

Construction Industry Council CDM Guidance for Designers

Spatial Design considerations to make management of hazards in construction easier

Technical Guidance Note

T 20.012

INTRODUCTION

1. Designers can play a major part in minimising the hazards associated with ill-considered location of a building on a site.
2. Designers are involved in and often give overriding advice in relation to the design of the spaces in a building. They are also often responsible – either in whole or in part – for the external form of the building. The spatial configuration: heights of spaces; balconies; overlooking; roof and soffit shape; etc, can have a significant effect on health and safety issues for constructors, maintainers and demolishers. Decisions made regarding placement on site, configuration of building volumes, storey numbers and heights, use of atria, double (or more) height spaces, stairwells, etc all have to be thought about in the context of designing out hazards for people who have to build them and, later on, maintain them.
3. Work on the form and spatial configuration of a building occurs very early on in the design process. Hence it has very significant effects on the buildability and safety of construction and subsequent maintenance and demolition. It is important that these early stages of the design process are adequately resourced both in financial terms and in terms of time. Rushed and/or under-funded initial stages of a project will always lead to a deficient result not only in safety terms but also in other terms such as:
 - a) lack of development of the brief
 - b) lack of consideration of whole life cost issues
 - c) lack of user, participant or stakeholder consultation
4. The creation of a new building or the re-working of an existing building is the primary means by which value is added in the construction process. Without this adding of value, the whole project would be pointless. (Value is not necessarily measured in monetary terms.) Because of this, this act of creation is also the prime means by which project risk of all types is created. The risks which are created include safety, health and welfare risks. The overall spatial and formal configuration of a building is arguably that part of the project development which adds most value – in the provision of internal and external space, for instance; in turn, it can add most risk (all the more so in that it occurs generally at the outset of projects), and is often that part of the project most closely controlled by the project designers.
5. Aside from those formally and legally responsible for the spatial and formal composition of the building (usually an architect, building surveyor or architectural designer) other parties may influence or even control some of all of these matters, by the restrictions, considerations and constraints that they may place on people who undertake design. These parties may include:

- a) planning consultants
 - b) Local Planning Authority personnel and planning committee members
 - c) conservation officers
 - d) amenity societies
 - e) members of quasi-governmental bodies (CABE, English Heritage)
 - f) funders
 - g) letting or land agents and advisors, especially when advising clients on the form & density of buildings.
6. All these contributors to the design process should be aware of and acknowledge either their duties under CDM Regulation 13, or the duties of the principal designers. This guidance explains how this can be achieved.

HAZARDS ASSOCIATED WITH SPATIAL CONFIGURATION

7. Depending on where a building is located, some or all of the hazards associated with construction could be present and/or exacerbated, because placement or form of a building could have a significant impact on how a building can be built and maintained. For example:
- a) A building at the waters edge could present problems for window cleaners, unless provision for the safe cleaning of windows is given some thought at the outset;
 - b) A very high glass atrium could present problems at the construction stage and for post construction maintenance.
8. And, as architects, building surveyors or architectural designers are aware, there is usually a key “gateway” that occurs during these earlier stages of a project that is very often irreversible: the obtaining of Planning Permission – see 5. Beyond this, the large-scale reworking of the formal and spatial configuration of a building is often either extremely difficult, expensive and time-consuming or entirely impractical. Matters not included at this stage of the project are very difficult to add later. Some examples of this will be given below.

WHAT DESIGNERS SHOULD DO

9. There is a wide range of matters which designers should take into consideration in relation to the overall spatial and formal configuration, which include:
- a) Local infrastructure: roads, rail, etc, which might affect:
 - i) deliveries of materials,
 - ii) siting of plant,
 - iii) slewing radius of cranes;
 - b) Site space requirements for transportation and movement of people around/near the site, eg:
 - i) can site traffic and people be segregated,
 - ii) can cranes be sited.
 - c) Adjacent occupied buildings, which might affect processes that can be used, because this could:
 - i) limit slewing radius of cranes,

- ii) limit noise levels,
- iii) limit hours of working.
- d) Contaminated land issues, because they could affect groundworks: foundations, drainage, tipping, etc;
- e) Natural features: slopes, watercourses etc, which might affect methods and processes;
- f) Location of services – electric, gas, above and below ground, because they could affect the processes that can be used by limiting:
 - i) the erection of scaffolds;
 - ii) where cranes can be sited and their slewing radius;
- g) Imposed requirements, eg:
 - i) planning requirements,
 - ii) results of local consultation,
 - iii) historic environment issues, and
 - iv) conservation issues,which might restrict the options for building form;
- h) Economic requirements;
- i) Retention of existing natural features: trees, other planting, watercourses, which could restrict space for circulation – see 9 b);
- j) Entrances and exits to vehicle routes;
- k) Emergency access to the site;
- l) Height of internal spaces:
 - i) Stairwells,
 - ii) Atria,
 - iii) Storey heights.
- m) Arrangement of roofs and other overhanging elements and how they might affect post-construction operations;
- n) Post-construction maintenance, including cleaning and regular maintenance of items of plant, etc;
- o) And finally, when the building's useful life is over, its demolition.

10. Each of these may have an effect on how a designer can discharge his duties under the CDM Regulations. Designers will have to balance the need to satisfy the requirements of CDM against the operational requirements of the building.

EXAMPLES OF APPLYING CDM TO SPATIAL DESIGN

Designing out potential hazards

11. A land surveyor, in advising a client about a warehouse project, provided a block plan indicating its location between a busy road and a railway. This plan was used to obtain outline planning permission. The site was sold on to another developer, who engaged an architect to obtain full planning permission. The Architect met with a contractor familiar with erecting these types of buildings, to assess if there were any unnecessary hazards associated with the outline design. At the first meeting it was pointed out that if the location of the building could be changed, then:

- a) The movement of vehicles, goods and individual people around the site would be improved and therefore made safer;
- b) Existing flora concentrated in a particular area of the site, which would be less damaged;

These matters were taken into account in the full planning application; the building was moved and significant hazards were designed out.

Minimising the hazard

12. All buildings need to be cleaned externally from time to time. This applies particularly (but not only) to the

windows. Where a building is of any height, it is likely that cleaning will present a safety hazard. Minimising the risk from this hazard would involve considering how the cleaning can be done as safely as possible. The design process in achieving this might be straightforward, eg, following the design guidance provided in British Standards; or, in the case of more complex or larger buildings, might be more involved, making it necessary for the building designers to liaise with cleaning specialists.

13. One solution is to provide a building, which steps in a series of terraces, so that outside each window there is a terrace, protected by a handrail that can be used, by anyone at any time for safe access to maintain the building.

14. Obviously, this results in a very distinctive building form, which might be appropriate in, say, a green-field site in an under-populated area, but which may not be appropriate in an inner-city office block. In the latter case, there are three possible solutions, as follows:

- a) Provide windows that are reversible;
- b) Provide suspended access equipment, designed in conjunction with the overall form of the building; or
- c) Provide anchor points for cleaning by rope access methods.

15. The first option is preferred. However, where this is not possible, there would have to be a good reason for favouring method c) over method b), for example, the building is extremely iconic in an historically sensitive location, eg, the Louvre Pyramid, a consideration that could outweigh the safety issue.

USEFUL REFERENCES

Designers should make reference to the following publications. The first two in particular cover a wide range of issues, which are not possible to outline in brief guidance such as this.

CIRIA Report 145 CDM Regulations - case study guidance for designers: an interim report:

CIRIA Report 166 [Section A] CDM Regulations – Work Sector Guidance for Designers:

HS(G)136 Workplace Transport Safety: Guidance for Employers