4.1.5 Piece size and count

The designer needs to consider limitations on piece size (weight, height and length) which are imposed by the workshop capacity. Handling, painting and galvanising may all need to be considered(').

For lifting on site, items fall into one of two categories; those which can be lifted and positioned by hand, and those which require a crane. Site conditions may dictate that the latter are minimised. If crane availability is a problem, the use of steel decking, which can be placed by hand, is preferable to precast concrete units requiring a crane for individual placement. The weights of some typical components found in a steel framed building are given in Table 4.1.

Table 4.1 *Weights of typical building components*

Item	Weight
Precast hollow concrete planks (8 m x 1.2 m x 0.2 m)	3000 kg
Steel decking (3 m x 1 m sheet)	40 kg
Concrete cladding (1 m^2)	600 kg
Composite cladding (1 m^2)	30 kg
Glazing (1 m^2 x 5 mm, including frame)	25 kg
Prefab, stairs (1 m wide x 1 flight)	2500 kg
Rolled steel sections	see standard section tables

The site programme is highly dependent on the number of crane lifts which are needed. To reduce this number, maximum use should be made of pre-assembled units. A 'piece count' is useful for the designer to assess the number of lifts (see below).

Example of using a piece count

Consider a small industrial project comprising a shed, mezzanine and offices. A breakdown of the steelwork is given in Table 4.2.

Table 4.2 *Breakdown of project components*

Item	No of pieces	Piece weight (t)	Total weight (t)
SHED			
Columns	22	1.5	33
Trusses	10	7	70
Posts	5	0.2	1
Purlins	110	0.1	11
Rails	50	0.1	5
Bracings	10	0.2	2
Ties etc.	160	0.025	4
Subtotals	**367**		**126**

Table 4.2 *Continued*

Item	No of pieces	Piece weight (t)	Total weight (t)
MEZZANINE			
Columns	5	0.4	2
Beams	10	0.7	7
Subtotals	**15**		**9**
OFFICES			
Columns	8	0.875	7
Beams	20	1	20
Bracings	8	0.125	1
Subtotals	**36**		**28**
TOTALS	**418**		**163**

The pieces to be erected may be grouped together as shown in Table 4.3.

Table 4.3 *Erection timetable*

Item	Weight (t)	No of pieces	Erection rate (pieces per day)	Gang time (days)
Specials over 5 t	70	10	2	5
Items requiring crane	73	88	6	15
Items requiring MEWP*	16	160	20	8
Items erectable by 1 man	4	160	40	2
TOTALS	**163**	**418**		**30**

* MEWP stands for mobile elevated working platform

From the tables, it can be seen that the rate of erection for the heaviest items, specials over 5 t, is 14 tonnes per gang day (5 days is needed to erect a total of 70 t). This is much higher than the two tonnes a day estimated for the lighter pieces. Hence, for example, the introduction of a lightweight fascia around the shed might only add another 10 tonnes, but could possibly add a week to the erection period if the components were assembled 'in the air'. Prefabrication might be appropriate in such a situation.

4.1.6 Surveying and aligning the structure

The normal procedure for achieving and checking the line and level of the frame consists of an interaction between the site engineer and the erection gang. The engineer may use various items of equipment to check the frame position:

- theodolite
- optical level
- EDM (electronic distance meter) - used in combination with a theodolite. Alternatively, a single unit (*complete* or *total station*) performs the same tasks
- damped plumb bob
- piano wire
- laser level.