrently. Once the modular building is delivered to the site the time to place the components and perform the necessary finishing and site restoration requires a minimal amount of time since 85% of the home is already complete. Therefore, the greatest benefit of using modular construction is the time savings which is represented in the green color at the top of the modular column. According to the Modular Builders Institute most projects that are built using modular construction units can be completed 30 to 50% sooner than traditional construction.



Site-built vs Modular Construction Chart

Cost Benefits

Another major benefit for a contractor in choosing modular construction is the reduced overhead cost. Since most of the construction is done by the manufacturer in the factory, the builder can concentrate on sales and marketing. Manufacturers also offer a wide range of sales and marketing support to the builder. Additionally, because most of the structure was constructed by a modular home manufacturer many of the callbacks when problems come up are handled by the manufacturer and not necessarily by the contractor. Overhead is further reduced simply because it takes less human capital to manage the business and the construction process.

Reduced Overhead Cost

- Most construction (60-90%) is done by the manufacturer in the factory
- Frees up time for the builder to focus on sales and marketing
- There is support from the supplier for sales and marketing as well as callbacks

There are several other benefits associated with improved cost control for the contractor. In today's construction environment finding available and skilled labor has become quite a challenge. With modular construction a majority of the module unit is constructed elsewhere, so the problem with finding skilled labor becomes the manufacturer's issue instead of an issue that must be handled by the contractor. When modular homes are constructed at a remote location then fewer subcontractors are needed for the contractor to finish the product. Another significant benefit is the fact that not having building materials left on a jobsite can reduce the risk of theft of building materials as well as reduce the risk of damage to those materials. Because modular units are manufactured in a controlled environment by experienced manufacturing staff the risk of material cost overruns is more manageable and largely handled by the manufacturer. Additionally, many of the unknown circumstances in site-built construction are eliminated due to the controlled construction environment, which creates more potential for profit for the contractor.

Improved Cost Control

- Eliminates problems caused by the shortage of skilled labor
- Fewer subcontractors are needed
- Reduces theft and material damage costs
- Reduces risk of material cost overruns
- Improves overall profit potential

Another significant benefit of modular construction is the sales and marketing support that the contractor will receive from the manufacturer of modular units. Keep in mind that the manufacturer doesn't sell units unless you sell units. Many modular companies have sales and advertising staff who will provide a great deal of sales collateral to you as a contractor, further reducing your costs. Furthermore, most manufacturers have skilled design staff who can work with your customers to design the home that they want and to ensure that your customer is satisfied with the final product. Once the home is complete you also have a partner in making sure that your customer is satisfied with the finished product.

Sales and Marketing Support

- Manufacturer doesn't sell units unless you sell units
- Manufacturers have skilled sales and design staff
- Manufacturer is your partner in assuring customer satisfaction

Improved Quality Control

Another benefit of modular construction is improved quality control. Remember that modular units are built to the same building codes as site-built homes or commercial properties. Because modular homes are built in factories, manufacturers can utilize tools unavailable to site builders such as custom manufactured jigs which ensure that all walls, floors, and ceilings are square and plumb. In addition, interior walls are lag-bolted to the exterior walls and bracing and insulation are installed on all electrical outlet boxes. Finally, straps brace the wall to the floor. It's also important to note that because the modular units are built in a controlled environment that weather delays and material shortages typically do not occur. Requirements for modular manufacturers also ensure that stringent quality control measures are in place in the factory and are continuously reinforced.

As a contractor there is a tendency to get extremely busy and only have time to appear at a jobsite in a management capacity once or twice a day. However, in a factory environment management personnel are present around the clock and stringent quality control measures are employed. Additionally, most manufacturers also employ field service personnel that will be there to assist you not only during construction but after the building is complete.

Improved Quality Control

- Modular units are built to the same building codes as site-built homes or commercial properties.
- Modular components are built in controlled environments. There are no weather delays or material shortages.
- Manufacturers employ stringent quality assurance and control measures in the factory setting.

