TECHNOLOGY

High-Strength Steels

From television towers to experimental roads, high-strength steels, made by adding such elements as vanadium, zirconium or columbium, are finding increasing uses.

➤ A SPECTACULAR candelabra television tower soars 730 feet into the Baltimore sky, designed to withstand winds of 165 miles an hour. Surmounted by a huge triangular platform 105 feet long on each side, the television tower requires enormous strength to keep it aloft. Yet, it is supported by legs that are 50% smaller than engineers would have dreamed possible only a few years ago.

In Pittsburgh, the International Business Machines Corporation is completing a unique 13-story office building, its floors supported by exterior fairylike walls of a slim interlacing diamond-shaped grid instead of conventional beam and column construction. Two hundred tons of steel will be saved by this slender framework.

Paint Never Needed

Chicago's tallest structure now a-building, the 631-foot high Civic Center, is supported by slender, widely spaced steel columns. Many of these columns are on the outside walls of the building and even though exposed to the elements, they will never need paint.

Across the Carquinez Strait, north of San Francisco, the new 4,884-foot long Benicia-Martinez Bridge was constructed with $500,000 less steel than would have been necessary a few years ago.

The uncommon common denominator that has made the savings possible in each of these four widely different construction projects is high-strength steel. It is one of the steel industry's newest and most potent salesmen, not only in the construction industry, but also in a kaleidoscope of other industries producing such products as hot water tanks and snow shovels.

As much as two to three times stronger than steels conventionally used in construction, high-strength steels of many kinds are inspiring revolutionary new design concepts. They are also producing a wide range of savings in weight and construction costs.

Acceptance in Business

Equally important, high-strength steel has now become another one of the more useful tools with which a market-oriented steel industry is expanding its business with old customers, and at the same time attracting new ones. High-strength steel personifies the industry's strong spirit of aggressive competition through new, versatile steels.

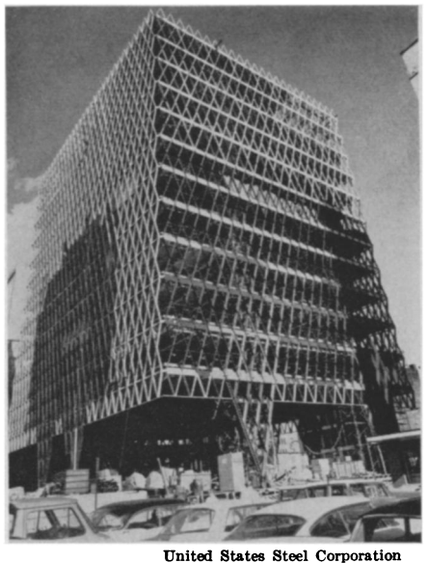
Some of the low alloy, high-strength steels have been known for some time. What's new is the mushrooming acceptance of these radically stronger steels, which are made by adding fractional amounts of such elements as vanadium, columbium or zirconium. A little goes a long way and produces a wide variety of attractive qualities, of which mere strength is but one.

Greater strength means that less steel can do a bigger job than ever before. Although high-strength steel costs more than ordinary carbon steel, the total cost of the high-strength steel required for a structure is usually less.

Other savings are equally important. In construction, less steel requires less erection time, smaller foundations, less field labor as well as less shop fabrication time. And there are savings in transportation and related costs.

For example, the use of high-strength steel in the Chicago Civic Center required fewer vertical supporting columns as well as less other building materials to cover such columns. The exterior columns were sandblasted and permitted to acquire a decorative russet brown color, and because of an inherent resistance to progressive corrosion, need never be painted. The same general kind of high-strength steel was selected by General Electric for the towers of its extra high voltage project line at Pittsfield, Mass.

Where painting is desirable, the superior corrosion resisting characteristics of most high-strength structural steels provide unusually good paint adhesion and the paint lasts longer.



United States Steel Corporation

PATTERNS IN STEEL — Modern steels of varying levels of strength are here combined in these load-bearing truss walls to provide new steel patterns in the new International Business Machines Corporation building at the Golden Triangle in Pittsburgh.

There are many kinds of high-strength steels, each with different tensile strengths and other properties such as resistance to corrosion, abrasion, fatigue and denting. Their varied use is illustrated in IBM's new Pittsburgh office building which was constructed of five different steels. Three different kinds were used in the Benicia-Martinez Bridge. In both structures, the strongest steels were confined to sections under greatest load, with each kind carefully selected for a precise stress.

Along with high-strength structural members, construction people also have the advantage of high-strength bolts. Two of them take the place of three carbon steel bolts or rivets.

