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## Building materials products

Around 10,000 years ago, man started to make fundamental changes in the way he lived. Slowly moving away from a nomadic lifestyle, he started staying in one place for longer periods. This was probably due to the ending of the last ice age creating more abundant resources. Man didn't have to travel as far to find food, so he stayed where food was plentiful. Over time, a more settled lifestyle brought some challenges with it. Instead of having to find caves or create makeshift shelters from animal skins for protection from the weather, man started to look for more durable materials with which to build long-lasting dwellings [source: Castleden].Over time, man has used a variety of materials, and they help to paint a picture of our ongoing quest to make long-lasting structures to meet our changing needs. The evolution of architecture meets those challenges and handles the cultural perception of what those buildings should look like and how they should be used.In the next few pages, we'll take a look at five materials that man has relied on to build homes, halls, temples and many other types of structures. All five are still used today, and knowing something about them will help us make the historic leap from mud huts and tents to skyscrapers that can shelter thousands.First up, lets take a look at the ever-versatile building material of man and termites alike: wood.As a construction material, wood has a lot going for it. It can be used as a primary material, as seen in log cabin construction or blended with other building materials and used as either a decorative element or support structure. Wood is lightweight compared to stone, and it's strong once it's been seasoned to remove moisture. It can also be cut to length easily.Wood does have some disadvantages, though. It decays eventually, and it's vulnerable to moisture damage like dry rot and predation by insects like termites. Fire is a big problem, too.Even with these vulnerabilities, wood buildings can survive a long time. Just how long may surprise you. The oldest wood building in existence is the Horyu-ji temple in Japan, which dates to the 8th century [source: CWC].In the next section, let's see how playing with mud can be a smart thing to do when you're trying to make bricks.Usually made of clay, brick has been used in many ancient structures, like the Roman aqueducts, the Pantheon and the Great Wall of China. The Sumerians made the earliest recorded bricks, and we can deduce that those early bricks used in construction were crude, uneven, sun-dried blocks probably made of silt that was deposited when high waters receded after storms [source: Britannica].The silt dried naturally to a very hard consistency, and then it was dug up, broken into chunks and used to make the walls of huts and other structures. Some experimentation led to the development of forms and molds to create uniform bricks that could be stacked easily for smooth walls with clean corners.This style of brickmaking is still being used today and is very stable in dry climates. But too much rain and the walls of your painstakingly built hut turn to mud. That's solved with the application of high heat. These bricks are durable, weather resistant, fire resistant, easy to make and convenient to work with.In the next section, let's take a look at a building material for the ages, stone.Stone is durable and impressive stuff, but it's also challenging to quarry, and heavy to move, and it has tension and stress limitations. Where there are resources available to excavate and cut it precisely, stone can be an extremely strong and useful natural material. Unlike brick, it can be stacked without mortar and support heavy vertical loads. Stone resists deforming, weathers the elements well, withstands fire and helps maintain stable interior environments. There are so many extraordinary stone structures that it seems a shame that modern construction uses stone more as decoration than anything else.Today, there are cheaper and more efficient building materials that have usurped the position of stone in modern building construction, not the least of which are decorative stone veneers. It seems humbling, but steel, wood and concrete construction with a thin layer of decorative stone on the outside is more in keeping with modern budgets and standards of construction than the impressive, towering stone edifices of historical buildings. Newer synthetic materials are even mimicking the look of stone in much lighter weight, inexpensive incarnations, eliminating the need even for veneers.Stone is still popular for its esthetic value, and it's unlikely that it will ever be completely eliminated. Stone has probably been around since the first Stone Age settlers reached for a few rocks to hold down their tent flaps, and as a decorative element in human design, it's bound to be a part of our structures for a long time.Concrete is an aggregate made up of a number of materials like stones and sand that are mixed with a binder like cement and water. The mixture is then left to dry and harden. It's a flexible material that can be formed on the spot or poured into molds, hardened and then transported.Even though it had been around for hundreds of years, it wasn't until 1860, when someone realized that concrete could be reinforced to increase its tensile strength (the amount of force or stress it could withstand), that concrete started gaining wide acceptance.Reinforced concrete can be formed into many shapes with a supporting structure of narrow steel rods embedded right in the concrete when it's poured. Rebar reinforcement makes concrete an ideal material for walls, beams, slabs, foundations, frames and many other applications. The use of metal rods and mesh, together with a relatively inexpensive concrete medium, make reinforced concrete a flexible, reliable and economical building choice.Twentieth century refinements have made reinforced concrete an even bigger player in modern building design and construction. Pre-cast concrete is made under controlled manufacturing conditions that increase its water repelling characteristics and limit its capacity to expand and contract. Pre-stressed concrete, made by placing stretched steel strands in the hardening concrete, increase reinforced concrete's tensile strength and resistance to downward pressure.Let's proceed to the next section, where we'll take a look at how steel is being used to do more than just reinforce concrete in building construction.Once man started building up instead of out, stronger building materials became necessary to support taller structures. And tall buildings place a lot of weight on load-bearing walls; some sort of support framework was needed to carry the load.We can see here that steel has a dual role in our builder's toolkit. It can be embedded in concrete to provide support or become a foundation in itself. Steel can easily be prefabricated to make for a fast and easy installation. It can be welded, bolted or riveted in place. It can be up to 100 percent recyclable, too, which is important with newer green building practices. Steel is a relatively economical commercial building choice which is making inroads in residential construction, as well.The advent of steel technology that allows man to design and build taller structures has changed the face of architecture and expanded the way we find creative solutions to our building challenges.On the next page, you'll find lots more information about building and architecture.Balogh, Anne. "What Makes Concrete a Sustainable Building Material." Undated. 