Many of us who are engaged in the construction industry are familiar with standards set forth by the Occupational Safety and Health Administration, or OSHA, which is a government agency that ensures workplace safety. Because most of a modular home or building is constructed in a factory environment then the adherence to safety protocols is the responsibility of the manufacturer. The risk of your building site being visited by an OSHA representative, and potentially finding something in noncompliance with OSHA standards, is dramatically reduced because most of the construction work is performed in the factory environment. The factory personnel are highly trained in safety protocols and understand that their strict compliance to those protocols is mandatory, and in many instances a condition of their continued employment.

Safer Construction

- An indoor, dry, level work environment reduces accidents.
- Factory personnel are highly trained in safety protocols.
- Factories adhere to strict OSHA standards.

Assessment Questions

23. Which of the following statement(s) about **modular** construction is NOT true?

(a) Modular homes require anchors and ties downs which must be inspected after the unit(s) are set

(b) Modular is considered the same as site-built dwellings for loans and mortgages

(c) Modular homes or building are normally accepted in all communities

(d) Building inspectors or certifying agencies inspect all modular work

24. Which of the following statements is NOT true when contemplating **modular** construction?

(a) Modular homes must comply with U.S Housing and Urban Development standards

(b) Modular homes are built in factory-controlled environments

(c) Modular homes are constructed according to International Residential Building Codes

(d) Are nearly indistinguishable from site-built homes once complete

25. **Modular** homes are:

(a) Built with materials that are of lesser quality than those used with site-built homes

(b) Are built with the same materials as site-built homes

(c) Achieve efficiencies through better time management, and reduced material waste

(d) Both b and c

26. When comparing site-built construction to modular construction there is a significant time savings of approximately _____ to _____%.

(a) 10 to 20%

(b) 30 to 50%

(c) 5 to 10%

(d) 75 to 80%

27. According to the *Site-built vs Modular Construction Chart*, how many months does it take for home construction for a site-built home?

(a) 2 months

(b) 4 months

(c) 6 months

(d) 8 months

28. According to the *Site-built vs Modular Construction Chart*, how many months does it take for factory construction for a modular home?

(a) 2 months

(b) 4 months

(c) 6 months

(d) 8 months

29. According to the *Site-built vs Modular Construction Chart*, how many months of time savings are achieved for a modular home?

(a) 2 months

(b) 4 months

(c) 6 months

(d) 8 months

30. With modular homes, most of the construction (_____ - _____%) is done by the manufacturer in the factory.

(a) 30 – 50%

(b) 50 – 60%

(c) 60 – 90%

(d) 40 – 50%

Modular Home Manufacturing Facilities

Below you can see the picture *Manufacturing Facility 1* which depicts a modular home manufacturing facility. As you can see in this photo, these modular units are being built from the inside out. Once the frame walls are attached to the floor system the drywall is applied to the interior walls. This makes it very easy and efficient for the manufacturer to access the exterior for wiring runs, insulation, and exterior finish material.

Manufacturing Facility 1

In the photos *Manufacturing Facility 2* and *Manufacturing Facility 3* below, you will see a manufacturing facility for a modular home that was being constructed in order to be placed on pilings at a beach in North Carolina. As you can see, the unit is nearly complete and ready for shipment to its final destination. Shown in the *Manufacturing Facility 3* picture is one of the excited homeowners doing a final review of their home just prior to shipment. The important thing to note is the assembly line fashion in which these units are constructed. Each individual station accomplishes a specific task in completing the home. This particular home traveled approximately 250 miles from the factory to its final destination.

Manufacturing Facility 2

Manufacturing Facility 3

In the photo *Manufacturing Facility 4* below, you can see a modular manufacturing plant that shows the individual modules on wheels being transported through the factory, and the efficiency in which the units are constructed. As you can see in *Manufacturing Facility 4* photo, scaffolding is located safely and conveniently next to each module, and overhead cranes and lifting capability is installed in order to facilitate the assembly of the pre-manufactured roof systems.

Another advantage of building in a modular factory is that electrical wire can be installed in the unit from the exterior which increases efficiency. Additionally, wall units are pre- manufactured and moved to the site of the unit construction for installation on the floor systems. Something to take note of is that most factories are now employing CAD design and CNC or Computerized Numerical Control automated construction techniques in order to improve efficiency and quality.

Manufacturing Facility 4

Assessment Questions

31. According to the photo *Manufacturing Facility 1,* modular homes built in a manufacturing facility are built from_____.

