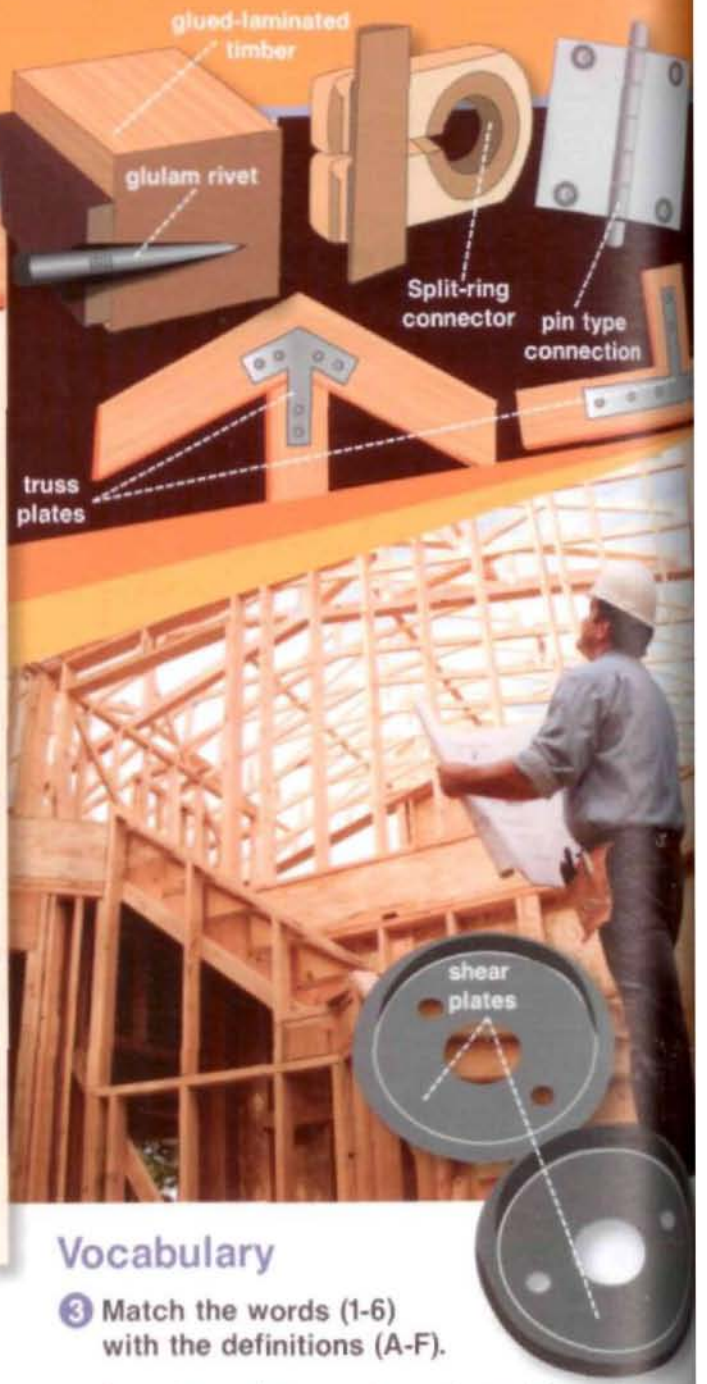
6 Timber frames

Introduction to Timber frames



Timber is lightweight, strong, and inexpensive. That's why it has been used in structural frames for centuries. Such frames must be able to support heavy loads. This includes the **dead load**, or the weight of the building itself. Also included are moving **live loads**, such as weather elements. Timber frames are allowed to move to a certain extent under such loads. The amount of movement allowed is known as a **deflection** limit.

Timber frames **transfer** loads to capable load-bearing structures and the foundation with **timber connectors**. The types of connectors used will depend on the building's materials and structural requirements. Timber frame connectors often have **pin-type connections**. They connect pieces through plates and bolts, and allow for some rotation between pieces. Specific types of connectors include:

Glulam rivets - These are special steel nails used to connect pieces of **glued-laminated timber**.

Shear plates - These plates are designed to prevent timber deformation by spreading pressure over a large area of wood. They can be used for wood-to-wood or steel-to-wood connections.

