CONSTRUCTION OF STANDPIPES

The Engineering News discussed in a recent number the construction of standpipes for water storage. The views and criticisms it advanced are radical, and they will call forth counter argument. On account of the importance of the subject, the Engineering News article is republished :

The long series of accidents to steel standpipes used for water storage has led many engineers to abandon this type of structure and use in its place a tank resting on a high tower.

We illustrate and describe in this issue a reinforced concrete standpipe, which may, we believe, bring back the standpipe into favor with engineers. The advantages of the concrete standpipe over the steel standpipe are many, and several of them are enumerated in the article, but there is one particular advantage which we have nowhere seen stated, and which is worth special consideration, and that is the much smaller formation of ice in a concrete standpipe. As our readers know, ice in a steel standpipe has been a most prolific cause of accidents. In cold climates it is certain to form, and its presence is a constant source of anxiety and danger. In a concrete standpipe, however, the water is protected from loss of heat by a wall of concrete 8 to 18 inches thick instead of by a thin plate of steel.

As the heat conductivity of concrete is probably not a twentieth as much as the conductivity of steel, the loss of heat to the air from a concrete standpipe of probably 20 times the average thickness of the steel should be hardly the four-hundredth part of the rate of loss from a steel standpipe. Of course the actual rate of loss from the steel standpipe is influenced also by the transmission from the water to the metal and from the metal to the air; but as a practical fact we should expect little or no ice to form inside a concrete standpipe well covered and with an ample flow of the water in and out. Not only is this of importance on account of the standpipe itself, but on account of preserving the water in the standpipe from being unduly chilled in regions where deep frosts occur, and frozen mains and service pipes are troubles to be guarded against.

The detailed account of the construction of the Attleboro standpipe makes clear that successful structures of this type can be erected ; but that their erection demands competent engineering design, intelligent work by the contractor, and first-rate inspection from start to finish. A head of 100 feet of water is to be treated with due respect, as many builders of steel standpipes have found. One batch of concrete in which the cement or the mortar is a little shy, due to oversight of the men at the mixer, may make a lot of trouble when it is put under water pressure. The case is not at all dissimilar to that of a reinforced concrete building, except that even greater vigilance is needed, as every square inch of exposed surface will be tested by searching pressure.

The experience of Attleboro, however, shows that this work can be done and success can be attained. At a cost less than that of a steel standpipe, a reinforced concrete standpipe can be built which will outlast a dozen steel pipes, which will be far safer from accident, and which may be made an ornament to the landscape instead of an ugly blot.

OTHER SIDE OF THE ARGUMENT.

The indictment against steel standpipes is too severe, perhaps—at least, that is the way it will strike many persons. A letter to Insurance Engineering presents the other side of the argument :

The Engineering News speaks of a long series of accidents to steel standpipes. Never has one failed, for whatsoever cause—ice, wind or gravity—unless the unit stresses due to load of water were more than 17,000 lbs. to the unit inch of material on the efficiency of the joints ; and the failures where stresses were below 25,000 lbs. to the unit inch of the material have been few. There are any number of structures standing in this country where the stresses on the material per unit inch are over 25,000 lbs. at this time, and they have been in service for many years. Furthermore, the conclusion is irresistible that the failures have been directly traceable to faulty design—without bothering to investigate material or workmanship.

The Engineering News draws conclusions from one example at Attleboro of concrete used with metal to make a standpipe :

(1) The cost is less ;

(2) Will outlast a dozen steel pipes ;

(3) Safer from accident.

(4) Ornament to the landscape.

(1) This is not worth while answering, as no one will believe it or give it a moment's consideration. The same metal is required in either case, with the same unit stresses assumed.

(2) Will outlast a dozen steel pipes! A very moderate suggestion being 100 years of life for a steel pipe, (as many have been in use over 30 years and show no waste), 1,200 years must be conceeded to the concrete structure!

(3) Safer from accident. The Attleboro standpipe is 100 feet high by 50 feet in diameter. It has 88/100 of an inch of metal to take up the unit tension at its base per inch high ; that is, the stress on the rods is 14,712 lbs. per square inch. This for the entire section of the rod, on the assumption of the connection either by the clamps or by the concrete, gets 100 per cent. efficiency. It is asserted that it would have taken 95 per cent. more in plate metal for a metal standpipe to have withstood this stress.

In the Engineering News of October 26, 1905, is described a a water tank for a gas holder, 195 feet in diameter and 39¼ feet high. It contains about six times the volume of water and its unit stress at the bottom is 53 per cent. greater than it is in the Attleboro tank. The stress on the gross material at the bottom of this tank is 12,200 lbs. to the inch, on the net material 13,290 lbs. to the inch. If the Attleboro standpipe had been built with plates for the same stress they would have been exactly 1 inch thick at the base. In making the comparisons with the concrete structure it was asserted 75 per cent. more strength of material at the base was necessary than for a metal standpipe.

As to the atmosphere, through which this subject was approached, 88 units of metal, as used in the Attleboro work, are doing the work that it, was asserted, 175 would have to be used for a steel standpipe.

The descriptive article of the Attleboro shows that two years and three months elapsed from the time the contract was let until the work was accepted of the contractor. The illustrations indicate a great washing of the surface by water and the article clearly indicates the difficulty in preventing leakage. That the parties responsible for this work had their nerve with them is apparent. That they succeeded as well as they have is greatly to their credit. That they have built an especially safe structure has yet to be proved.

Owing to the amount of exploiting this particular work has had in the press, other communities have attempted to pattern after it, but have been unable to get tenders for the same class of work at prices that would justify the building and have been most grievously disappointed. One instance came to our notice where a letting was postponed three times, in the hope of getting a tender from the parties who constructed this particular work ; but that hope was abandoned and a standpipe 80 feet high and 50 feet in diameter is now being built. It is to be covered with a concrete case, and this brings us to—

(4) The ornament to the land-