(a) the outside in

(b) the inside out

(c) front to back

(d) back to front

32. Constructing the home in a manufacturing facility allows the manufacturer to easily access the exterior to complete which of the following building aspects?

(a) wiring runs

(b) insulation

(c) finishing materials

(d) all of the above

33. Which of the following equipment are used in manufacturing facilities to facilitate the assembly of the pre-manufactured roof systems?

(a) Overhead cranes

(b) Lifting capability

(c) Hydraulic pulleys

(d) Both a and b

34. True or false? When constructing modular homes, the wall units are pre- manufactured and moved to the site of the unit construction for installation on the floor systems.

(a) True

(b) False

35. Manufacturing factories employ which of the following or Computerized Numerical Control automated construction techniques in order to improve efficiency and quality.

(a) CAD design

(b) CNC

(c) Both a and b

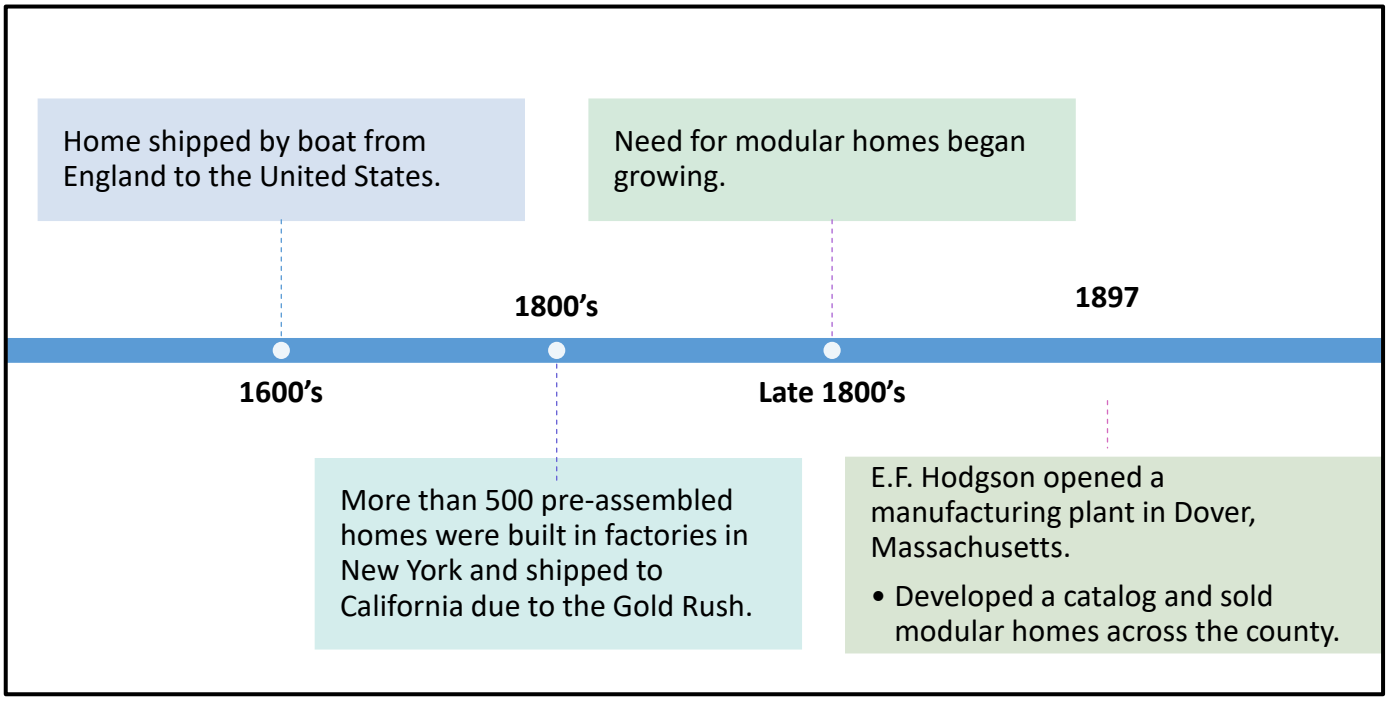
(d) None of the above

History of Modular Construction

Modular buildings date back to the 1600s. One of the first reported modular homes was brought to life by a colonial American fisherman who had recently moved from England and wanted a home built with trusted English construction methods. The solution to this was to have a disassembled home shipped by boat across the Atlantic Ocean.

