The general procedure to be adopted is as follows:

1. evaluate results of ground investigation and decide whether spread or piled foundations are to be used
2. examine existing and future levels around the structure, and taking into account the bearing strata and ground water levels, determine the provisional formation levels
3. **calculate the loads and moments, if any, on the individual foundations using the partial safety factors in Table 1 and the imposed loading reduction in BS 6399[4] where appropriate**
4. recalculate the loads and moments, if any, on the individual foundations without the partial safety factors in Table 1, using the imposed loading reduction in BS 6399[4] where appropriate; in many cases it may be sufficiently accurate to divide the factored loads and moments calculated in step 3 by 1.45
5. calculate the plan areas of spread footings or the number of piles to be used to support each column or wall using the unfactored loads
6. calculate the depth required for each foundation and the reinforcement, if any, using the factored loads.

4.10.2 Durability and cover

All foundations other than those in aggressive soil conditions are considered as being in moderate environments (for definitions see Appendix C). Cover to *all* reinforcement should be 50mm. For reinforced foundations the minimum cement content should be 300kg/m^3 and the maximum water/cement ratio 0.60.

The characteristic strength of the concrete for reinforced bases and pile caps should therefore be not less than 35N/mm^2. For unreinforced bases f_{cu} = 20N/mm^2 may be used, subject to a minimum cement content of 220kg/m^3. Where sulphates are present in significant concentrations in the soil and/or the ground water, the recommendations of BRE Digest no. 250[11] should be followed.

4.10.3 Types of foundation

The loads and moments imposed on foundations may be supported by any one of the following types:

Pad footing
A square or rectangular footing supporting a single column

Strip footing
A long footing supporting a continuous wall

Combined footing
A footing supporting two or more columns

Balanced footing
A footing supporting two columns, one of which lies at or near one end

Raft
A foundation supporting a number of columns or loadbearing walls so as to transmit approximately uniform loading to the soil

Pile cap
A foundation in the form of a pad, strip, combined or balanced footing in which the forces are transmitted to the soil through a system of piles.

4.10.4 Plan area of foundations

The plan area of the foundation should be proportioned on the following assumptions:

1. all forces are transmitted to the soil without exceeding the allowable bearing pressure
2. when the foundation is axially loaded, the reactions to design loads are uniformly distributed per unit area or per pile. A foundation may be treated as axially loaded if the eccentricity does not exceed 0.02 times the length in that direction
3. when the foundation is eccentrically loaded, the reactions vary linearly across the footing or across the pile system. Footings should generally be so proportioned that zero pressure occurs only at one edge. It should be noted that eccentricity of load can arise in two ways: the columns being located eccentrically on the foundation; and/or the column transmitting a moment to the foundation. Both should be taken into account and combined to give the maximum eccentricity.
4. all parts of a footing in contact with the soil should be included in the assessment of contact pressure
5. it is preferable to maintain foundations at one level throughout.

4.10.5 Design of spread footings

4.10.5.1 Axially loaded unreinforced pad footings

For concrete with $f_{cu} = 20\text{N/mm}^2$ the ratio of the depth h to the projection from the column face a should be not less than that given in Table 38 for different values of **unfactored** pressures, q, in kN/m^2.

Table 38 Depth/projection ratios for unreinforced footings

Unfactored ground pressure q, kN/m^2	h/a
≤ 200	1.0
300	1.2
400	1.4

For other concrete strengths

$$\frac{h}{a} > 0.15 \left(\frac{q^2}{f_{cu}}\right)^{1/4}$$

In no case should h/a be less than 1, nor should h be less than 300mm.

4.10.5.2 Axially loaded reinforced pad footings

The design of axially loaded reinforced pad footings is carried out in three stages:

1. Determine the depth of the footing from the ratios of the overall depth h to the projection from the column face a, given in Table 39 for different values of **unfactored** ground pressures q.
   The effective depth h should not in any case be less than 300mm.
2. Check that the face shear
   $$v = \frac{1000N}{2(c_x + c_y)d}$$
   does not exceed $v_c = 0.8\sqrt{f_{cu}}$ or 5N/mm^2, where N is the factored column load in kN, c_x and c_y are the column dimensions in mm and d is the effective depth in mm.
   If v does exceed v_c increase the depth.
3. With the chosen depth (revised according to stage 2, if necessary) enter Table 39 and obtain the corresponding reinforcement percentage.