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SURFACE TREATMENT FOR CORROSION PROTECTION  
OF STEEL MEMBERS FOR LOW-COST HOUSING CONSTRUCTIONI. - General

A general outline of the objectives, procedure and scope of the research program on building materials has been given in Letter Circular 500. The present circular describes that part of the general program dealing with the surface treatment of steel for corrosion prevention particularly as related to structural units for housing construction. The use of sheet steel, as in wall panel construction, and as structural members fabricated from sheet in housing construction serves to emphasize the need for study of the problem of the protection of steel against the corrosive conditions peculiar to such structures.

The necessity of adequate protection for steel that is to be exposed to the atmosphere need not be emphasized. A great deal of work has been done on the atmospheric corrosion of steel and much valuable information is available concerning the various methods of protection against this type of corrosion.

It is not so generally appreciated, however, that the interior of walls and other inaccessible places in buildings may be subjected to severe corrosive conditions as a result of the condensation of moisture from the atmosphere. Recent tests at this Bureau have demonstrated the severity of this type of corrosion on unprotected sheet steel and served to emphasize the need for surface protection. This is especially true for inaccessible locations such as the enclosed areas within the walls. The need for adequate initial surface protection in such locations is evident since renewal after installation is not practicable.

II. - Scope

It is proposed to limit the study of the surface treatment of steel for corrosion prevention largely to painted structures. The purpose of the investigation is to obtain, from various available sources, such information relative to the painting of sheet steel as appears to be of value to those interested in the construction, financing, or maintenance of low-cost steel houses. Particular attention will, therefore, be paid to the following items:-

1. The extent of the use of sheet steel, as such or as structural units fabricated from sheet, in low-cost houses.
2. Methods of fabrication and installation of structural units together with their possible effects on subsequent corrosion, including the effects of different materials in contact, and the effect of damage to paint or priming coats applied in the shop by subsequent operations such as welding, or other methods of assembly.
3. The tendency for corrosive conditions to obtain in service, particularly the conditions that favor corrosion by condensed moisture.
4. Methods of preliminary surface treatment and painting in general use for prefabricated steel units and related structures, with particular reference to the initial protection of enclosed areas.
5. Cost of painting as compared to total cost of house including initial cost and upkeep.
6. Data on the durability of painted steel structures under various conditions of service including type and locations of failures where available.

### III. - Methods

It is proposed to make use of the following sources of information:-

1. Contact, by correspondence or travel, with the manufacturers of prefabricated units, with the builders of low-cost houses, and with the various Federal Agencies interested in the building or financing of low-cost houses. It is hoped that valuable information on special problems such as adequate protection against corrosion by condensed moisture may be obtained from the manufacturers and users of refrigerators and air conditioning equipment.
2. Review of the published results of investigations on corrosion such as those of the American Society for Testing Materials and the Iron and Steel Institute (Great Britain).
3. Inspection of prefabricated houses or related structures such as manufacturing plants, steamships, and steel railway coaches and freight cars. Such structures are subjected to somewhat similar corrosive conditions and have been in use for longer periods.
4. Atmospheric exposure tests, particularly of damaged paint films, and tests in which specimens are exposed to the surface condensation of moisture but not to sun and rain.

b. laboratory study: The relative merits of different surface treatment and priming methods prior to painting will be studied by established laboratory methods for testing paints. Study will be made of the protection afforded by various primers in damaged areas where the bare steel has been exposed. The factors affecting the adherence of paint to steel, including the effect of a galvanized surface, are to receive special attention. Study will be made of the factors affecting corrosion by condensed moisture by means of accelerated laboratory corrosion tests in which conditions that may obtain in service will be simulated as closely as possible. For instance, specimens with paint coatings intact or intentionally damaged will be exposed to corrosion by surface condensation of moisture in a relatively pure atmosphere and in an atmosphere polluted with sulphur dioxide. The accelerating effect of accumulations of dust or dirt on corrosion by condensed moisture will also be studied.

#### IV. - Cooperation with Industry

Interested industrial groups are invited to cooperate in the program by exchanging information on the problems connected with the corrosion and protection of sheet steel used in building construction. Offers of manufacturers to submit specimens of recommended material to be included in the laboratory tests will receive careful consideration.

