

PROTECTION FOR STEEL STRUCTURAL MEMBERS AND REINFORCEMENT

1. GENERAL

1.01 This section outlines desirable procedures for protecting steel structural members and reinforcement in buildings of fire resistive construction against the effects of fire and corrosion.

1.02 The following suggestions are in general based on the Building Code recommended by the National Board of Fire Underwriters. Where, however, corresponding requirements of local or state codes conflict with or are more severe than those covered herein, the legislated regulations should, of course, prevail.

1.03 It is recommended that dial central office buildings and toll buildings be of fire resistive construction. For the purpose of this recommendation, a fire resistive building is defined as a building with all exterior, bearing and interior fire walls of masonry or reinforced concrete, with all floors and roof of reinforced concrete and having a structural frame of reinforced concrete or of structural steel which is encased in concrete or masonry for protection against the effects of heat. Except for community dial offices, office buildings, and garages, construction utilizing steel decking, open truss steel joists, open web joists and similar methods, even though protected with expanded metal lath and plaster or non-flammable board, etc., is not considered to be fire resistive within the meaning and intent of this recommendation.

1.04 This section is revised and reissued to define and recommend fire resistive construction for dial central office buildings and toll buildings. Arrows are used to indicate changes in the text.

2. PROTECTION

2.01 Experience indicates there are definite advantages in covering structural steel members and reinforcement with stone concrete. As compared with coverings of brick, hollow tile, cinder blocks and similar materials, stone concrete provides equal protection against fire with considerably less thickness. Also, there is evi-

dence that stone concrete is preferable to other coverings including cinder concrete for protection against corrosion. The use of the various lightweight aggregates such as those composed of pumice, expanded mica, volcanic glass, slag, burned clay, etc., in concrete is not recommended for the fireproofing of structural members which are a part of or which are adjacent to exterior walls because of the importance of the protection of such structural members against the possible penetration of moisture. It is desirable, of course, to prevent rusting of wall columns, spandrel beams and girders as far as practicable by constructing the walls solidly to minimize moisture penetration as described in Section H32.334 of Bell System Practices. Structural steel members which are not concrete covered or solidly pargeted in exterior walls, particularly where hollow tile is incorporated in the wall structure, have in certain instances corroded even to the extent of building up sufficient rust to crack the enclosing masonry. Continued rusting could, of course, weaken the steel. There is evidence that paint alone will not provide adequate protection. It is important that concrete for protection completely encases the steel, also that it be free from voids and thoroughly set before laying up the surrounding masonry. The effectiveness of pargeting is usually dependent upon careful workmanship and vigilant supervision. Also the thickness of this type of covering on the inner faces of steel members must be increased to at least 2 inches for protection against fire unless other covering is provided. Consideration of these factors indicates advantages for stone concrete casing.

2.02 Where reinforced cinder concrete has been used for floor and roof slabs, the steel reinforcement sometimes develops rust and corrosion, particularly if subject to moisture conditions such as may occur in roof slabs. This action evidently results from the porous nature of the concrete as well as from the corrosive action of some cinders, at least when wet. Corrosion is not prevalent, however, where stone concrete is used.

2.03 The placing and agitating of concrete so that it will be free from voids is covered in Section H32.378 of Bell System Practices.

2.04 The recommended thickness of stone concrete for protecting structural steel members is not less than 2 inches, and coarse aggregate for such concrete is preferably trap rock, limestone or calcareous gravel. Where it is necessary that granite or silicious gravel aggregate be used, the concrete thickness should be increased to at least 3 inches.

2.05 All concrete protection should be secured in position with heavy steel wire or rods firmly attached to the structural members.

2.06 It is important to avoid embedding pipes, etc., in the concrete protection of structural members. Pipes, conduits, sleeves or cable hole sheathing should not be placed where they encroach within the required thickness of protection. Requisite chases are sometimes provided in the concrete covering of "H" section columns on the sides opposite the web, to receive conduits. It is desirable that pipes, etc., which are located adjacent to protected structural members be so arranged that in warping or bending

under excessive heat they can not displace the concrete protection.

### 3. TREATMENT OF RUSTED STEEL IN EXISTING STRUCTURES

3.01 Where, during routine inspections, rusting of structural steel members in exterior walls is indicated, for example, by a crack in the masonry parallel and adjacent to a structural member; it is important that the condition be investigated and corrected as soon as practicable, particularly if the crack continues to widen. This would include the removal of sufficient masonry to expose and clean the steel involved and to reinforce it if necessary. The steelwork affected is then painted and pargeted and the enclosing masonry solidly replaced. If these procedures are not followed the rust build-up can continue and may seriously impair the strength of the steel. Such investigations and repairs are, of course, executed during seasonal periods not subject to freezing temperatures.