

designed for 300 pounds live load per square foot on a safety factor of four would, in the case of timber and steel, if tested to four times the specified loading, be deflecting to a very large extent; whereas the concrete work designed under exactly the same conditions will be able to carry its load without any deflection whatever. No doubt the reason for this is that no advantage is taken by the designer of the arching and trussing effect of concrete construction, and as we have no reliable data or tests on the load carrying capacity of these factors, it is proper to ignore this additional safety factor. But on the other hand the writer feels that it is not justice to concrete construction in its competition with wood and steel to first have a safety factor due to over-specifying of the live load, which is often done, then to design with the ordinary safety factor of four and then to have in addition the safety factors due to the arching action, truss action and neglect of the tensile strength of the concrete. The writer personally knows of case after case of concrete floors designed in the ordinary manner, which have been tested to eight times the load for which they were designed without damage. Again, specifications a great many times are written in a sort of a half-hearted description of the style of reinforcement which is to be used. By this I mean that the exact idea of the architect and engineer is not expressed clearly. Either a certain definite type of reinforcement should be specified, or the specifications should be left open to any kind of reinforcement with the stipulation that plans and specifications must be submitted. The specifications for reinforced concrete should recognize the fact that work in structural concrete is too large a part of the whole building to be subordinated to all the other building trades, as is so often done. If a structure is to be built of concrete, then the other trades should be grouped around and specified to depend upon the concrete and the contractors along the lines of these other trades should be called upon to consult with the structural concrete contractor with the idea of adapting their work to his. There is a very good reason for requiring this specification, in that as concrete is but comparatively a new line the other trades are not familiar with the proper methods of handling their work under the new conditions; whereas, with the old idea of building they were entirely familiar, due to years of experience. Much damage, extra cost and delay can be caused by failure to recognize this fact. The specifications for structural concrete should also specify that where construction in concrete is to be carried on through cold weather, resulting in slower progress, that if it is necessary to begin the construction during the cold period, of which we have only three months, then that all other lines of work such as excavation, preparation of foundations, preparation of cut stone, mill work, interior fittings, etc., be completed as far as possible during such time and possibly anticipating its need in the building; since, if this is done, when the cold weather has passed by the reinforced concrete and the balance of work can proceed simultaneously, resulting in a rapid completion of the structure, as concrete is particularly desirable where it is desired to complete each part of the structure as construction proceeds.

Responsibility for Success or Failure.

The writer considers that the foregoing is only a preface to what is the real subject of this paper. It seems to the writer that too little attention is paid to the subject of responsibility for work done in structural concrete.

In the foregoing we have considered the doing of work by contract and stress has been laid upon the importance and necessity of an experienced organization. The question of responsibility is a very important one and it is with reference to this particular idea that the writer desires your closest attention.

Who is responsible for the construction of a good structure and who is responsible for a failure? The writer has given much thought along this line and while ordinarily the credit or blame is placed upon the architect, engineer and the contractor who secured the contract; he is of the opinion that this is wrong. Most propositions are awarded to the low bidder, regardless of his responsibility and experience, provide

he is able to furnish a bond, on the theory that if he should make a failure of the job the bonding company with its millions of assets must step in and complete the work to the satisfaction of the architect and engineer, and the owner upon the signing of the contract and securing of the bond tosses same into a pigeon hole of his desk and says: "There, now, that is settled."

In the first place, granting that we have an efficient design, I believe the financial worth of all of the contractors bidding on the work should be considered and the contract awarded to the lowest responsible bidder and not necessarily to the lowest bidder. I say financial worth of the contractor because I believe that his financial worth does not necessarily mean all dollars, but rather includes the value of his character, ability, education, experience and broad-mindedness. Few specifications demand these attributes and it is not practical to so specify them.

In the first place I take it all will agree that any person or firm choosing any profession, occupation or vocation in our business and social life and publicly announcing such purpose assumes more of a personal responsibility than simply the earning or accumulation of a personal selfish income or competency. It is necessary that some one shall be in a position to fulfil the needs of the community along the lines of each and every want, need, or desire of mankind, and having selected a certain line, he is under a moral obligation to his neighbors to so fit himself and so prepare the business he has selected as to be always in a position to furnish the particular want when called upon. While it is granted that the selfish end of personal advancement or gain is perfectly legitimate and laudable, still the further moral obligation to his fellows to give his best knowledge, advice and protection on any question pertaining to his own line is demanded, for, otherwise, he is acting short of honest purpose.

Competition generally controls and fixes prices, but it is presumed that all those competing know their business. The ignorant, inexperienced man may advertise a certain line, but he must employ the skilled and experienced assistant to execute, or otherwise he is a danger to the community. When in need, the one needing has a right to expect his neighbor who is a doctor, lawyer, grocer, coal man, or contractor to not only be properly prepared to fill his need, but to tell him the truth regarding same and all the truth.

Now with especial reference to our subject, the owner of the prospective building is not supposed to possess anything more than a general idea of the art of building.

He calls upon his architects or engineer to plan for him and specify for him how his structure is to be built, in order to carry out his ideas. He expects, and rightly, that the architect or engineer is so informed that the resulting structure will be fully up to modern standards. He also expects him to so design as to comply with all municipal regulations provided to protect the public.

He expects his own public officers to so fulfil their pledges and duties of office that any and all proper regulations will be published and enforced.

He expects his legal adviser to examine his title to the building site, to satisfy him of the legal right to build a structure of the kind contemplated in the manner planned, and to draw up a contract which will secure for him a structure for the stipulated price and protecting him against improper construction and unreliability and dishonesty on the part of the builder.

He expects the architect's or engineer's inspector on the structure to be honest and to know what is the correct interpretation of the plans and specifications.

He expects the builder to be experienced in the class of construction he proposes and expects him to be interested and of the intention to give him a dollar of construction value for the dollar of money expended.

He expects the bonding company and liability insurance company to protect him against loss should the builder prove to be unreliable.

The owner having apparently taken care of all points, feels protected, but is he in the full sense of the word? His