In the 1800s, as the United States expanded westward, modular construction began to make a more prominent appearance. During the California Gold Rush, mining towns boomed, and as they flourished, a quick housing solution was needed. More than 500 preassembled homes were built in factories in New York and then shipped across the country to California.

But it wasn't until the end of the 19th century that the demand for modular homes started trending upwards. In 1897, E.F. Hodgson opened a manufacturing plant in Dover, Massachusetts which profited from the rapidly growing American population. The E.F Hodgson Company developed a catalog from which they sold modular homes across the country. Sears, Roebuck, and Montgomery Ward soon followed in their footsteps and sold hundreds of thousands of modular homes over the next few decades.



In the 20th-century, after the development of the assembly line, it became easier to manufacture modular homes at prices that were more affordable to consumers. After the Second World War, the United States faced a housing crisis and modular construction offered a quick and low-cost option in order to house a new generation of Americans.

The famed architect Frank Lloyd Wright also realized the benefit of factory construction. Between 1916 and 1917 he developed The System Built Homes, also known as the Ready-Cut System.

In later years the modular industry expanded from homes into commercial projects. The benefits of modular construction had become clear and modular construction was being used for housing, recreation, classrooms, offices, and even into the easily recognizable modular diner.

In the 21st century, consumers have begun to realize that modular construction can be friendly for both the environment and their budgets. Newer technology, such as better construction cranes, have allowed modular buildings to be built bigger, taller, and in many different designs. Units can be shipped across the country and can be put together on site in a matter of days. In 2003 a McDonald's fast-food restaurant was constructed in a record 13 hours. In the future we can expect more and more people and businesses to embrace modular building concepts.

Assessment Questions

36. How far back do modular buildings date?

(a) 1500s

(b) 1600s

(c) 1700s

(d) 1800s

37. During the California Gold Rush more than _____ preassembled homes were built in factories in New York and then shipped across the country to California.

(a) 50

(b) 200

(c) 500

(d) 1000

38. It was at the end of the _____ century that the demand for modular homes started trending upwards.

(a) 17th

(b) 18th

(c) 19th

(d) 20th

39. Between 1916 and 1917 Frank Lloyd Wright developed The System Built Homes, also known as the _____.

(a) Ready-Cut System

(b) Ready-Build System

(c) Pre-Cut System

(d) Pre-Built System

40. In 2003 a McDonald's fast-food restaurant was constructed in a record _____ hours.

(a) 5

(b) 8

(c) 12

(d) 13

Myths of Modular Construction

In order for us to clearly understand the benefits of modular construction there are several myths that we must dispel regarding what modular construction is and is not. Once these myths are dispelled, we can focus on facts regarding modular construction's use in our modern world. Let's take a look at, and dispel, seven different myths surrounding modular construction in order to enhance our understanding.

Myth #1

All factory-built homes are trailers.

A common myth is that all factory-built homes are trailers. Let's take a look at the facts.

Manufactured homes are trailers, mobile homes, single-wide homes, and double-wide homes. Manufactured homes are built to different standards than modular homes or buildings. Manufactured homes must comply with standards put forth by the US Department of Housing and Urban Development.

Modular homes are similar to manufactured homes in that they are both built in a factory-controlled environment. Other than this similarity, manufactured and modular homes are entirely different.

Modular homes are constructed according to the International Residential Building Code. A completed modular home is basically indistinguishable from a traditionally site-built home of similar size and style.

Myth #2

Modular homes are constructed using cheaper materials.

A second myth is that modular homes are constructed using cheaper or lesser quality materials.

Simply put, this myth is untrue. Modular homes are made with the same standard of building materials that site built homes are constructed with.

The reduced cost of building modular homes is a result of the time savings achieved when constructing them. Cost savings also occur due to the lesser amount of material wasted on the construction site. In most instances the building products, materials, finishes, and fixtures are the same that are used in site-built home, and in some cases the quality may even be better.

Myth #3

Modular Homes aren't as safe as site-built homes.

Here's an interesting myth about modular construction that some people may believe: Modular homes aren't as safe as site-built homes. Once again, the facts dispel that myth.

