3.9 Reinforcement estimates

In order for the cost of the structure to be estimated it is necessary for the quantities of the materials, including those of the reinforcement, to be available. Fairly accurate quantities of the concrete and brickwork can be calculated from the layout drawings. If working drawings and schedules for the reinforcement are not available it is necessary to provide an estimate of the anticipated quantities.

The quantities are normally described in accordance with the requirements of the *Standard method of measurement (SMM)*.[7] In the case of reinforcement quantities the basic requirements are, briefly:

1. for bar reinforcement to be described separately by: steel type (e.g. mild or high yield steel), size and weight and divided up according to:
   (a) element of structure, e.g. foundations, slabs, walls, columns, etc. and
   (b) bar 'shape', e.g. straight, bent or hooked; curved; links, stirrups and spacers.
2. for fabric (mesh) reinforcement to be described separately by: steel type, fabric type and area, divided up according to 1*(a)* and 1*(b)* above.

There are different methods for estimating the quantities of reinforcement; three methods of varying accuracy are given below.

Method 1

The simplest method is based on the type of structure and the volume of the reinforced concrete elements. Typical values are, for example:

warehouses and similarly loaded and proportioned structures: 1 tonne of reinforcement per $10m^3$.
offices, shops, hotels: 1 tonne per $13.5m^3$
residential, schools: 1 tonne per $15.0m^3$.

However, while this method is a useful check on the total estimated quantity it is the least accurate, and it requires considerable experience to break the tonnage down to *SMM*[7] requirements.

Method 2

Another method is to use factors that convert the steel areas obtained from the initial design calculations to weights, e.g. kg/m^2 or kg/m as appropriate to the element.

Tables A1 to A5 in Appendix A give factors for the various elements of the structure that should be used for this purpose.

If the weights are divided into practical bar sizes and shapes this method can give a reasonably accurate assessment. The factors, however, do assume a degree of standardization both of structural form and detailing.

This method is likely to be the most flexible and relatively precise in practice, as it is based on reinforcement requirements indicated by the initial design calculations.

Method 3

For this method sketches are made for the 'typical' cases of elements and then weighted. This method has the advantages that:

(a) the sketches are representative of the actual structure

(b) the sketches include the intended form of detailing and distribution of main and secondary reinforcement
(c) an allowance of additional steel for variations and holes may be made by inspection.

This method can also be used to calibrate or check the factors described in method 2 as it takes account of individual detailing methods.

When preparing the final reinforcement estimate, the following items should be considered:

(a) *Laps and starter bars*
A reasonable allowance for normal laps in both main and distribution bars, and for starter bars has been made in Tables A1 to A5. It should however be checked if special lapping arrangements are used
(b) *Architectural features*
The drawings should be looked at and sufficient allowance made for the reinforcement required for such 'non-structural' features
(c) *Contingency*
A contingency of between 10–15% should be added to cater for some changes and for possible omissions.