

Since all parts of a structure are either in tension or in compression, or both, the materials used to build structures must, first of all, be strong in tension or in compression, or in both. Reinforced concrete is a very good and inexpensive material because it uses a large amount of cheap concrete and a small amount of expensive steel. cement and water fills the space between the grains. Stone, brick and concrete are good materials to build columns and arches with, but they are not well suited for beams as some part of a beam is always in tension. Steel is very strong at normal temperatures, but if a fire develops in a steel- framed building, the columns and beams, even if covered with fire- insulating materials, may get hot, and if their temperature rises above 700°F. Heavily loaded beams of concrete show vertical cracks near the bottom because the tension there pulls the concrete apart. The Romans, who were great road and bridge builders, built their arch bridges of stone, and the Egyptians built their pyramids out of stone. Steel bars are added to the concrete and they prevent cracks in the concrete beam from happening or opening wider if they do occur. Concrete is a man-made material, a mixture of water, sand, small stones, and a gray powder called cement, that hardens to full strength in four weeks.