The fact is modular homes meet the same construction standards as traditionally built homes. Modular homes must meet the same stringent building code requirements that are developed to protect the consumer. Modular homes and buildings can resist fires, earthquakes, hurricanes, and other disasters as well as a site-built home. As a matter of fact, modular homes have often been chosen by people who are rebuilding after a natural disaster. FEMA, the Federal Emergency Management Agency, has stated that modular homes may be safer than site-built homes.

Proponents of modular homes have maintained that the building system at manufacturing facilities can produce structures that are far stronger than site-built housing. For instance, the modular sections are built to withstand the stresses of highway travel, containing up to 30% more building materials than a comparable site-built home. Drywall is often both glued and

screwed to wall studs and triple-headers are used over window openings and around stairwells to withstand the stress of transportation and being lifted by a crane.

Recently, the Federal Emergency Management Agency (FEMA) confirmed that modular homes withstood Hurricane Andrew far better than site-built housing. In FEMA's report "Building Performance: Hurricane Andrew in Florida," the assessment teams from FEMA concluded that modular homes withstood the 131-155 mph winds of the Category 4 storm in August of 1992 far better than site-built housing. In their report FEMA stated: "Overall, relatively minimal structural damage was noted in modular housing developments. The module-to-module combination of units appears to have provided an inherently rigid system that performed much better than conventional residential framing. This was evident in both the transverse and longitudinal directions of the modular buildings". (FEMA publication number FIA-22, item 3-0180)

Myth #4

The design of modular homes is simple and unattractive.

Another common myth is that the design of modular homes is simple and unattractive. However, you will see that the contrary is true.

As mentioned previously, modular buildings that are built today are virtually indistinguishable from traditionally built homes. Designs can vary to accommodate your taste and your budget. Sizes can vary from a smaller one-story starter home to a stately structure. If the truck transporting the modules can get to your site, any structure is possible!

Assessment Questions

41. **Modular** homes include which of the following?

(a) Trailers

(b) Single-wide homes

(c) Double-wide homes

(d) None of the above

42. True or false? Modular homes are made with the same standard of building materials that site built homes are constructed with.

(a) True

(b) False

43. Modular homes and buildings can resist which of the following disasters as well as site-built homes?

(a) fires

(b) earthquakes

(c) hurricanes

(d) all of the above

44. Modular sections are built to withstand the stresses of highway travel, containing up to _____% more building materials than a comparable site-built home.

(a) 10%

(b) 15%

(c) 30%

(d) 50%

45. True or false? In FEMA's report "Building Performance: Hurricane Andrew in Florida," the assessment teams from FEMA concluded that modular homes withstood the 131-155 mph winds of the Category 4 storm in August of 1992 much worse than site-built housing.

(a) True

(b) False

Myth #5

As soon as the home is delivered to the property and placed on the foundation, the homeowners can move in!

Let's consider another common myth: Some individuals believe that as soon a modular home is delivered to the site and placed on the foundation that it is ready for occupancy. Well let's look at myth number five and discover what the real truth is.

When a modular structure arrives on site the modules themselves are virtually complete. However, there is still a significant amount of work to be performed. The sections must be joined together, plumbing connected, electrical joined together from section to section, utilities must be connected, and site work must be finished. On average it takes an additional 8-12 weeks to complete the project.

Myth #6

You can't get a mortgage on a modular home.

Another myth about modular construction is that banks and mortgage companies will not lend money on a modular home. Let's take a look at this in a little more detail.

In many instances financial institutions must be educated about modular construction just as much as the general public. What we have discovered is that, as is the case with most construction projects, it may be necessary to obtain a construction loan in order to make progress payments on the construction of modular units.

The homeowner will also need financing in order to purchase the land and to perform all the necessary site work including the footings and foundation. Funds will also need to be acquired to perform the remaining work once the units are delivered. This construction loan can then be converted to a permanent mortgage and the home can be treated the same as a traditionally built structure.

According to one major bank, the process of securing financing for modular construction involves the following seven-step process.

