Temporary Works Toolkit

Part 2: CDM 2015 and the responsibilities of permanent works designers with regard to temporary works

The Temporary Works Toolkit is a series of articles aimed primarily at assisting the permanent works designer with temporary works issues. Buildability – sometimes referred to now as "construction method engineering" – is not a new concept and one always recognised as vital to the realisation of one's ideas; it ought to be at the forefront of an engineer's mind.

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Temporary Works forum
Promoting best practice in the construction industry.

In the second part of the series, John Carpenter examines the impact of CDM 2015 and temporary works on permanent works design.

Introduction

This article is intended to advise UK permanent works designers (PWDs) of their legal obligations in relation to temporary works, stemming from the Construction (Design and Management) Regulations 2015 (CDM 2015); and also to demonstrate more generally the wider project benefits of careful consideration.

Temporary works cover a wide field of activity: these are illustrated in Appendix B and C of the Temporary Works Forum (TWf) *Client's guide to temporary works*[1].

The definition of temporary works adopted by the TWf includes interim states of permanent works and the loading of permanent works by temporary construction loads.

Safety risks

The main concern for PWDs in relation to temporary works is one of safety, i.e. an action falling to the PWD which, if not taken at an early stage, could lead to an unnecessary or enhanced risk on site. In the extreme, this could precipitate failure and affect the well-being of others. However, there are also other actions which, although lacking the same degree of safety concern, could add unnecessary cost or time to a project if not thought through by the PWD.

Although safety issues tend to dominate, ill health associated with temporary works, but arising from poorly thought-out permanent works design, is also an important aspect which needs to be considered by PWDs. In this article, the term "safety" is also intended to cover ill health. (Ill health is a major concern generally, as it affects, and kills, many more people than do safety-related shortcomings.)

On many projects, temporary works are, in effect, a "hidden" element, despite forming a significant cost component: they are not explicitly billed or identified, nor do they feature as part of what the client receives on project completion; hence, they often do not receive the same attention as the permanent works at the design stage. However, attention to detail can bring commensurate project savings, in addition to eliminating or reducing unnecessary safety risk.

The duty of PWDs to consider safety risk in connection with temporary works arises under a general duty of care, but specifically under statute and often under contract. PWDs may be employed directly by the client, or by a contractor.

It is important to remember **that risk does not respect project size**. A loft conversion, or house extension, is as likely to create complex and safety-critical temporary works situations as any larger project.

The duties falling to PWDs are the same in all cases.

Statutory obligations

The statutory obligations on PWDs arise from Reg. 9 of CDM 2015. This requires PWDs to:

- eliminate risk or, if not reasonably practicable, to reduce risk, so far as is reasonably practicable (SFARP)
- provide information on significant residual risks to others (specifically the principal designer, but required by the principal contractor)

The risks here are those which adversely affect the safety of others; however, the approach may be used to consider all adverse risks.

CDM 2015, like its predecessors, does not make any distinction between temporary works and permanent works. Thus, temporary works designers (TWDs) will also be following the above requirements. To do this, they will require adequate base data on the permanent works (in the pre-construction information) on which to base their design, and the means to coordinate the temporary works design with the permanent works.

To discharge this statutory duty, the PWD must:

- understand how the structure can be constructed, and temporary works erected,

used and dismantled safely (Box 1)
- determine if, by altering or supplementing the permanent works design in some way (SFARP), risk arising from construction, use or dismantling of temporary works can be eliminated or reduced (Box 2)
- consider what useful information should be passed on to the contractor (via the pre-construction information) (Box 3)

In considering the above, it is not intended to restrict the contractor in how the facility is constructed (unless there is good reason to do so). Nor is it intended to take responsibility for site matters. The aim is to explain the PWD's thinking, remove or reduce unnecessary obstacles, and provide information. It is then for the contractor to ensure the safety of the method eventually adopted.

To do this, the PWD clearly needs to have a good understanding of contemporary construction techniques, including the associated likely temporary works solutions, and to know the critical aspects of the permanent works design, e.g. an interim stage of possible instability, reliance on adjacent structures, or limits to deflections or movements.

Clear thinking and action in this regard will help in the management of safety risk, but also in the management of other business-related risks, e.g. programme or unexpected costs.

