4 Final design

4.1 Introduction

Section 3 describes how the initial design of a reinforced concrete structure can be developed to the stage where preliminary plans and reinforcement estimates may be prepared. The cost of the structure can now be estimated.

Before starting the final design it is necessary to obtain approval of the preliminary drawings from the other members of the design team. The drawings may require further amendment, and it may be necessary to repeat this process until approval is given by all parties. When all the comments have been received it is then important to marshal all the information received into a logical format ready for use in the final design. This may be carried out in the following sequence:

1. checking of all information
2. preparation of a list of design data
3. amendment of drawings as a basis for final calculations.

4.1.1 Checking of all information

To ensure that the initial design assumptions are still valid, the comments and any other information received from the client and the members of the design team, and the results of the ground investigation, should be checked:

Stability
Ensure that no amendments have been made to the sizes and to the disposition of the shear walls. Check that any openings in these can be accommodated in the final design.

Movement joints
Ensure that no amendments have been made to the disposition of the movement joints.

Loading
Check that the loading assumptions are still correct. This applies to dead and imposed loading such as floor finishes, ceilings, services, partitions and external wall thicknesses, materials and finishes thereto.

Make a final check on the design wind loading and consider whether or not loadings such as earthquake, accidental, constructional or other temporary loadings should be taken into account.

Fire resistance, durability and sound insulation
Establish with other members of the design team the fire resistance required for each part of the structure, the durability classifications that apply to each part and the mass of floors and walls (including finishes) required for sound insulation.

Foundations
Examine the information from the ground investigation and decide on the type of foundation to be used in the final design. Consider especially any existing or future structure adjacent to the perimeter of the structure that may influence not only the location of the foundations but also any possible effect on the superstructure and on adjacent buildings.

Performance criteria
Establish which codes of practice and other design criteria are to be used in the final design.

Materials
Decide on the concrete mixes and grade of reinforcement to be used in the final design for each or all parts of the structure, taking into account the fire-resistance and durability requirements, the availability of the constituents of concrete mixes and any other specific requirements such as water-excluding concrete construction for basements.

4.1.2 Preparation of a list of design data

The information obtained from the above check and that resulting from any discussions with the client, design team members, building control authorities and material suppliers should be entered into a design information data list. A suitable format for such a list is included in Appendix B. This list should be sent to the design team leader for approval before the final design is commenced.

4.1.3 Amendment of drawings as a basis for final calculations

The preliminary drawings should be brought up to date incorporating any amendments arising out of the final check of the information previously accumulated and finally approved.

In addition the following details should be added to all the preliminary drawings as an aid to the final calculations:

Grid lines
Establish grid lines in two directions, mutually at right-angles for orthogonal building layouts. Identify these on the plans.

Members
Give all walls, columns, beams and slabs unique reference numbers or a combination of letters and numbers related if possible to the grid, so that they can be readily identified on the drawings and in the calculations.

Loading
Mark on the preliminary drawings the loads that are to be carried by each slab. It is also desirable to mark on the plans the width and location of any walls or other special loads to be carried by the slabs or beams.

4.1.4 Final design calculations

When all the above checks, design information, data lists and preparation of the preliminary drawings have been carried out the final design calculations for the structure can be commenced. It is important that these should be carried out in a logical sequence. The remaining sections of the *Manual* have been laid out in the following order, which should be followed in most cases:

slabs
structural frames
beams
columns
walls
staircases
retaining walls, basements
foundations
robustness and
detailing.