3/4/09. Mary. " The History of Concrete and Cement." Undated. 3/4/09. Rodney. "Inventions That Changed the World." Chartwell Books, Inc. 2007Castleden, Rodney. "Events That Changed the World. Time Warner Books. 2005Craven, Jackie. "Viking Log Homes." Undated. 3/4/09. . "Wood's Heritage." 6/08. 3/2/09. 20Heritage/?Language=ENCWC. 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Ever since the first skyscrapers went up in Chicago during the late 1800s, steel has been a major component in commercial building construction [source: Time Rime]. Before that, builders used cast iron. But they found that structural steel beams set in concrete allowed them to frame tall buildings that were more fire resistant and more structurally sound than cast iron. Since that time, steel (an alloy made by combining iron and carbon) has not only become the best building material for commercial construction but closely tied to economic health. In fact, many experts look to the steel industry as an indicator of how well the economy is doing [source: Pamuk]. Steel has a long history in the construction industry, but is it still the best material for building?Prices for steel company stocks are dropping, so it's not surprising that there's a question as to whether steel is still an ideal material for construction projects. The steel industry was not immune to the effects of the recent economic downturn. American steel producers like Butler Manufacturing have been facing layoffs, due to a slowdown in construction projects. Steel companies are trying to weather the economic storm just like other businesses, and less construction means fewer production jobs [source: Batura].Steel is also getting more expensive because of the price of raw materials for making steel, iron and coal, are on the rise. And while steel is still popular, other construction materials are giving it a run for its money.New Building MaterialsWhile no one alternative has become a standard to replace steel, materials like engineered timber and metal composites are becoming more common in new construction projects.Timber companies tout wood as a durable, renewable resource, and engineered timber is gaining some traction as an alternative to steel. For example, the new arts and media building at Nelson Marlborough Institute of Technology in New Zealand used engineered wood in place of typical steel and concrete construction, and the company that worked on that building says that it's taking on more and more contracts that would have gone to steel construction companies [source: Nelson Mail].Composite materials like Fiber Reinforced Plastics (FRP) and alternative metal alloys are gaining popularity in commercial construction, as well. Composites can be more durable than steel, and repairing damaged composite components is often less costly and requires less heavy machinery [source: Biswas]. The big drawback with these alternative materials right now is the cost. Because FRP and other composites are relatively new, they're still costlier to produce than steel components.Residential SteelIn residential construction, steel is actually gaining popularity. In the past, builders preferred wood over steel for framing residential buildings, but its durability has some builders looking to steel as an alternative.The major drawbacks to using steel in residential construction are price and energy use. Steel is becoming more common in residential buildings, but in many areas it is still hard to find contractors to build residential homes with steel framing. A 2002 U.S. Department of Housing study built a steel home alongside a wood home to compare the costs of the two materials. The steel home cost about 14 percent more to build and required more time to complete [source: National Association of Home Builders].However, steel has a higher strength to weight ratio than wood, meaning that steel components are stronger without adding much weight. That helps make steel structures stronger than wood, which is very attractive in areas prone to tornadoes, earthquakes, and other natural disasters. Steel is also fire- and termite-resistant, making it more durable than wood. [source: Bradley]Steel's Pros and ConsThere are a couple of problems with using steel in construction. In very humid areas, coastal regions, or even in rooms like the bathroom that get very moist, steel will corrode unless builders use extra coatings of anti-corrosives to protect it [source: Living Steel]. Also, since steel conducts heat and cold well, it's not ideal from an insulation standpoint. To make a steel building energy efficient requires additional insulation.Green builders use steel in eco-friendly construction projects because of its durability and renewability. Steel is long-lasting, and combined with other eco-friendly building materials is often used for green building projects [source: MBMI Metal Building]. And unlike other recyclable materials such as plastic, steel doesn't lose quality each time it is recycled [source: Pamuk]. There's also less waste associated with steel construction compared to wood, because you can weld small "offcuts" together to do smaller jobs [source: Bradley].Despite a few drawbacks, steel is still the preferred material for framing commercial buildings and is gaining popularity for residential construction. Reclaimed wood floorboards. Photo: houzz.comFactor in Transportation It's a great idea to shop for green products. Fortunately, they're becoming easier to find. But don't forget to factor transport into the true cost of what you're buying. Every time a product has to be loaded onto a ship, truck, airplane or train to get to you, fuel is consumed and its carbon footprint gets bigger. If it has to go to Italy to be cut and polished, that stone countertop suddenly gets a lot more expensive for you and the environment even if it was quarried in the next county.Look for Local Products Reclaimed wood siding is a great idea, especially if it was taken from a barn down the road. If it had to be shipped across the continent, though, you're better off using lumber that was harvested near you. Look for the stamp of the Forest Stewardship Council to be sure it was sustainably harvested. When it comes to cabinets, doors, hardware and decorative details, never underestimate the power of your local salvage yard. Invest a little paint stripper or brass polish, and you've got an authentic piece of history that hasn't had to travel far to find a home.Revive Instead of Buying By the same token, before you junk that tattered old sofa, find out what your local upholsterer would charge to revive it. Most likely, it will cost less than buying, packaging and transporting a new one.Work with Local Services By employing services and retailers in your community, you're keeping money and jobs local and encouraging wise use of nearby natural resources.

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