1. The first step of modular home construction financing is to get preapproval for the loan. During the preapproval process it will be determined how much can be borrowed and which type of product best suits the borrower's needs.
2. Once the borrower is preapproved, and they have determined which modular company they want to do business with, they will complete the formal loan application and an appraisal will be ordered based on the home being completed. Many financial institutions have a list of preapproved modular suppliers which may in fact make the building experience easier.
3. The third step is to obtain mortgage approval after a complete review of the loan application. The lender will then issue a commitment letter which informs the borrower that the bank will underwrite the loan after all other requirements are met.

4. Once the mortgage has been approved, a disbursement or draw schedule is established which allows the homeowner or the contractor to obtain disbursements at predetermined milestones throughout the project.
5. Once agreement is reached between the builder, supplier, customer, and financial institution the next step is to close the construction loan.
6. Once the loan is closed then construction of the new modular home can begin.
7. The final step, after all construction is complete and a certificate of occupancy is granted, is to convert the construction loan into a permanent mortgage.

As you can see, this process is not much different from the process that is experienced with a conventional construction loan which is later converted to a permanent mortgage.

Myth #7

Modular structures don't last as long and depreciate just like trailers do.

Another myth that we can dispel is the common belief that modular structures don't last as long as traditional site-built homes and that they depreciate just like manufactured homes or trailers and mobile homes do. However, as we will see, the facts will discredit this myth.

In an article from Forbes magazine from February 2021, the author questioned whether modular homes had comparable resale values, quality construction, and whether loans were available. What the writer discovered was that modular homes appreciate similar to stick-built homes and loans and mortgages were also treated similarly. The writer also stated that the same was not true for mobile homes that customarily aren't built on solid foundations.

Assessment Questions

46. Which of the following projects must be completed after a modular home is delivered to the site?

(a) The sections must be joined together

(b) The plumbing must be connected

(c) The utilities must be connected

(d) All of the above

47. On average it takes an additional _____ _____ to complete a modular home after it has been delivered to the site.

(a) 4-5 weeks

(b) 4-5 months

(c) 8-12 weeks

(d) 8-12 months

48. True or false? A construction loan for a modular home can be converted to a permanent mortgage.

(a) True

(b) False

49. Which of the following is the **first** step to secure financing for modular home construction?

(a) Complete the formal loan application

(b) Get preapproval for the loan

(c) Obtain mortgage approval

(d) Establish a disbursement schedule

50. Which of the following is the **fourth** step to secure financing for modular home construction?

(a) Obtain mortgage approval

(b) Complete the formal loan application

(c) Establish a disbursement schedule

(d) Begin construction on the modular home

51. Which of the following is the **seventh** and final step to secure financing for modular home construction?

(a) Begin construction on the modular home

(b) Close the construction loan

(c) Issue a commitment letter

(d) Convert the construction loan into a permanent mortgage

52. True or false? The value of modular homes will depreciate, and the value of stick-built homes will appreciate.

(a) True

(b) False

Commercial Modular

Now let's take a quick look at commercial modular, and particularly at the two types of commercial modular that we may encounter as contractors: permanent and relocatable modular construction.

Commercial Modular	
Permanent	**Relocatable**
• Comparable to site-built construction	• Temporary modular
• Must meet IRC or IBC	• Meets temporary space needs
• Must meet local building codes	• Often leased under short-term agreements
• Accounts for over 50% of modular units shipped today, and 4% of all new commercial construction starts	• Examples are site trailers, classrooms, communication pods, etc.

The construction industry considers commercial modular construction to be either permanent modular construction or relocatable modular buildings. According to the Modular Building Institute:

> *Permanent Modular Construction (PMC) is an innovative, sustainable construction delivery method utilizing offsite, lean manufacturing techniques to prefabricate single or multi-story whole building solutions in deliverable module sections. PMC modules can be integrated into site-built projects or stand alone as a turn-key solution and can be delivered with mechanical, electrical and plumbing (MEP), fixtures and interior finishes in less time -- with less waste, and higher quality control compared to projects utilizing only site-built construction. Recent research has come out supporting the fact that modular construction is an efficient construction process and poised to help the construction industry grow.*

A Relocatable Building (RB) is a partially or completely assembled building that complies with applicable codes or state regulations and is constructed in a building manufacturing facility using a modular construction process. Relocatable buildings are designed to be reused or repurposed multiple times and transported to different building sites. They are utilized for schools, construction site offices, medical clinics, sales centers, and in any application where a relocatable building can meet a temporary space need. These buildings offer fast delivery, ease of relocation, low-cost reconfiguration, accelerated depreciation schedules and enormous flexibility. Relocatable buildings are not permanently affixed to real estate but are installed in accordance with manufacturer's installation guidelines and local code requirements. These buildings are essential in cases where speed, temporary space, and the ability to relocate are necessary.

