Form 259
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UNITED STATES DEPARTMENT OF COMMERCE

WASHINGTON

National Bureau of Standards

REPORT

Report of Destruction of Perlite-Gypsum Concrete Roof Deck,
Wentile Air Force Base, Dayton, Ohio.

A telegram of June 23, 1944 (Reference [illegible]) signed Lieut. Colonel [illegible], Chief of Engineers, District Engineer, Louisville District, requested a field examination and advice by National Bureau of Standards representative relative to the extent of crack sealing required to sustain two-hour fire rating of a poured in place perlite-gypsum concrete roof deck at Wentile A. F. B., Dayton, Ohio. The examination requested was begun at 1 P.M. on June 28 with Mr. A. V. Covington, Area Engineer, Mr. C. E. Burton, Resident Engineer, Messrs. F. Tiber, R. Freeman, and W. A. Nelson from the U.S.A. Louisville District present. A lift truck with suitable platform controls and ladder was available and a detailed examination of nine roof panels was made from the platform provided. Specimens of the perlite-gypsum concrete were taken from two of the panels which were showing signs of disintegration.

It was evident from the materials observed that an excessively wet mix of gypsum and expanded perlite aggregate had been deposited in the forms for the deck slab. The proportions of the mix were nonuniform. In some places segregation of gypsum from the mix was shown by a layer of gypsum with little aggregate, while above this layer was a region with relatively large proportions of perlite with increased distance from the bottom of the deck slab. There was also evidence that in some places the mixing operation had not been properly done as shown by nodules of gypsum without perlite.

About 35 panels were reported to be badly cracked and had been marked with markers for attention. Many others had other records of cracking. Without making a detailed survey, it was estimated that about 80 to 90 panels would need some repair. About six of the panels seem unsound to be in need of major repair on account of the badly cracked condition and poor quality of the gypsum concrete.

The panels which have few cracks and the gypsum concrete of which is of reasonably good quality can be repaired by making a 1½-in. deep dovetailed groove along the crack and filling the groove with gypsum plaster. Cracks less than 1/16-in. wide do not require grooving and filling. The panels which have signs of disintegration of the gypsum concrete require more extensive repair than the grooving and filling of the cracks.

Inasmuch as many of the older cracks are either below or alongside of the tee iron subpurlins it is recommended that the grooving of the crack should be deep enough to expose some of the wire fabric coating which encases the bottom flanges of the tee iron. This would permit the plaster filling the crack to engage the wire coating in a manner to support the fireproofing of the subpurlin.

A method for the repair of panels which show signs of disintegration is suggested by the sketch herewith. Holes would be drilled into the slabs from below at 16 in. centers so as to expose main strands of the wire fabric reinforcement. No. 18 gage galvanized tie wires would be doubled and looped over the strands of the reinforcement, or in lieu of ties No. 12 gage wire hooks. Two-by two-in. mesh wire fabric would be tied to the soffit of the damaged slabs and furred down at least 1/8 inch to provide for embedment of the wire fabric in plaster. Three fourths inch thick sanded gypsum plaster applied to the bottom of the deck slab, when so reinforced by wire fabric, will be sufficient to support the weak perlite gypsum concrete and provide cover to the tee irons to give two-hour rating for the assembly. The plaster mix should be 1 part gypsum cement extra fibered to 2½ parts by weight of clean sharp sand. The scratch coat should be applied as thick as will adhere. The second coat should be applied as soon as it will stay in place, preferably before the scratch coat has set and given a sand float finish.

It is suggested that the perlite-gypsum concrete of the roof deck be dried until it contain not to exceed 10 percent by weight of free water before repairs are begun. The drying might be expedited by the use of artificial heat and mechanical air circulation. Precautions must be taken to prevent the temperature at automatic sprinklers exceeding 110°F at any time and should not exceed 100°F for any extended number of days. If blasts of warm air from heating equipment are to be directed toward sprinklers the ratings of such sprinklers should be intermediate (212°F) or hard (286°F).

N. D. M.

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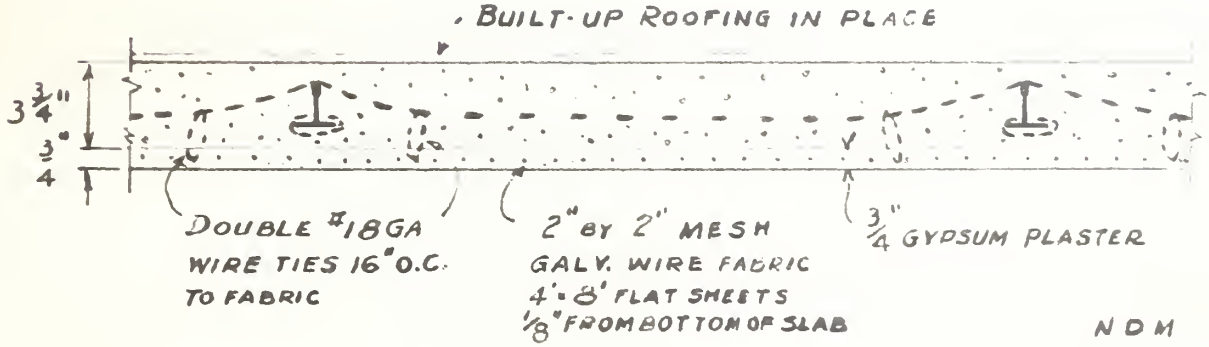

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SUGGESTED METHOD FOR REPAIR OF ROOF SLAB
GENTILE AIR FORCE BASE