**Table 37 Modification factors for $M/bd^2$ for stairs**

| Steel stress N/mm$^2$ | $M/bd^2$ | | | | | |
|---|---|---|---|---|---|---|
| | 0.50 | 0.75 | 1.00 | 1.50 | 2.00 | 3.00 |
| ($f_y$ = 250) 156 | 2.00 | 2.00 | 1.96 | 1.66 | 1.47 | 1.24 |
| ($f_y$ = 460) 288 | 1.68 | 1.50 | 1.38 | 1.21 | 1.09 | 0.95 |

Notes to Tables 36 and 37
1. For spans in excess of 10m, the above ratios should be multiplied by 10/(span in metres).
2. $M$ in Table 37 is the design ultimate moment at midspan or for a cantilever at the support.
3. Where the stair flight occupies at least 60% of the span the permissible span/depth ratio may be increased by 15%.

### 4.7.6 Section design

The design of the landing slabs and flights should be carried out in accordance with the methods described in clause 4.2.5.

The overall depth of the flights should be taken as the minimum waist thickness measured perpendicular to the soffit of the stair flight.

There is normally no need to calculate shear stresses in staircases supported on beams or walls. For stair landings, or beam strips supporting stair flights, the shear around columns should be checked in a similar manner to the shear around columns in solid flat slab construction.

## 4.8 Design of non-suspended ground floor slabs

Non-suspended ground slabs are generally designed on an empirical basis. Successful design requires attention to practical details. Thermal and moisture movements tend to produce the most critical stresses and cracking particularly when the concrete is still green. Careful planning of joints and provision of suitable reinforcement are essential. Useful guidance can be obtained from reference 9.

The long strip method recommended in reference 9 is suitable for buildings where large areas of the ground floor are free of structural walls (e.g. warehouse floors). Where the layout of the building does not lend itself to long strip construction, the slab can be normally cast in bays not exceeding 50m$^2$ in area with the longer dimension of the bay limited to 10m. The slab thickness and reinforcement can be obtained from reference 9.

## 4.9 Guidance for the design of basement walls

### 4.9.1 General

This subsection describes the design of basement walls that form part of a reinforced concrete structure.

The general procedure to be adopted is as follows:

1. establish the requirements for the internal environment and follow the appropriate recommendations in the CIRIA guide on waterproof basements [10]
2. make the walls at least 300mm thick and ensure that they comply with the slenderness provisions in clause 4.6.2.1

3. check that walls comply with the requirements for fire resistance in clause 4.6.2.2
4. check that walls comply with the requirements for durability in clause 4.6.2.3.

The face exposed to the earth must be considered to be in a moderate environment, unless the soil is aggressive, in which case BRE Digest no. 250[11] should be complied with.

### 4.9.2 Bending moments and shear forces

The maximum values of the bending moments and shear forces at any section should be obtained by elastic analysis using the appropriate ultimate loads noted in subsection 2.6*. A minimum vertical surcharge of 10kN/m$^2$ should be considered where vehicular traffic could impose lateral loading on the wall.

Construction method and sequence could affect the design and should be considered early in the design process.

Any design requirements for temporary works (e.g. propping, sequence of backfilling and construction of floors) should be stated on the drawings.

### 4.9.3 Section design

The sections should be designed in accordance with subsections 4.2 and 4.4 as appropriate. Where axial loading is significant, the provisions of subsections 4.5 and 4.6 should be followed as appropriate.

### 4.9.4 Foundation

The foundation or base slab should be designed as a strip footing under the action of the axial load and bending moment from the wall. The base should be reinforced to ensure that the bending moments at the base of the wall can be transmitted safely to the base slab.

### 4.9.5 Reinforcement

The minimum area of reinforcement in each direction of the wall should be 0.4% of the gross cross-sectional area.[10] The spacing of reinforcement should not exceed 300mm. Diagonal reinforcement should be provided across the corners of any openings in the wall.

## 4.10 Foundations

### 4.10.1 Introduction

The design of the foundations is usually the final step. The type of foundation, the sizes and the provisional formation levels depend on the results of the ground investigation.

Until partial factors for bearing pressures and pile resistances are codified it will be necessary to use the dead, imposed and wind loads on their own (i.e. without multiplying them by the partial safety factors from Table 1) for the proportioning of the foundations. The factored loads are, however, required for determining the depths of foundations and for the design of any reinforcement.

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*For pressures arising from an accidental head of water at ground level a partial safety factor of 1.2 may be used.