Cooperation, coordination and communication

The PWD must cooperate, coordinate and communicate with others in respect of temporary works (safety) issues, as for any other aspects of the design, where reasonably practicable. Taking these actions will also assist in other regards (Table 1).

However, much depends upon the nature of the contractual arrangements (discussed further on). Where the contractual arrangements militate against this, e.g. by the timing of appointments, the PWD should ensure that reasonable alternative action is taken.

Box 1. Understanding the construction process

There may be a number of ways in which the structure could be constructed, and the temporary works erected, used and dismantled safely, but the PWD must have identified at least one likely and feasible method, and understand the manner in which the permanent works design impinges on this, or vice versa.

Box 2. Eliminating or reducing temporary works risk

There are a number of ways in which temporary works risk may be eliminated or reduced by alterations to the permanent works design. The PWD may:

- consider ways of facilitating lifting
- provide a moment connection (even if not needed in the final structure) so as to allow for a predictable temporary situation
- make provision for predictable temporary works cast-in elements
- add bracing or reinforcement to accommodate predictable interim conditions
- enhance the strength of a member so as to accommodate predictable temporary loading
- ensure adequate space is provided for predictable temporary works items
- consider issues associated with demolition-related temporary works

Risk management

Unfortunately, neither CDM 2015, nor the accompanying guidance[2] published by the Health and Safety Executive (HSE), explain how the PWD determines whether the risk-management action taken is compliant. This is a long-standing deficiency and is discussed elsewhere[3,4]. In the absence of such advice, it is suggested that:

- the PWD follows contemporary industry practice where available; if it is available, but not adopted for good reason, the PWD should provide an explanation for record purposes
- where no contemporary advice is available, the PWD uses engineering judgement stemming from capable individuals

In short, the PWD should ask: *If I was the constructor or the TWD, what would I reasonably expect, or want to know, so that I could proceed safely, but also economically?*

What must be avoided, without exception, is overtly dangerous situations occurring on site as a result of poor design consideration.

Careful consideration of the construction sequence and the associated temporary works, and using this to identify associated hazards and risks, will then allow consideration of whether any of these may be eliminated or reduced. A useful model for this, conducted if possible in a group with a facilitator, is **ERIC** (eliminate, reduce, inform, control). Such a facilitator should be capable in temporary works design and construction techniques; they could be from the design team, the principal designer, or from a contractor (including where sensible and feasible, the temporary works coordinator (TWC), as set out in BS 5975:2008+A1:2011[5]).

The PWD should be aware that even common-place designs, such as a multistorey flat slab, can present difficulties to contractors if not thought through, e.g. in terms of propping constraints and safe temporary loading.

Information

The key issue here is to distinguish between general information of which the contractor will already be aware by virtue of being a capable contractor, and "significant residual risk data" which the contractor will find of use – either in the actual construction, use or dismantling of the temporary works, or in its design (Table 2).

Contractual obligations

Contractual arrangements

Notwithstanding statutory obligations, the manner in which the project team is assembled can have a significant effect upon the management of risk and the transfer of information. The PWD needs to be aware of how the chosen arrangements may impede the necessary actions.

On design-and-build projects (or similar arrangements), the contractor has contractual control over all designers. The PWD is therefore able to ensure that the permanent works design takes account of construction issues, as they are able to make direct contact with the relevant contractors and TWDs. This allows a design, and the provision of information, which suits those who are going to design and construct the works. The PWD should be pro-active in this regard and should also expect to have contact with the principal designer and, when appointed, the TWC.

However, on projects where the client appoints PWDs and contractors separately, the process is more complex. In these cases,

Box 3. What information should be passed to the contractor?

Passing useful information to the contractor is a very important aspect of a project (and is discussed in more detail further on in the article). As a minimum, the suggested construction sequence should be illustrated (generally as an option) unless it is obvious to a capable* contractor, with no significant issues which might be unexpected.

* "Capable" is the term used in CDM 2015. It replaces "competence", having regard also to resource, which was used in CDM 2007.

