Part 3
DESIGN CRITERIA

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3.1 General

This part of the document sets out the general design assumptions and design criteria used to develop the span tables. Full details of specific design actions and design parameters for each structural member type are presented with the tables.

3.2 Permanent Actions

The following permanent actions have been used to develop the tables throughout this publication.

Descriptions	Distributed Action (kPa)
Timber flooring and ceiling	0.5
Allowance for non-loadbearing walls	0.5
Floor joists	0.3

The permanent action for timber flooring and ceiling also includes an allowance for lightweight floor covering such as carpet, and does not include the self-weight of the member being designed. However the self-weight of the member is included in the calculation of the span tables. No allowance has been made for roof permanent actions.

3.3 Imposed Actions

3.3.1 Design Actions

The following imposed actions have been used to develop the tables throughout this publication. These imposed actions are taken from Tables 3.1 and 3.2 in AS/NZS 1170.1. No allowance has been made for roof imposed actions. The floors in this publication are designed for floor actions only.

Location	Uniformly Distributed Action (kPa)	Concentrated Action (kN)	Line Action (kN/m)
Office floors	3.0	2.7	1.5
Storage floors (storage height 2.1 m)	5.0	7.0	1.5
Storage floors (storage height 3.0 m)	7.2	7.0	1.5

Notes: 1. The storage floor distributed action is based on 2.4 kPa for each metre of storage height.
2. The line action only applies along the edge of a cantilevered floor.

Partial loading has been considered for alternate spans of continuous beams where appropriate, in accordance with Clause 3.3 of AS/NZS 1170.1.

Note: Imposed actions specific to construction are not considered.

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3.3.2 Reduction of Uniformly Distributed Imposed Actions

Clause 3.4.2 of AS/NZS 1170.1 allows a reduction factor to be applied to uniformly distributed imposed actions on floors based on the area supported by the structural element. This reduction factor has not been applied in this publication.

3.3.3 Load Redistribution Factor

Appendix C of AS 3623 gives methods for calculating load redistribution factors for concentrated actions which may be applied to beams in a grid system. In this publication, redistribution of concentrated actions is used for floor joists only.

The concentrated imposed actions applied to floor joists are multiplied by the load redistribution factor k_s which is calculated in accordance with Appendix C (a) of AS 3623. For floor joists the "crossing" member is considered as a continuous sheet of flooring.

For office floors, the following flooring properties have been used to develop the span tables:

E_c = 3000 MPa (particle board)

The second moment of area of the flooring (I_c) is calculated for a width equal to the span of the floor joist and a particle board thickness of 22 mm.

For storage floors, the following flooring properties have been used to develop the span tables:

E_c = 10500 MPa (F11 plywood)

The second moment of area of the flooring (I_c) is calculated for a width equal to the span of the floor joist and a plywood thickness of 21 mm.

While in many cases flooring with higher rigidities may be used with LSB floor joists, thereby providing greater redistribution of the concentrated action, these properties have been chosen as a more conservative approach for the production of the span tables.

3.4 Other Actions

The span tables presented in this publication apply only to the actions specified in Sections 3.2 and 3.3. If a floor is subject to specific actions larger than those specified in this publication, then the span tables are invalid and the floor must be designed for the larger actions by a professional structural engineer.

The span tables are not applicable to floors subject to wind and earthquake actions. Neither has any account been taken of impact forces from vehicles on the columns.

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3.5 Stability

The span tables provide member sizes for vertical gravity actions only. It is assumed that the floor and column configuration are such that there are no destabilising effects caused by large floor cantilevers or the like, and that the floor has adequate lateral bracing.

However, Clause 6.2.2 of AS/NZS 1170.0 has a requirement for all structures to have a minimum lateral resistance equivalent to 0.025 ($G + \psi_c Q$) applied at floor level. Clause 6.2.3 of AS/NZS 1170.0 has a minimum requirement for all connections to be capable of transmitting 0.05 ($G + \psi_c Q$).

where ψ_c = combination factor
= 0.4 (office floors)
= 0.6 (storage floors)

If the floor is not provided with adequate lateral restraint via connection to the main building structure or by some other means, then diagonal bracing or bracing walls are required to provide lateral stability and robustness. Such bracing is outside the scope of this publication.

3.6 Strength Design

The design of the LSB members for the strength limit state is in accordance with the combinations of actions given in Clause 4.2.2 of AS/NZS 1170.0. The combinations considered for the development of the span tables are:

$1.35G$ (permanent action)

$1.2G + 1.5Q$ (permanent and imposed action)

More detailed combinations of actions for each member type are provided with the span tables.

3.7 Serviceability Design

3.7.1 Deflection

The combinations of actions considered for the development of the span tables for the serviceability limit state are as follows:

$G + \psi_s Q$ (permanent + imposed actions)

where ψ_s = short term factor

Details of the deflection limits used for each member type are given with the span tables.

3.7.2 Dynamic Requirements for Floors

Floor joists in office floors are designed to have a lowest natural frequency greater than 8 Hz. This frequency is calculated for a uniformly distributed imposed action of 0.3 kPa.

An allowance for the response of the floor to dynamic actions is also made for floor joists in office floors. This is achieved by limiting the floor deflection to a maximum of 2 mm under the application of a static concentrated action of 1.0 kN anywhere on the beam.

The dynamic response of storage floors is not considered to be warranted for this type of floor activity.

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3.8 Durability

LiteSteel beam AZ+ sections are supplied with 55% Aluminium-Zinc alloy protective coating that provides significantly greater protection against atmospheric corrosion than galvanised coatings of the same coating mass.

For use in severe environments, additional corrosion protection is required in accordance with Table 3.4.4.2 of the Building Code of Australia (ABCB 2005).

3.9 Fire protection

Generally no fire protection is required for the steel support structure of office and storage floors, but this requirement is dependent on the building classification, construction type, floor area and building volume as determined by the Building Code of Australia (ABCB 2005).

If steel components require fire protection, further details can be found in the BCA (ABCB 2005), and a professional engineer should be consulted for advice in this area.

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