Building Materials and the Environment.

A review of the main building materials throughout history, and the dangers associated with them.

Construction and the development of materials that can be used in construction have been essential to the evolution and development of humans. There is evidence that the first building materials were used as far back as 400 BC, and some of those materials are still utilised in contemporary building. Because buildings and other human-made structures have been around since pre-history, the history of the materials that are used to construct them has also been around for a very long time. Let's take a look at this quick overview of the history of building materials, and analyse what the future might have in store for us.

Construction was carried out on a very modest scale in the early stages of human history. During the Stone Age, people made use of natural shelters such as caves and other naturally occurring rock formations; however, all shelters were constructed by humans themselves. Mud and clay were the primary building materials for primitive homes in many parts of the world. In addition, readily accessible resources such as leaves, branches, straw, and animal hides or bones were incorporated into the design.

Because it is possible to harvest and shape clay and mud by hand, these two materials were ideal for use as early building materials. These materials were used to construct huts, the primary purpose of which was to offer inhabitants protection from both the elements and any potentially dangerous animals that might be present. Other constructions using these components would have the same fundamental make-up. A bridge for a stream or river might have just been as simple as being a tree or a log that had been dragged across the water.

The use of wood as a structural material became a practical possibility as technological advancement and general knowledge grew. As humans developed more effective tools for cutting wood and learned more efficient methods for working with wood, wood evolved into an extremely useful material for construction.

The Ancient Greeks constructed long-lasting and intricate buildings out of timber. Some of these buildings were temples and other places of worship. Wood was also commonly used in the construction of ancient Chinese temples. It is believed that the Nanchen Temple was constructed in the year 782 AD, making it the oldest wooden building in the world that is still standing. Due to the fact that it is readily available and easy to work with, wood has a long history of being utilised in the construction industry for the purpose of constructing temporary military buildings or barriers.

Because of its plentiful supply, wood has been widely used as a building material in North America and in some regions of Europe for many years. In many parts of the world, including the present day, timber is used to construct the framework of residential and commercial buildings.

Concrete has been a major building material for many centuries. The Romans are famously known for their use of concrete, and many of the structures that they built with it have been preserved. Due to the fact that it was produced from only rubble and water, early Roman concrete was very affordable and simple to make.

During the reign of the Romans, there was a shift away from using concrete in favour of using more permanent materials like stone, but during the Middle Ages, concrete technology continued to regress. It wasn't until the fall of the Roman Empire in 476AD that the methods

for making pozzolan cement were lost. It wasn't until the discovery in 1414 of manuscripts describing those methods that interest in building with concrete was reignited. John Smeaton's discovery in 1793 of a more contemporary method for producing hydraulic lime for cement marked a significant turning point in the development of technology. Prior to this time, technological progress had been relatively stagnant. He made use of clay-containing limestone that, after being heated to the point where it turned into clinker, was then ground into powder. He made use of this material in the historically significant rebuilding of the Eddystone Lighthouse, which is located in Cornwall, England.

Because of its low cost and high resistance to wear and tear, concrete is a multipurpose building material that is still in use today. In the year 1849, the mixture of water, cement, and aggregates that would later become reinforced concrete was first combined with steel. Since its inception, reinforced concrete has found widespread application in the construction of highways, bridges, and foundations.

Due to the troubles in developing it, steel – being derived from iron together with differing amounts of carbon – is now also a major building material. Invention, innovation, and massive-scale construction were all made possible as a direct result of the Industrial Revolution. By the nineteenth century, mass production of steel had enabled its use in a variety of applications, including beams and reinforced concrete. It was at this time that mass production of glass for buildings began.

As a result, people who had previously been unable to afford such a luxury were suddenly able to do so. At the turn of the twentieth century, a new type of building known as the high-rise was developed, and steel emerged as an essential component of these massive construction projects. In the 1850s, due to the manufacturing processes that were being developed in Britain by Sir Henry Bessemer, it became possible, at least in theory, to produce enough steel of adequate quality to make it an economically viable material to use in the construction of buildings.

This was made possible by the introduction of the blast furnace. However, despite the relatively early development of Bessemer steel, iron, in both its wrought and cast forms, was the material of choice in the construction industry until the very late 19th century. The first significant application of steel dates back to the 1880s, when it was used for the mightiest engineering projects of their time, which were the enormous bridges that were used for road and rail projects. This was the beginning of steel's widespread use.

