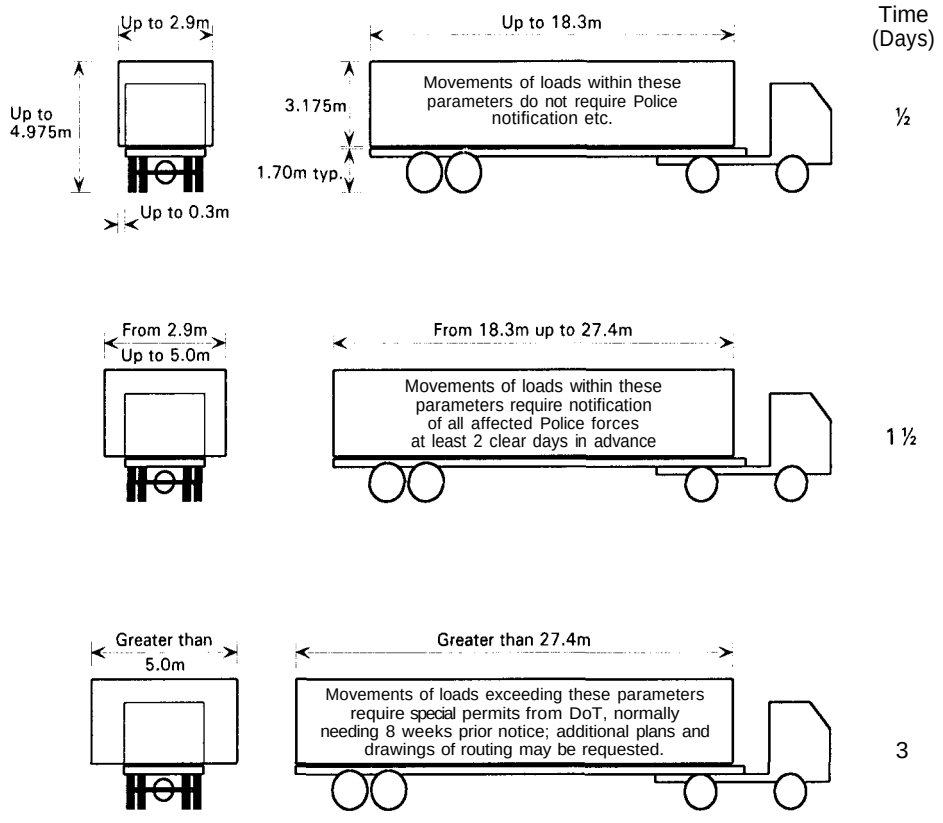

Figure 4.1 *Road transport limitations*

4.1.2 Storage

Handling of materials can be reduced by careful consideration of storage, with potential savings in both plant and labour costs. 'Just in time' delivery can be used to avoid double handling, provided deliveries are carefully planned; this may be essential on a congested site. It is worth remembering that 'just in time' on site does not necessarily mean leaving the fabricator's workshop just in time. An intermediate off-site storage buffer may be used.

Material should be stacked in such a way that the items which are needed first are readily available without moving other material. However, some compromise may be necessary, since it is also desirable that the heaviest items are stacked nearest to the crane access (lifting capacity decreases with radius, see Section 4.2.1). Heavy loads should not be placed on top of underground services such as electrical cables, culverts or drains, which could be damaged by the weight.

The area set aside for storage must be firm and level. Wooden sleepers or other suitable material should be placed on the ground at regular intervals to act as bearers. Sufficient space must be left between stacked material for slinging and crane movements.

There are several methods of stacking steel members to give stability and optimise use of space. The most appropriate method depends largely on the uniformity of the steel and the overall dimensions of each component. Further aims of stacking are to avoid mechanical damage, and to prevent water build-up. Particular care is needed for members which are protected with an intumescent coating (which is generally less resistant to damage) so that the extent of on-site repair work is minimised.

4.1.3 Foundation interface

Accurate positioning and subsequent surveying of holding-down bolts prior to frame erection is essential. The recommendations made in *BS 5964:* Part **1** *Building setting out and measurement* [86] should be adhered to. Tolerance values for the position and level of holding down bolts are given in the NSSS(@. These values, which are quantified in Section 8.3.1, are achievable with normal site practice. Further details concerning foundations are given in Section 6.1.

4.1.4 Sequential erection operations

The erection operations should be carefully planned by the steelwork contractor, and follow a logical sequence. Access restrictions to suit the main contractor's requirements will generally govern the sequence. Splitting the frame into zones for erection and alignment allows following trades to work in a zone whilst erection and alignment of the remaining steelwork progresses. An efficient sequence must also be carefully tied in with cranage, which often dictates the speed of erection (see Section 4.3). The need to maintain stability of the part erected structure at all times must also be respected.

Knowing the sequence and timescale available, the steelwork contractor can assess his resource requirements, and determine how to provide access and safe working positions for the erection personnel. He should present all this information in an erection method statement, including a clear statement of the procedure for checking the alignment of the structure, and for handing it over to the client correct and complete.

The 'Key Points' that should be included in a contractor's method statement are summarised below. Of these, the designer is primarily interested in seeing a stable and safe erection sequence.

KEY POINTS - Method statements

The contractor's method statement should include the following information:

- Stable and safe erection sequence
- Plant resources
- Manpower and other resources
- Safe working positions and access
- Handover requirements

The following sections give a typical erection sequence for two common types of frame. Note however that although typical, these sequences must not be blindly adopted for specific cases; stability must be ensured at all times, and for some frames this will necessitate modifying the sequence.