

# Preface

This manual sets out the requirements for the design of steel composite and non-composite members and connections to resist the effects of fire and specifies the means of attaining the required fire resistance levels.

The design requirements are simple to use and will ensure uniform assessment of fire-protection systems while facilitating the design and checking of fire-protection systems.

The manual is based on a report prepared by Melbourne Research Laboratories of BHP—Report No. MRL/PS69/87/003.

AISC

GUIDELINES FOR ASSESSMENT  
OF FIRE RESISTANCE OF  
STRUCTURAL STEEL MEMBERS

## ABSTRACT:

This report sets out the requirements for the design of steel composite and non-composite members and connections to resist the effects of fire and specifies the means of attaining the required fire-resistance levels.

The requirements are consistent with those being proposed for the Steel Structures Code but have been extended to cover composite members. A commentary is also included and provides background and examples to the requirements.

**REFERENCE:** Bennetts, I. D., Proe, D. J. and Thomas, I. R., "Guidelines for Assessment of Fire Resistance of Structural Steel Members", Australian Institute of Steel Construction, September 1987.

**KEYWORDS:** Fire-resistance, steel members, composite members, fire-protection, design requirements.

# Contents

|                                                                                  | <i>Page No.</i> |
|----------------------------------------------------------------------------------|-----------------|
| 1. SCOPE                                                                         | 1               |
| 2. DEFINITIONS                                                                   | 1               |
| 3. METHODS OF ASSESSING PERIOD<br>OF STRUCTURAL ADEQUACY                         | 1               |
| 3.1 Methods                                                                      | 1               |
| 3.2 General Principles                                                           | 1               |
| 4. INTERPOLATION OF THERMAL<br>PERFORMANCE FROM A SERIES OF TESTS                | 1               |
| 4.1 General                                                                      | 1               |
| 4.2 Interpolation Method                                                         | 1               |
| 5. CALCULATION OF TEMPERATURE<br>CONDITIONS FOR STRUCTURAL ADEQUACY              | 2               |
| 5.1 General                                                                      | 2               |
| 5.2 Loads                                                                        | 2               |
| 5.3 Calculation of Strength Under Fire<br>Conditions                             | 2               |
| 6. MEMBERS WITH WEB PENETRATIONS                                                 | 3               |
| 7. CONNECTIONS                                                                   | 3               |
| COMMENTARY                                                                       | 3               |
| C.1 Scope                                                                        | 3               |
| C.2 Definitions                                                                  | 4               |
| C.3 Methods of Assessing Period of<br>Structural Adequacy                        | 4               |
| C.3.1 Methods                                                                    | 4               |
| C.3.2 General Principles                                                         | 6               |
| C.4 Interpolation of Thermal Performance<br>From A Series of Tests               | 6               |
| C.4.1 General                                                                    | 6               |
| C.4.2 Interpolation Method                                                       | 6               |
| C.5 Calculation of Temperature Conditions<br>For Structural Adequacy             | 6               |
| REFERENCES                                                                       | 8               |
| APPENDIX 1 Worked Examples                                                       | 9               |
| 2 Use of Simplified Formula for<br>Obtaining Critical Temperature<br>for Beams   | 12              |
| 3 Use of Simplified Formula for<br>Obtaining Critical Temperature<br>for Columns | 14              |
| 4 Behaviour of Composite Beams<br>in Fire                                        | 14              |
| 5 Influence of Concrete Properties<br>on Beam Temperatures                       | 17              |

ISBN 0 909945 45 4

While every effort has been made and all reasonable care taken to ensure the accuracy of the material contained herein the Authors, Editors and Publishers of this Publication shall not be held to be liable or responsible in any way whatsoever and expressly disclaim any liability or responsibility for any loss or damage costs or expenses howsoever incurred by any person whether the purchaser of this work or otherwise including but without in any way limiting any loss or damage costs or expenses incurred as a result of or in connection with the reliance whether whole or partial by any person as aforesaid upon any part of the contents of this publication.

Should expert assistance be required, the services of a competent professional person should be sought.