

Construction Industry Council CDM Guidance for Designers

Designing to make management of the risks associated with work at height easier

Technical Guidance Note

T20.008

INTRODUCTION

1. Designers can play a major part in making it easier to manage the hazards associated with work at height.
2. Falling from height is the most common cause of fatal accidents on construction sites. Often, the accident happens because fall protection had either not been provided or used incorrectly.
3. In many cases, the design of works is such that the provision of fall protection is either not practicable or requires workers to work beyond the confines of the protection. In such circumstances designers should attempt to prevent the development of conditions in which an accident can happen.
4. Nevertheless in many instances work at height is necessary and cannot be avoided. Even so-called low-rise buildings and structures have some element, eg, roofs, chimneys, requiring work at height
5. Information from accident reports show that there are four main reasons why people fall. These are:
 - a) Poor work place design
 - b) The access support collapsed, eg, scaffolds, ladders etc;
 - c) The worker was required to work beyond the confines of the protection provided;
 - d) The edge protection was inadequate or not provided or of poor design or construction;
 - e) Restrictions placed on the movements of workers did not accommodate the construction activities and hence were ignored.

WHAT DESIGNERS SHOULD DO

6. Designers do have a role in trying to ensure that the designs eliminate, as far as possible, the need to work at height. For example:
 - a) Retaining walls in a cutting could be designed as bored contiguous piles installed from existing ground level, which would eliminate shuttering and concreting operations at height;
 - b) Service runs could be designed for access for maintenance from the floor above;
 - c) Trusses, etc, could be designed to allow pre-assembly and lifting;
 - d) Floor heights in buildings should be determined so that proprietary temporary works systems, which can be installed by working from the floor below can be used.

7. However it has been established above, in 4, that in many instances this cannot be avoided and for the work that remains to be done at height, designers should aim to assist the Contractor by applying the following hierarchy of control in their design:

- a) Facilitate the provision of fall prevention measures [to make temporary work at height during construction safe];
 - b) Facilitate the use of temporary access equipment, eg, scaffolds, MATs;
 - c) Facilitate the provision of fall arrest measures;
- In addition the design should:
- d) Eliminate requirement for persons to work outside the confines of the edge protection;
 - e) Facilitate the use of suspended access and/or mobile access equipment [if applicable] during maintenance.

Facilitating the provision of fall protection measures

8. Workers are at their most vulnerable when working around the perimeter of a structure or when they are working close to advancing edges inside the structure. While it is difficult to limit the former, the design should aim to limit the exposure of workers to the hazard in the latter, for example designers could:

- a) Specify composite flooring which can carry erection loads, to allow placing of permanent formwork immediately the support frame is complete, the designer eliminates the need for people to work at height to erect falsework to temporarily support floors;
- b) Specify attachments for temporary edge protection on perimeter members, eg, tubes welded to steel members or cast into concrete members;
- c) Position splices for steel columns at 1 m above floor level, to allow splicing from a completed protected floor;
- d) Consider using precast slabs and elements to potentially reduce the time spent working at height;
- e) Design stairways with 7b) to be installed early in the construction phase to avoid the need for temporary access.

Facilitating the provision of safe temporary access to work at height during construction

9. Temporary access equipment, for access above 5 m: scaffolds and towers, needs to be tied at regular intervals, to provide restraint against buckling and overturning. Usually, they are tied to

the structure. Therefore, the designer needs to ensure provision is made for this. This is particularly important with facades where glazing predominates. Further information relevant to the safe use of TWE is given in **T 20.006**.

Facilitating the provision of fall arrest measures

10. The most commonly used fall arrest systems are safety nets and personal fall protection equipment [PPE]. Safety nets are preferred to PPE.

Safety Nets

11. The designer should refer to BS EN 1263-1&2 regarding the use and provision of safety nets.

12. General considerations include:

- a) Discussing the use of nets with a competent supplier before developing the design;
- b) Where safety nets are to be attached to a structural grid, designers should:
 - i) Check that the grid will resist the lateral loads, especially when nets are attached to steelwork in composite construction or to purlins in roof work;
 - ii) Ensure that the net installation points are located such that they minimise the falling height. For example: detail pre-installed anchors at 1.2m centres, attached to the webs of beams a maximum of 100mm below the flange (to-date within 1.5m of the work area has been considered as acceptable);
- c) Giving consideration to restricting service runs to limited areas so that they cannot obstruct a fall into a net or prevent a net deflecting;
- d) Consider restricting the net area enclosed by the grid (eg, to 45m² with one maximum dimension of 9.0m);
- e) That the storey height is at least 3.75m, so that nets attached close up to the working surface can deflect safely.

13. Safety nets in industrial developments are often installed from mobile elevating work platforms [MEWPs]. Therefore, designers should allow for the concentrated loads applied by MEWP wheels/outriggers.

PPE: Lanyards used with Harnesses

14. Lanyards must be attached to a suitable and sufficient load-bearing anchor. Therefore, designers should:

- a) Provide anchor points capable of supporting 12kN applied horizontally;
- b) Be aware that:
 - i) Lanyards should be as short as possible,
 - ii) Impact forces are lower when the anchor is above the worker,
 - iii) Lanyards can be cut by sharp edges;
- c) Show, clearly, where these anchors are located;

- d) With horizontal lifelines anchor forces may be greatly in excess of 15 kN. Therefore, the manufacturer should be consulted for advice.

15. For PPE used in steel erection, designers should consider the provision of holes in flanges of columns and beams, where:

- a) holes in columns are 1.5m above beams,
- b) holes in beams should be at 2.0m c/c;

16. For pre-cast concrete, designers should specify anchor points:

- a) In slots, 50mm × 125mm × 75mm deep;
- b) Located as far as possible behind the leading edge;
- c) At a spacing not in excess of 2.5m.

Facilitating future maintenance

17. Designers should also give due regard for the future maintenance of the proposed facility, because they are in a strong position to eliminate and/or minimise the requirement to work at height during maintenance operations. For example they could:

- a) Ensure any service plant/structures are not located at height, ie, on roofs;
- b) Specify high durability materials;
- c) Locate system/process pipework at ground level where practical;
- d) Avoid locating high maintenance items above stairwells and other deep recesses;
- e) Specify reversible windows over 2m. When this is not appropriate, ensure provisions for access equipment are incorporated at the design stage;
- f) Where suspended access equipment is the intended means for maintenance of a building façade, information for designers is given in **T 20. 014**.
- g) Roofs are always hazardous places to work. For further information see **T 20.009**.

18. Remember the designer shall need to apply the principles of prevention ensuring where reasonably practical, that the hazard of working at height is firstly removed, then minimised and finally controlled.

PROVIDING SUFFICIENT INFORMATION

19. Sufficient information on the significant hazards that remain within the design must be highlighted and included within the Health and Safety Plan and/or the Health and Safety File.

USEFUL REFERENCES

EN 1263 parts 1 & 2