In 1905, Georges Chedanne designed an office building for Le Parisien Libéré in the rue Reamur neighbourhood of Paris. In this building, the steel frame is expressed with the plastic qualities of rolled steel sections that are utilised in a striking manner to achieve an organic, Art Nouveau flowing line with a steel frame of minimal section permitting large areas of glazing. Georges Chedanne's building is considered to be one of the most significant examples of this style.

The Ritz Hotel in Piccadilly, London, was not built until 1904, and it is widely considered to be Britain's first fully load-bearing steel-frame structure. The building was designed by architects Mewes and Davis, and it was constructed by Swedish-American engineer Sven Bylander. In the United States, the beam-to-stanchion connections are made using rivets. This method required the installation of small furnaces at the construction site so that hot rivets could be hammered into drilled holes in the frame. In contrast, the method used in other countries utilises welding.

The soft rivets were able to completely fill the holes into which they were hammered, and as they cooled and contracted, they pulled the frame together, which was a significant benefit of this system. The riveting of beam-to-stanchion connections in steel-frame construction was

made illegal by the London Building Act of 1894; however, the fact that the frame of the Ritz Hotel was clad by a loadbearing masonry skin provided the sort of solidity and fire protection that was demanded by the more cautious building inspectors. The next of Britain's steel-framed structures presented a more significant challenge to the Buildings Acts, which resulted in the need for amendments to the original legislation. Steel is, without a doubt, still utilised in the building industry today. Because of its high strength as well as its adaptability, it is highly sought after. Additionally, it does not catch fire easily and can be recycled, making it an attractive option.

All of these materials still find extensive use in everyday building projects, but materials for this sector are always being further developed. The home construction industry is being reshaped not only by the proliferation of computer-enabled smart appliances, lighting, and security systems, but also by the development of modern building materials. There are currently a lot of different kinds of materials being developed that will continue to revolutionise the building industry.

Solar panels are one of these options. Solar panels have gained in popularity as a result of their improved efficiency and falling prices. By the end of May 2019, more than two million solar systems had been set up in the United States alone, with many more being set up elsewhere around the world. They reduce the amount of money spent on energy and come with other benefits as well, such as the opportunity to sell power back to the grid and tax breaks at the state and federal levels. Numerous technologically advanced materials are now raising the possibility of changes that have never been seen before in human history. The following are examples of developments from the future:

- Self-healing concrete: When exposed to water, bacteria in the mixture produce calcite, which can effectively heal cracks. This helps reduce the amount of maintenance and greenhouse gases that are associated with the processes of repairing and replacing damaged concrete.
- Concrete that generates light has tiny glass balls embedded throughout it. These balls reflect light and can be used to create warning signs, signage, and even lighting for underground tunnels. It cannot catch fire and has potential applications in the arts as well.
- 3D Graphene is a form of carbon that can be printed using a 3D printer. It is 200 times stronger than steel despite having only 5% of the density of steel, and it may find applications in automobiles and extremely tall skyscrapers.
- Laminated timber is a type of prefabricated timber that is water-resistant, has a high strength, and is strong enough to be used in the construction of skyscrapers, all while significantly reducing the amount of carbon emissions produced.
- Bamboo can be fashioned into a variety of different forms, and it grows quickly while also having a low cost. Modular bamboo. It is resistant to earthquakes and can have steel bars added to it to make it even stronger.
- Aluminium that is transparent is a ceramic alloy that is resistant to corrosion and can also resist radiation and oxidation. This material has the potential to be used for domes and windows in marine and space vehicles.
- Wood that is translucent retains a high level of strength even after being bleached, and it also has good insulating properties. It is possible that it could serve as a viable replacement for window glass and that it could be used to make cells for solar panels.
- Wool bricks. This material is fused with wool and seaweed polymer, and it is stronger than conventional brick. Additionally, it reduces greenhouse gas emissions. Additionally, it is resistant to the entry of cold air.

These materials, along with others, have the potential to make buildings considerably more robust, secure, and energy-efficient than in the past. Not only do building materials continue to evolve, but they also continue to take on new forms.

