Coefficient of Expansion of Brick.

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Inasmuch as brick is used extensively as a building material in different ways and in different types of construction, and also beacuse it is used to a large extent as a paving material, a knowledge of its physical properties is of value. With a view to increasing this knowledge a series of experiments were made at Purdue University to determine the coefficient of expansion of different grades of brick. It is the purpose of this paper to give the results of these experiments.*

The method used to determine the coefficient was to subject a bar of steel whose coefficient of expansion was known, and the specimen of brick, to identical changes of temperature. The difference of expansion was measured by the principal of the optical lever. This difference reduced to unit length and unit temperature gave a correction to apply to the coefficient of the metal bar.

The apparatus used for these experiments was designed by Professor W. D. Pence, former Professor of Civil Engineering at Purdue University, and used by him to determine the coefficient of expansion of concrete. It consists of, first, the specimen to be tested; second, the bar of steel of known coefficient; third, a heating apparatus, consisting of a double-walled steam jacket through which the mirror of the optical lever could be seen; fourth, a rod in the opposite side of the room, whose image, reflected in the mirror, was read by means of an engineer's level. The thermometer is hung inside the heater and is read through the glass door by the aid of an incandescent lamp suspended alongside of it. The lamp is turned on only for an instant in order not to affect the reading of the thermometer. Both the level and the steam jacket were mounted upon a concrete foundation. The arrangement of the apparatus and the method of conducting the experiment will be easily understood from the figure.

*The experiments were conducted, under the writer's direction, by W. J. Burton and C. W. Wilson (1902-1903), and by G. W. Case and G. C. Curtiss (1904-1905), as thesis work in the School of Civil Engineering, Purdue University.

Three qualities of brick were used. First, a good quality of No. 1 paving brick; second, a medium quality of No. 2 paving brick; third, a soft quality of ordinary building brick. The brick were approximately 2"x4"x8" in dimension and were cemented together in order to obtain the specimen of desired length.

Following is the mean value obtained for each of the above qualities of brick:

No. 1 brick (hard) Coefficient of Expansion per degree F = .00000401.

No. 2 brick (medium), Coefficient of Expansion per degree F = .00000401.

No. 3 brick (soft), Coefficient of Expansion per degree F = .00000393.

It will be noted that the hardness of the brick has little to do with the amount of expansion, the three qualities giving essentially the same values.