

Anchorage Sand and Gravel Co. Successfully Introduces Prestressed Concrete To Alaska

The old adage of "there's nothing new under the sun" doesn't apply now nor has it for the past 10 years if you are speaking of the concrete industry in Alaska as well as in the other 49 states.

By experimentation other than a "follow your nose" idea, the industry has developed "pre-tensioning" and "post-tensioning" into what has become known throughout the world as prestressed concrete, not just slabs of reinforced concrete, but huge spans, posts, pillars, walls and countless other forms in both flat and curved design.

Brought on by the industry itself as an answer to the shortage of structural steel, plus the desire to develop a competitively priced product, it was first patented more or less as a "theory" early in the 19th century. However, little development was actually done until the early 1930's.

In Alaska the first firm to start prestressing was the "Prestressed Concrete, Inc." a division of Anchorage Sand & Gravel Co. whose pits were already supplying the basic ingredients.

Basically, the process of this pre-tensioning or post-tensioning (both methods are used) depending on when the reinforcement of the concrete is done, is placing long lengths of high strength stress-relieved wires or strands into a form and then pouring concrete over and around them. The concrete is allowed to harden and then the wires or strands are released from the tension. As the wires contract naturally after their release, they transmit compressive stresses to the concrete by bond. This is pre-tensioning.

In post-tensioning, the form is poured with spaces positioned in the form for the tensioning wires or strands to be passed through after the concrete has hardened. Once the wires have been added, the space around is filled with grout and a mechanical anchor is relied upon to hold the tension expressed and a bond is not essential.

Prestressed concrete is proving its versatility in deck construction, bridges, dams and retaining walls, tiebacks, pavements, poles, piling and in repairing existing structures. It is used in new construction where longer spans, shallower depths, and rapid erection mean greater economy and less dead load plus greater live load carrying capacity is desired.

For example, 50 to 100 foot spans of

prestressed concrete are commonplace nowadays with the longest span currently being 295 feet in length in a bridge in Cuba. It must be noted that on the drawing boards, however, is a 1,312 foot bridge span that can become a reality next year.

Probably, if you've been traveling much, you've seen such impressive structures as San Francisco's Barrett-Lick garage, the famous Sunshine Skyway crossing over lower Tampa Bay in Florida, Pier 57 at the Port of New York, the Garrison Dam Spillway Bridge, the 24-mile long bridge over Lake Pontchartrain in Louisiana and three new piers in Hoboken, New Jersey. If you are in the construction business you might have wondered as to the method of construction—well—each of these relied almost entirely on prestressed concrete.

Further, depth of beams and girders can be greatly reduced as the thickness of the slab is cut considerably allowing more head room in buildings of multiple stories. As an added afterthought, two, three or more stories can be added at any time with the roof of a one-story building easily becoming the floor of the added story.

Safety, always uppermost in the minds of architects and engineers as well as contractors and building owners, is an outstanding feature of prestressed concrete. Bending movement stresses in prestressed concrete due to live and dead loads are extremely small. Actual practice shows the first tensile crack usually appears at dead load 1.125 greater design than a live load. Should these tensile cracks appear on an overload, they will close when the load passes or is removed, whereas steel, once it is bent, never comes back into place. Brittleness and sudden failure, such as is found in structural steel, are very remote in prestressed concrete.

Economically, and everyone likes to save money, figures are most impressive in the use of prestressed concrete over other materials. Actual figures on record show savings up to 50 per cent of the concrete and 75 per cent of the steel over old-design reinforced structures. Also to be considered is the fact that no forms are necessary on the site.