Advantages in Construction

Some of the advantages of high-strength steel can also be used by prestressing steel structural members so they may carry greater loads or span longer distances. Ordinary carbon steel also can be prestressed. An example of this is the roof of the celebrated Pan American Terminal at Idlewild Airport in New York. This cantilevered roof is composed of a number of carbon steel "spokes" radiating from a central core. The spokes receive their unusual strength by being suspended under tension by prestressed high-strength steel cable.

Another use of high-strength steels is in structural members built up of steels of different strengths, utilizing the stronger ones in those positions having greatest strength requirements, less strong ones in less critical positions.

These structural members are called hybrid beams and often offer additional economies.

High-strength steel also is available in reinforcing bars which have added to the strength and height to which reinforced concrete structures may be erected. The two 60-story Marina City buildings in Chicago, the tallest reinforced concrete structures ever built, are constructed with high-strength steel reinforcing bars.

The huge bases of the 630-foot-high St. Louis steel Gateway Arch, designed by the late Eero Saarinen, are made stronger by high-strength reinforcing bars.

Motorists Also Profit

Motorists, too, profit by high-strength reinforcing bars. In 14 states, experimental roads have been constructed of continuous strips of concrete reinforced with high-strength steel bars. This new kind of construction eliminates the need for expansion joints and takes the "thumps" out of driving. It also provides longer road life with lower maintenance.

Another automotive use of high-strength steel is in auto bumpers, making them stronger, thinner and lighter than conven-

tional bumpers. Entire heavy-duty trucks can be made of high-strength steel.

Even New York's famous subway will soon share the benefits of high-strength steel. Recently this line purchased 236 subway cars, each containing about 16,000 pounds of high-strength steel—presumably to hold more harried rush hour crowds without bursting.

High-strength steels provide many substantial benefits, including weight reduction, to a miscellany of products. Shells for water heaters and water softeners made of high-strength steel are 30% lighter. This cuts the overall weight by about 15% and reduces shipping costs.

Cargo containers made of high-strength steel weigh appreciably less, thus allowing shipment of added cargo. The weight of liquefied petroleum containers has been reduced from 100 to 65 pounds, thereby reducing shipping costs and making it possible to handle empties without the use of hoists, a previous added cost.

Few new product developments of the steel industry have been as far-reaching and have brought as many benefits as low-alloy high-strength steels. Steel men say that, for the most part, manufacturers of steel products have not yet awakened to the full possibilities inherent in high-strength steel.

They foresee its widespread use in a host of applications now using other materials—for steel, they know, is still the most versatile and economical material available. Through use of new high-strength steels, present and future, they see the world of the future, like today's world, built out of steel.

• Science News Letter, 84:46 July 20, 1963

ARCHAEOLOGY

4,000-Year-Old House Excavated in Peru

➤ A 4,000-YEAR-OLD house, virtually intact, although made of perishable materials, has been excavated at a site on the Peruvian coast.

Christopher B. Donnan, a University of California, Los Angeles, archaeologist who is working at the site, said the semisubterranean house was in an excellent state of preservation.

Beams, thatch covering and bindings were preserved in the same position as they had been left 4,000 years ago.

The structure has been sectioned and transported to the University of La Molina museum in Lima, Peru, where it will be reconstructed.

The site being excavated is located about 70 miles south of Lima. Designated as the Chilca site, it has been declared a national monument.

Latest inhabitants of the location, who lived there around 700 A.D., appear to have had a rather advanced civilization. They had cotton textiles, adobe architecture, domesticated plants and animals and ceramics.

Eleven tombs at various levels in the site have been excavated. Radiocarbon dating of the various levels has established a relatively accurate chronology of the habitation levels.

• Science News Letter, 84:47 July 20, 1963

PSYCHOLOGY

Eight- to Ten-Year-Olds Most Highly Imaginative

➤ MOST IMAGINATIVE of all children are the eight- to ten-year-olds.

These youngsters can act out typical hypnotic experiences even when they are not actually hypnotized.

They responded to experimental suggestions that their arms were getting heavy, their bodies immobilized or their hands interlocked better than children of other age groups.

Generally, children were more suggestible than adults.

Drs. Theodore Xenophon Barber of the Medfield Foundation and David Smith Calverley of the Medfield State Hospital, Mass., reported their research on 724 students aged six to 22 in the Journal of Abnormal and Social Psychology, 66:589, 1963.

• Science News Letter, 84:47 July 20, 1963

Do You Know?

Sensitivity to glare becomes increasingly greater with age, and facing oncoming headlights becomes increasingly painful.

As many as 18 different varieties of *milk* can be produced by cows.

There were 54,652 new active cases of *tuberculosis* reported in 1962 compared with 53,726 in 1961.

Carbon, universally burned as a fuel on earth, may turn out to be an important structural material in space.

Massive accumulations of *detergent* foam are blighting public highways as well as public waters.

• Science News Letter, 84:47 July 20, 1963