However, history has also seen a number of building materials that, while initially regarded almost as wonder materials, have become regarded as either unsafe to use for a number of reasons, or are now declared to be completely unsafe to use and are actually hazardous to health. Historical materials that fall into this category include:

- Lead paint. Before it was first prohibited in 1978, lead paint was used in residential and commercial buildings for decades before it was finally phased out. Before the true toxicity of the metal was fully understood, it was common practise to include lead in house paint as an additive in order to make it more durable and improve its appearance. Alarmingly, lead-based paint can impede the growth of young children, cause damage to the central nervous system, and slow down development. Unfortunately, the product tastes sweet, which encourages children to put lead paint products in their mouths. Lead-based paint can also cause children to develop at a slower rate. Even though the use of lead paint has been prohibited in the UK for decades, some older homes may still have rooms that have been painted with the substance.
- Lead piping. In addition to its application as a component in paint, lead has long been the material of choice for the construction of residential and commercial plumbing systems. This use of lead dates back hundreds of years. Since the same body of knowledge that led to the demise of lead-based paint in the 1970s also prevented the material from being used to make pipes, lead-based plumbing is no longer used in newly constructed homes or commercial establishments. However, lead piping is still present in a significant number of older buildings, which is something that must be taken into consideration whenever building surveys or dilapidations surveys are carried out in the United Kingdom.
- Pressed wood panelling. During the 1970s, pressed wood panelling was extremely popular in commercial offices and even in many homes, but thankfully, the material has since fallen out of fashion and can no longer be found in either setting. In addition to having an awfully dated appearance, many pressed wood products are made with urea-formaldehyde resin, which is a highly toxic substance that has been linked to a variety of respiratory issues and possibly even cancer. Formaldehyde exposure is a concern associated with modern pressed wood products, which is why these products are subject to stringent regulations.
- Fibreglass insulation. The man-made product fibreglass insulation was initially introduced as a replacement for asbestos because it boasted many of the same attributes that made the naturally occurring insulator so popular in the first place. Asbestos was banned in the United States in the late 1970s. Insulation made of fibreglass, on the other hand, is not without its detractors. There are those who believe that the minute fibres can contribute to significant health problems in humans, particularly in locations where it is likely to be disturbed frequently. In spite of the fact that numerous healthcare organisations have deemed the product safe for use in homes and commercial properties, there are those who hold the belief that the product can be used. Because of its potential to cause irritation, extreme caution is required whenever it is installed or removed from its location.

But when considering hazardous building materials, there are few that are as high profile – or as dangerous – as asbestos sheeting and filler. Asbestos is a naturally occurring mineral group that is formed from microscopic fibres. It was first discovered in the 19th century, and it gained popularity in the United Kingdom during the 1950s due to the various applications that erroneously revealed it to be a miracle building material.

However, many years later, health issues with respiratory systems and cancers were linked to buildings and products made with asbestos. It was also discovered that the tiny fibres could

be breathed in when disturbed, causing potentially fatal illness over a prolonged period of time. This information was discovered many years later. Since its inception, the so-called "miracle material," which was used because of its low cost and high strength, has been the source of countless problems. In 1999, the government of the United Kingdom made its use illegal and has been attempting to eradicate it entirely by promoting the discovery of the material and urgently removing it ever since.

According to the Health and Safety Executive (HSE), there are currently more than 5,000 deaths that occur annually due to health problems that are directly caused by or related to asbestos. This number is twice as high as the number of deaths that occur due to road accidents. In addition, as if detecting asbestos wasn't already difficult enough due to the minute size of its fibres, the symptoms of asbestos exposure frequently don't become apparent until 30, 40, or even 60 years after coming into contact with it.

This is as if asbestos weren't already dangerous enough. Workers who were only on a short contract may find it much harder to relate these diagnosed symptoms to a point in their past, which may lead to issues with proper diagnosis and treatment. Long-term construction workers may find it easy to relate these diagnosed symptoms to a point in their past.

Workers who were only on a short contract may find it much harder. Crocidolite (blue), which is the form of asbestos that is considered to be the most dangerous variety, is responsible for one out of every five cases of lung cancer among asbestos miners identified as being the cancer group mesothelioma. In addition to this, the HSE estimates that more than fifty percent of homes in the UK still contain asbestos. Before beginning any kind of construction work, it is of the utmost importance to look for potential sources of asbestos.

It cannot be emphasised enough how dangerous asbestos is to mammalian life, and the deadly outcomes of the disease known as asbestosis, which still claims a significant amount of lives every year. Exposure to asbestos is the root cause of the debilitating lung disease known as asbestosis. Exposure to asbestos-containing materials on construction sites, ships, and in industrial facilities has been linked to the development of asbestosis in a significant number of patients. One of the many lung diseases known as interstitial lung diseases, asbestosis is characterised by inflammation and scarring in the lungs.

