

## ABSTRACT

The connection is the most important aspect of steel structure for two principal reasons. The type of connection determines the frame's response performance to loading. Also failure of a connection is frequently sudden and thus more likely to be catastrophic than that of a member.

For these reasons, and in view of the rapidly increasing use of structural steel for building frames in Trinidad, the writer has been prompted to investigate the research and standards to date on the performance of connections.

This report is written for a 'typical' building using steel members for both vertical and lateral load resistance. The frame is three dimensional, members being mainly horizontal and vertical, with its connections resisting vertical loads in the form of shears and/or moments. Lateral loads are resisted by the horizontal and vertical members as moments. However, if bracing is used, the lateral load is resisted as an axial force. This report concentrates on the moment/shear connections.

The investigations proceed along the following lines:-

### 1. STRUCTURAL STEEL FASTENERS

The fasteners systems used in Trinidad are bolting and welding. In view of the higher stresses to which modern buildings are designed, the performance of these systems becomes increasingly critical. The performance of bolts in particular have been intensively researched to improve knowledge on their behaviour

under combined tension and shear. This report reviews currently available standards and the way in which recent research would serve to amend or verify them.

2. STEEL TO STEEL CONNECTIONS

The accepted general classifications for such connections are simple, semi-rigid, and continuous. This report reviews these classifications and the criterion for categorizing in any one of them. It then reviews current research and standards leading to the design of a number of connections of each category.

3. STEEL TO CONCRETE CONNECTIONS

Concrete is the universal material for floors in building, and the combining of the floors and beams to obtain a composite beam is now a standard practice, both because of the savings in steelwork and improved lateral rigidity by so doing. Of vital importance is the connection system which makes such beams possible. The present design standards for such beams will be reviewed, with particular regard to their connectors. The present practice of using permanent steel decking and its effect on the beam will also be investigated.

Foundations too are always made from concrete and so connection between the column and foundation is a standard part of design. It also presents many challenges, especially from the practical viewpoint and it is these practical aspects which be the main focus of the review.

4. CONNECTIONS AND FRAME PERFORMANCE

In many ways, the performance of a frame under load is a direct reflection of its connection behaviour. In fact, the general categories of steel frames are the same as those for bolts, i.e., simple, semi-rigid and continuous. The predicted performance of the frame under each category is investigated, with particular regard to the practical problems posed for each type.