Split-ring connectors - These are similar to shear plates but transfer a load through a ring instead of a bolt. They can only be used for wood-to-wood connections.

Truss plates - These special plates connect timber of the same thickness in the same plane.

Get ready!

1 Before you read the passage, talk about these questions.

1 What type of building might have a timber frame?
2 What are some different types of timber connectors?

Reading

2 Read the *construction manual on timber* frames. Then, mark the following statements as true (T) or false (F).

1 __ It is normal for wind or snow to move a wooden frame slightly.
2 __ Pin-type connections prevent rotation between pieces of timber.
3 __ Split-ring connectors are only for wood-to-wood connections.

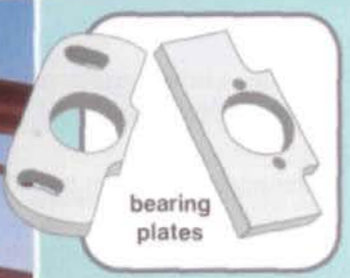
Vocabulary

3 Match the words (1-6) with the definitions (A-F).

1 __ truss plate
2 __ glulam rivet
3 __ deflection
4 __ shear plate
5 __ pin-type connection
6 __ transfer

A a special steel nail used in connections of glued-laminated timber
B a device that distributes force over a large area of timber in order to prevent damage
C a timber connector that uses thin plates and bolts to join timber pieces, which allows for some rotation between the pieces
D a metal plate used to connect timber of the same thickness in the same plane
E to move the pressure of a load from one structure or object to another
F a measure of how much a piece of timber changes shape under the pressure of a load

7 Steel frames



Steel frame CONSTRUCTION

Safety Guidelines

There are several important safety concerns when constructing a **steel frame**. First, ensure that each **member** is in the correct position. Do so by locating the **erection mark** on each piece. This will tell you how the **section shape** fits together.

Next, if using a **bolting** connection, use the correct size and strength of bolt. Bolts are labeled by their **ASTM designation**. An A307 bolt is not suitable for a job requiring an A325, and vice versa. Also be sure to use the proper type of connection. A **bearing-type connection** should be used where the applied load mainly pulls in one direction. **Friction-type connections** can be used where the load direction varies. When drilling holes, pay attention to the standard **pitch** and **gauge** distances for that structural shape.

Welding also has particular connections for specific jobs. Use **fillet welds** as much as possible. They do not require preparation of the welded material. However, a **groove weld** is safer if a very strong connection is needed.

When erecting a steel frame, place **anchor bolts** carefully. This allows the **bearing plates** to be positioned accurately. These plates will hold the **columns** of the frame in place, with **girders** connecting between the columns. Last, **open-web steel joists** or bar joists are often used to support roofs and floors.

Get ready!

1 Before you read the passage, talk about *these questions.*

1 What type of frame is used for high-rise buildings?

2 What is one type of bolt used to connect steel frames?

Reading

2 Read the safety guidelines for steel frame construction. Then, choose the correct answers.

1 What does an erection mark do?

A indicates what kind of connection to use
B shows how a section shape fits together
C shows the strength and size of a bolt
D indicates a pitch and gauge distance

2 When should a bearing-type connection be used?

A when no preparation of the material is needed
B where the load direction varies
C when a very strong connection is needed
D where the load mainly pulls in one direction

3 Which of the following frame components is placed first?

A girders
B bearing plates
C anchor bolts
D columns

Vocabulary

3 Match the words (1-9) with the definitions (A-I).

1 __ girder
2 __ groove weld
3 __ bolting
4 __ pitch
5 __ open-web steel joist
6 __ column
7 __ gauge
8 __ fillet weld
9 __ member

A the distance between a row of bolts in a steel frame connection
B a type of welding used in steel frame construction that joins pieces of metal that are at 90 degree angles
C an individual piece of a structural frame, made of steel, timber, or concrete
D the primary horizontal piece of a steel frame
E a type of welding used in steel frame construction that does not require preparation on the material that is welded
F a lightweight truss used to support a roof or floor in steel frame construction
G the distance between the center of holes in a row of bolts in a steel frame connection
H the primary vertical piece of a steel frame
I the use of strong cylindrical metal fasteners to join pieces of a steel frame