will not maintain satisfactory standards, as it is to secure and retain those who will and can advance such standards. The superannuated, whose efficiency is reduced on account of age and not through fault of their own, should be retired under a system which will adequately recognize their past services. Others should be transferred, demoted or dismissed as the equities of the individual case and the best interests of the service require. No one should be held on the rolls who cannot and will not render a service commensurate with the compensation received.

There is much more in the question than the welfare of individuals. The interests of the engineering profession and the integrity of the public service are involved. These services represent operations of enormous magnitude, involving hundreds of millions of annual expenditure in engineering construction alone. To attempt to execute this work with an incompetent, dissatisfied and constantly shifting personnel, because such a personnel can be secured at a merely nominal compensation, is inexcusable folly. No plan more wasteful of public funds could be devised; and yet no mere statement of this fact, not even the general acceptance of its accuracy by the engineering profession, is sufficient to effect a remedy. The organized co-operative effort of the entire profession, coupled with a definite policy of public enlightenment is necessary. The engineering societies must act not only in behalf of the individuals in their membership and in support of the standing of the profession, but also as advocates of adequate standards of performance in both public and private work. The most difficult field in which to reach a solution is the public service, for in this field final action rests with legislative bodies, and legislative bodies are moved primarily by political considerations. Not until the public at large has recognized the situation and demanded a cure, can we expect that congress or state legislatures or municipal councils will pay heed. The situation demands organization, publicity and action.

INSULATION OF CONCRETE WALLS*

By Noland D. Mitchell
Structural Engineer, Supervising Architect's Office, U.S. Treasury Department

SINCE the dawn of civilization man has made buildings to protect family and chattels from the weather and depredation. With succeeding ages or civilizations, better and better protection has been afforded. Can we continue this progress? In view of the many improvements that are being made in all our arts we can readily imagine great forward strides in building in the near future. Certainly, some forward movement is needed when the loss by fire is now approximately $300,000,000 in money and hundreds of lives each year. And incidental to this fire-cost must be added the upkeep cost of our large standing army of insurance and fire protection forces. The fire fighter comes after the fire starts, to limit it to as small space as possible, and the insurance man comes later to distribute a part of the loss money to the more fortunate. Let us, in making our improvements, not overlook this monstrous thing now exacting such heavy tolls of our energy and resources.

Another phase of the situation is the growing scarcity of fuels. We have been, and are still, very prodigal of them. Now is the time to consider in an economic way what we can do to conserve our supply. If we can make houses that do not require so much fuel for heating we should at least investigate the possibilities.

One cannot deny that our better constructed wooden houses have been comfortable and, except against fire, have afforded reasonable protection for a comparatively short time at a low first cost. While our lumber resources are by no means exhausted, it is becoming more and more uneconomical to build wooden houses. In making the change from the wooden house to types of more permanent construction, we must select some kind that will provide as much or more comfort for the occupants.

The unfortunate thing that we realize at once is that our common fire resisting materials of construction have a high rate of heat conductivity as compared with the more combustible kinds. The cold walls resulting from the use of these has had no small influence in retarding the change from the wooden house. This being the case, is it not time to make some effort at the solution of the problem?

The maintenance of an even temperature in a house resolves itself into provision of adequate heating apparatus and a construction that will satisfactorily prevent rapid dissipation of heat through floors, walls and ceilings. It is just another phase of the problem that refrigerating engineers have found to be of such importance in their work —namely, insulation.

Are Present Methods Satisfactory?

There is plenty of evidence that many builders realize the necessity of insulation against heat transference, but we are not so sure that an altogether satisfactory solution has been found. If the various improvements in cellular blocks, walls and the like that are being brought out are any criterion, then we can say not.

Let us look briefly into what has been done and the results. Wood furring with lath and plaster on the inside was probably the first effort to avoid penetration of dampness and the condensation of moisture on the inside of the wall. The result, as far as insulating against the heat loss through an 8-in. wall, was an improvement of approximately 15%. Where the wall block absorbed dampness from the weather, the result was not so good, for in general any porous material in moist or damp condition transmits heat much more readily.

The hollow block was another development in the right direction. The total result was probably not so very different from the wood furring except that it provided no lodgement for vermin and no runway for fire. The chances for dampness showing on the plaster were much higher, however, and there is no doubt that passage of dampness through the withes of hollow blocks is responsible for a large part of the long fight that advocates of concrete house construction have had to make to keep in the business.

Other builders, realizing that dampness cannot travel by capillary action across a space bridged only by thin metal ties, adopted that system and at the same time realized an improvement of about 20% over the 8-in. solid plastered wall. Hollow monolithic walls give about the same or perhaps a little better protection. The matter of detail of construction of the hollow wall is apparently more troublesome, yet with some builders they are still favorites.

Use of Cinder Concrete

A system not so much in vogue has been the building of a solid wall of lean cinder concrete, facing it with stucco on the exterior and plastering the inner face; or, where the temperatures justify it, furring has been applied.

Another use of cinder concrete has been in making furring blocks to face the inside of the walls. I have not been able to find any data on the relative merit of these. One recent system imbeds the porous block in the centre of a monolithic wall so that the inner shell may serve as the supporting wall for floors and ceilings and thereby not break the continuity of the insulating course.

Other developments, such as multiple cell blocks with offset withes, various forms of opening to allow freer circulation, etc., have been improvements in both insulating value and saving of materials.

A very popular building block is one made solid, with projections on the rear face to bond with like projections on the blocks laid up to form the opposite face of the wall. This gives a good bond and is a simple arrangement, easily

*Read at the National Conference on Concrete House Construction, February 17th-19th, 1920, Chicago, Ill.