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Metals

Outline:

- Ferrous Materials (المعادن الحديدية)
- Nonferrous Materials (المواد غير الحديدية)

المعادن Metals

Metals are widely used in building construction for both structural and nonstructural applications.

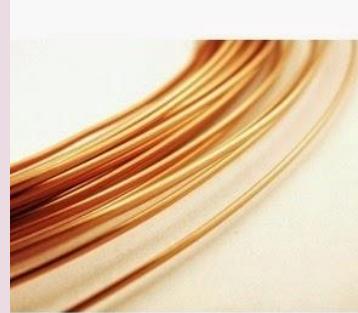
Ferrous metals, copper and its alloys, and aluminum are the most commonly used metals in building interiors.

Ferrous Materials

Iron is the principal element in ferrous metals. Iron is the earth's most common element. It is the fourth most common element in the earth's crust, and is believed to comprise about 80 percent of the earth's core.

Ferrous metals are strong in compression, tension, and shear, making them ideal for structural uses.

Iron is magnetic, a property useful for sorting metals for recycling.



Copper



Lead



Tin



Nickel



Aluminium



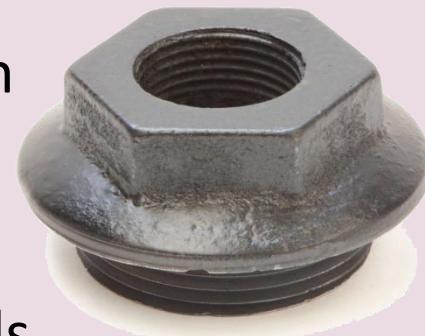
Zinc



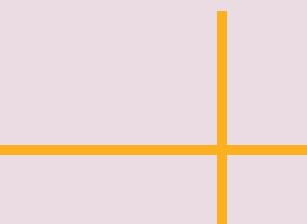
Types of Ferrous Metals

Iron is produced as **cast iron**, **wrought iron**, and **steel**.

Cast iron is strong in compression but brittle. It can be cast into ornate and complex designs, and is used for waste plumbing in buildings. Wrought iron is malleable and relatively soft. It is ductile, and is given form by hammering.



Wrought iron is iron that has been heated and then worked with tools. In fact, the term “wrought” derived from the past participle of the word “worked.



Steel comprises strong, hard, and elastic alloys of iron. It is categorized as either carbon or stainless steel.

Carbon steel is generally any unalloyed steel with limited amounts of residual carbon or other elements. The higher the carbon content, the stronger and harder the steel, and the lower its ductility and ability to be welded.

Stainless steel contains at least 12 percent chromium which produces a corrosion-resistant chromium- oxide film. It is strong and very durable.



Interior Applications for Ferrous Metals

Iron and steel are used in interiors where their strength and durability are needed.



Lightweight steel studs are used to build interior walls.



Cast iron is used for cabinet, door, window, and drapery hardware, stairs, and woodstoves.

Wrought iron is used for cabinet and door hardware and accessories, and for furniture.



Steel is used for perforated wall and ceiling panels and suspension systems.

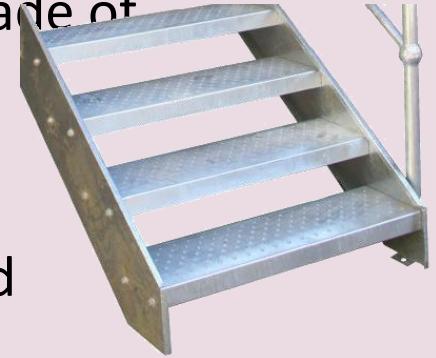


Toilet partitions, lockers, and benches are made with powder coated steel.



Stairs, platforms, walkways, and moveable partition supports are also made of steel.

Stainless steel is used for column covers, railings, and hardware. Wall and countertop surfaces and food preparation equipment are made of stainless steel. It is also used for toilet partitions, furniture, and accessories. Stainless steel fibers scattered in carpets reduce static shock.



NONFERROUS METALS

Nonferrous metals contain little or no iron. There are many nonferrous metals; included here are ones often used in building interiors.

Examples:

1. Aluminium.
2. Copper.
3. Zinc.
4. Tin.
5. Lead.
6. Silver.
7. Gold.
8. Magnesium.



Properties

Many metals are good conductors of electricity; copper wiring is used to conduct electricity in buildings.

Metals tend to be thermally conductive as well. Because most metals conduct heat rapidly, they tend to draw heat out of the body and feel cool to the touch.

Metals are often lustrous and reflective. Except for copper and gold, metals are silver or gray in color. Metals also have acoustic qualities, and they are used in many musical instruments.