Permanent modular construction would be comparable to site-built structures. Permanent module structures must meet either the International Residential Code or the International Building Code as well as any local codes that may exist regarding their construction. In today's market permanent modular construction accounts for over 50% of the total number of modular units that are shipped today and 4% of all new construction starts. The US is slightly behind the curve because other countries such as Sweden are manufacturing many more permanent modular structures. For example, in Sweden 70% of all new construction starts are permanent modular.

When considering relocatable modular we must understand that relocatable modular applies to modular structures that are temporary in nature and are designed to meet temporary space needs. In many instances these temporary modular structures are leased under short- term agreements to the end users for immediate and, in most instances, short-term needs. Some examples of short-term modular might be mobile classrooms, communication pods, and even military barracks in foreign destinations.

Permanent Modular

Relocatable Modular

Assessment Questions

53. Permanent commercial modular accounts for over _____% of modular units shipped in the United States today.

(a) 15%

(b) 50%

(c) 70%

(d) 5%

54. Permanent commercial modular accounts for approximately _____% of all new construction starts in the United States today.

(a) 10%

(b) 50%

(c) 4%

(d) 70%

55. In Sweden, _____% of all new construction starts are permanent modular.

(a) 70%

(b) 50%

(c) 4%

(d) 100%

56. True or false? Permanent commercial modular constructions must meet either the International Residential Code or the International Building Code as well as any local codes that may exist regarding their construction.

(a) True

(b) False

57. Relocatable modular construction could be utilized for which of the following?

(a) Schools

(b) Construction site offices

(c) Medical clinics

(d) All of the above

58. Which of the following are benefits of relocatable modular construction?

(a) fast delivery

(b) ease of relocation

(c) low-cost reconfiguration

(d) All of the above

59. True or false? Relocatable modular constructions must meet the International Residential Code as well as any local codes that may exist regarding their construction.

(a) True

(b) False

60. True or false? Relocatable buildings are permanently affixed to real estate.

(a) True

(b) False

ANSWER SHEET

Modular Construction

First Name: _____ Last Name: _____ Date: _____

Address:_____ City: _____ State: _____ Zip: _____

DCQ License #:_____ Phone: _____ Email: _____

1.	A	B	C	D		25.	A	B	C	D		49.	A	B	C	D
2.	A	B	C	D		26.	A	B	C	D		50.	A	B	C	D
3.	A	B	C	D		27.	A	B	C	D		51.	A	B	C	D
4.	A	B	C	D		28.	A	B	C	D		52.	A	B	C	D
5.	A	B	C	D		29.	A	B	C	D		53.	A	B	C	D
6.	A	B	C	D		30.	A	B	C	D		54.	A	B	C	D
7.	A	B	C	D		31.	A	B	C	D		55.	A	B	C	D
8.	A	B	C	D		32.	A	B	C	D		56.	A	B	C	D
9.	A	B	C	D		33.	A	B	C	D		57.	A	B	C	D
10.	A	B	C	D		34.	A	B	C	D		58.	A	B	C	D
11.	A	B	C	D		35.	A	B	C	D		59.	A	B	C	D
12.	A	B	C	D		36.	A	B	C	D		60.	A	B	C	D
13.	A	B	C	D		37.	A	B	C	D						
14.	A	B	C	D		38.	A	B	C	D						
15.	A	B	C	D		39.	A	B	C	D						
16.	A	B	C	D		40.	A	B	C	D						
17.	A	B	C	D		41.	A	B	C	D						
18.	A	B	C	D		42.	A	B	C	D						
19.	A	B	C	D		43.	A	B	C	D						
20.	A	B	C	D		44.	A	B	C	D						
21.	A	B	C	D		45.	A	B	C	D						
22.	A	B	C	D		46.	A	B	C	D						
23.	A	B	C	D		47.	A	B	C	D						
24.	A	B	C	D		48.	A	B	C	D						