The development of scar tissue within the lungs, also known as pulmonary fibrosis, can be caused by the inhalation of asbestos fibres. Pneumoconiosis, also known as occupational lung disease, is the name given to this condition when it is caused by breathing in dust from substances such as asbestos. When scar tissue develops around the microscopic air sacs, also known as alveoli, in the lungs, it gradually makes it more difficult for the alveoli to expand and become filled with fresh air.

A dry cough and difficulty breathing, accompanied by crackling sounds, are among the first symptoms of asbestosis. Scarring causes the tissue in the lungs to become rigid, which can result in symptoms such as coughing, discomfort, and crackling sounds when asbestosis is present. This leads to a decrease in the amount of oxygen that is delivered to the blood, which in turn causes shortness of breath. Because the body gets its energy from oxygen, having trouble breathing on a consistent basis can cause you to become exhausted and lose weight. In advanced stages, patients may experience clubbing of the fingers and toes in addition to pulmonary hypertension.

Pulmonary hypertension is a distinct condition from high blood pressure or systemic hypertension, both of which are much more common conditions. The development of scar tissue can result in the constriction of arteries, which makes it more difficult for the heart to pump blood out of the body and into the lungs, which in turn requires an increase in blood pressure. Pulmonary hypertension is a risky condition because it makes the heart work harder

than it normally would, which can increase the risk of coronary artery disease and congestive heart failure. Although asbestosis does not have a known cure, treatment can help alleviate symptoms and slow the progression of the disease.

Because of the inherent danger with the potential for the onset of asbestosis by breathing in even a small amount of dust, the handling of asbestos is, quite rightly a huge concern for the construction industry and for bodies such as the Health and Safety Executive (HSE), who have a number of stringent rules and regulations regarding its removal. Asbestos is no longer used in the construction industry but it is still frequently found during renovations, rebuilds and demolition sites. When it is found, work in the area in question is usually completely stopped while a licensed contractor is bought in to ensure that all traces of the material are removed and it is transported off site in the safest way.

The removal of asbestos is a huge industry that requires highly skilled operators and usually follows a very well defines series of steps, which will include:

- Licensed professionals involved. These are able to evaluate the scope and severity of the abatement project, which is an important step in the appropriate planning of the project. This is of utmost importance to the local officials who are in charge of issuing permits for the various types of asbestos removal projects.
- Preparation of the work Area. In order to prevent contamination from spreading beyond the confines of the work area, it must first be enclosed in plastic sheeting and then subjected to a negative air pressure environment using special equipment. Plastic sheeting needs to be used to cover up any surfaces that do not require abating. It is required to put up warning signs in order to make others aware that an asbestos project is currently being worked on.
- The wearing Personal Protection Equipment (PPE). In order to prevent asbestos exposure, workers are required to wear protective clothing and either an N-100 or P-100 respirator at all times.
- Condition the area of work. It is imperative that all heating, ventilation, and air conditioning (HVAC) systems be turned off in order to stop the spread of asbestos fibres. Workers should control dust by cleaning asbestos off of immovable objects with wet wipes or a HEPA vacuum. After the abatement has been completed, the area is vacuumed using a specialist HEPA vacuum to remove any remaining debris.
- Safe removal of asbestos materials. Asbestos-containing materials are wetted before any removal efforts are made; this step comes first in the proper management and disposal of asbestos waste. When working with contaminated materials, workers are required to protect themselves by donning a respirator and other personal safety gear. Wetting the waste containing asbestos that was generated during the project is required before it is double-bagged in plastic bags with a thickness of 6 millimetres, placed inside a plastic container that is airtight, has a lid, and is properly labelled. It is only possible to dispose of it in particular landfills that are set aside specifically for the disposal of asbestos waste.
- Development of a safe storage area. The creation of decontamination units requires the installation of enclosure systems for decontamination, which will enable workers to remove contaminated clothing, footwear, and tools from their possession.
- Following decontamination procedures fully. In order to remove contaminated protective clothing and equipment in a secure manner, professionals are required to follow a set of specific steps. These procedures protect workers from potential dangers and keep them from bringing asbestos into their homes.

However, despite these stringent procedures being in place, many professional asbestos removal companies are still reticent to deal with these incredibly harmful materials since, despite having such stringent procedures in place is invariably expensive, and because

asbestosis can be cause by even the smallest amounts of the uncontained material, there may still remain a risk. Many companies find this unacceptable and an increasing number of clean-up companies are refusing to deal with asbestos on site.