Metals can absorb radiation; for example, lead is used to block x-rays.

Types of Nonferrous Metals

Aluminum, copper, bronze, and brass are the most common nonferrous metals used in building interiors.

Other metals with important interior uses include chromium, gold and silver, nickel, tin, titanium, and zinc.

الألومينيوم

Aluminum

Aluminum is the most abundant metal in the earth 's crust, but it is always found combined with other minerals.

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Aluminum is a silver-white metallic element that is ductile, malleable, soft, flexible, and easy to fabricate. Although it is lightweight, it is quite strong.

An excellent thermal and electrical conductor, aluminum resists corrosion and is nonmagnetic



Alucobond

Also commonly referred to as "Diabond" or "ACM", aluminium composite panels consist of two aluminium cover sheets and a core made of low density polyethylene





النحاس والبرونز Copper, Bronze, and Brass

Copper is a naturally occurring reddish-orange element that is readily available, easily fabricated, and generally corrosion-resistant.

Copper has high ductility, malleability, and thermal and electrical conductivity.

Copper is alloyed with zinc, tin, aluminum, nickel, and silicon to produce various bronzes and brasses. The term **bronze** covers a variety of alloys of copper. The metal most often added to copper to produce bronze is tin, although phosphorus, manganese, aluminum, or silicon may also be used.

Brass is an alloy of copper and zinc (Figure 9.20). There are many types of brass, and the hardness or softness of the material depends on the proportions of copper and zinc. It is yellow in color with a resemblance to gold.



الكروم Chromium

Chromium is a steel-gray, lustrous, and hard metal that takes a high polish .

There are two principal types of chromium.

Trivalent Cr(III) chromium is used in decorative finishes and is not generally considered to be hazardous to human health.



Hexavalent chromium or Cr(VI) is toxic, and its production is regulated; it is not used as a decorative finish.

ذهب وفضة *Gold and Silver*

Gold in pure form is relatively soft and malleable.

Gilding is the application of gold leaf or powder to a solid surface to produce a thin decorative coating.

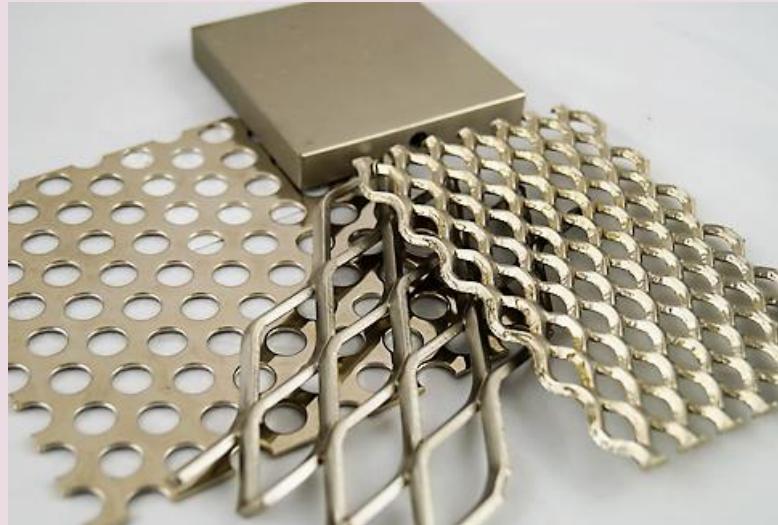
Gold and silver fibers have been used for centuries to decorate fabrics. They continue to be used in contemporary metallic textiles.



Nickel

Nickel is a hard, silvery-white metal that is malleable and ductile. It polishes well and does not tarnish.

New and recycled nickel is used in the production of stainless steel. Nickel alloys with copper, chromium, aluminum, lead, cobalt, silver, and gold. It is used as a base for chromium plating. Nickel produces a green color in glass.



Tin

It is lustrous and bluish white.

Tin takes a high polish, and is used to plate other metals as it forms an oxide film that protects it from corrosion.



Titanium التيتانيوم

Titanium was first isolated in 1791, and pure titanium was first produced in 1910. It was used in the aerospace industry in the 1950s, and is today used as a building material.

Titanium is light, strong, lustrous, and corrosion-resistant; its hard, smooth surface keeps other materials from sticking. It is as strong as steel but much less dense.

Titanium develops a very thin, conductive, oxide surface film at high temperatures and resists tarnishing at room temperatures.



Zinc زنك

Zinc is a ductile, crystalline, brittle, bluish-white metallic element. It is corrosion-resistant in air and water. A cut zinc surface tarnishes quickly to a light gray patina. It is often alloyed with small amounts of titanium and copper. Both pure and alloyed zinc can be worked by hand at room temperature.