Table 1: Cooperation, coordination and communication actions for the PWD	
Cooperate	Assisting the principal contractor, via the pre-construction information and the principal designer as required, to understand the intricacies of the permanent works design; and considering options to assist in the build process
Coordinate	Taking steps to ensure the permanent works design is compatible with temporary works needs
Communicate	Ensuring that appropriate communication channels are available, and used

depending upon the specific arrangements and timings, the PWD may not be able to make direct contact with the principal contractor, still less the subsequent subcontractors or TWDs. If this is so, the PWD should:

- discuss any specific issues with the principal designer, if appointed
- seek advice from other contractors/TWDs if there is any doubt about the likely method of construction or other temporary works issues
- ensure adequate information is provided on the drawings for the benefit of those contractors yet to be appointed

Contractual provisions

The PWD should give careful consideration as to what contractual provisions should be included in the construction contract. General provisions, which may need to be particularised for a specific project, are set out in PAS 8811[6].

Sources of advice for the PWD

When necessary, the PWD is able to obtain advice from a number of sources:

- **the principal designer** will not necessarily be competent in this area but should be able to suggest others if this is the case
- **contractors** may differ in their individual approach to construction, but the PWD should be able to obtain relevant generic advice
- **a TWC** may be a useful source of advice if appointed at the relevant stage and if specifically competent in design matters[7]
- **TWDs** may be a useful source of advice if appointed at the relevant stage
- **the TWf** cannot give project-specific advice, but its website (www.twforum.org.uk) contains a range of useful information

The PWD will need to decide whether, if no contractual route is available, to obtain advice on a *pro bono* basis; or, perhaps for the more complex or safety-critical project, to seek funds to engage one of the advisers listed here to provide a consultancy service.

Table 2: Examples of useful information for contractors and designers	
Ground conditions and design characteristics (affecting safety and health)	Provision of site investigation (SI) data. The PWD should also give consideration, when setting up the permanent works SI, as to whether additional tests or data collection (including actions required to determine contaminants and the like) will assist in the design of predictable temporary works or the protection of associated workers. This may require an extended SI time period
Restrictions on horizontal/vertical movements and deflections to existing assets or the permanent works	Essential information in order to plan and design the temporary works
Maximum loads to be applied to existing assets or to the permanent works	The PWD should have regard to predictable temporary loads on the permanent works and accommodate these into the design, where reasonably practicable. Data on this may be obtained from a number of sources, including industry bodies (e.g. the BCSA or the TWf) or contractors*
How interim strengths are to be determined	For example, the early strength of concrete floors
Interim stages of construction involving potential instability	Essential information in order to plan and design the temporary works
Party wall details	The contractor should be informed of all party wall matters, including the name of the party wall surveyor, existing party wall details, investigations and the like
Traffic flows	As traffic management can be defined as temporary works, useful information would be traffic flows, speed and use restrictions to allow the traffic management to be sensibly designed

* Examples include the inability of a suspended floor slab to take predictable temporary works propping loads (supporting the next floor). However, it would be better if the PWD eliminated the problem by increasing the strength of the slab

Further details

An extended version of this article is available on the TWf website at www.twforum.org.uk/publications/public-twf-documents/.

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REFERENCES:

1) Temporary Works Forum (2014) *Client's guide to temporary works* [Online] Available at: www.twforum.org.uk/media/58911/twf2014.02_client_guide_26_january_2015_final.pdf (Accessed: October 2016)

2) Health and Safety Executive (2015) *L153: Management of health and safety in construction* [Online] Available at: www.hse.gov.uk/pUbns/priced/l153.pdf (Accessed: October 2016)

3) Carpenter J. (2014) *Construction design dilemma: CDM2015* [Online] Available at: www.shponline.co.uk/construction-design-dilemma-cdm2015/ (Accessed: October 2016)

4) Carpenter J. (2016) 'Construction Design: Moving Forward', *SHP*, 34 (1), pp. 41–43 [Online] Available at: www.shponline.co.uk/moving-forward-on-cdm2015/?cid=searchresult (Accessed: October 2016)

5) British Standards Institution (2008) *BS 5975:2008+A1:2011 Code of practice for temporary works procedures and the permissible stress design of falsework*, London, UK: BSI

6) British Standards Institution (In press) *PAS 8811 Temporary works – Major infrastructure client procedures – Code of practice*

7) Temporary Works Forum (2012) *Competencies of the TWC* [Online] Available at: www.twforum.org.uk/publications/public-twf-documents/ (Accessed: October 2016)

FURTHER READING:

Carpenter J. (2011) *Designing for safer concrete structures*, London, UK: MPA Concrete Centre

A range of other useful information is also available on the TWf website at www.twforum.org.uk.