



**Temporary Works  
forum**

Promoting best practice in  
the construction industry.

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## Principles for the management of temporary loads, temporary conditions and temporary works during the construction process

### PREAMBLE

#### 1. Introduction

- 1.1 'Temporary works' is a widely used expression in the construction industry for an engineered solution which is used during the construction process to provide support, restraint or access. It tends to exclude machinery and plant when used in standard configurations, but does include bespoke equipment, support to plant and modifications to plant that are specific to the project.
- 1.2 Temporary works become redundant once the permanent works are built and have attained full strength and are normally removed.
- 1.3 One of the most important questions in temporary works is simply: 'When and where are temporary works needed and how long do they need to be in place?' Many failures occur because it is assumed that structures, excavations, stockpiles and other features on construction sites will stand up on their own, at each and every stage of construction, when in fact they won't. Engineering analysis is needed to back up such judgements.
- 1.4 The management of temporary loads and temporary conditions is intimately bound up with temporary works, as the title of this document implies, and the three aspects of construction can be managed using a common approach.
- 1.5 This document is in two parts:
  - Discussion (**Part A**); and
  - Principles (**Part B**).

## PART A - DISCUSSION

### 2.0 Examples

#### 2.1 Some examples of temporary works are:

##### **Earthworks**

Support to trenches, excavations, temporary slopes and stockpiles

##### **Structures**

Formwork, falsework, propping, façade retention, needling, shoring, edge protection, scaffolding, temporary bridges, site hoarding and signage, site fencing, cofferdams

##### **Equipment and plant foundations**

Tower crane bases, supports, anchors and ties for construction hoists and mast climbing work platforms, groundworks to provide suitable areas for plant erection, e.g. mobile cranes and piling rigs, mechanical equipment and special configurations bespoke to the project

#### 2.2 Some examples of temporary loads are:

- using a ground level slab over a basement as a vehicle access bay;
- storage of materials during construction;
- backpropping loads;
- positioning an excavator on a building upper level as a part of the demolition sequence;
- loads induced in components while they are lifted;
- loads from temporary works;
- loads on the ground from heavy plant.

#### 2.3 Some examples of temporary conditions are:

- part built bridges;
- high-rise building cores that are advanced above the floor plates and thereby lack torsional stiffness;
- early-striking of concrete;
- excavations which are partly dug, immediately before the lowest level slab is installed;
- masonry which is nearly full height but not yet reaching its head restraint.

### 3 Consequences of failure

- 3.1 Any failure of temporary works may lead to collapse of the temporary works and/or the permanent structure. In addition, any failure of a permanent structure which is in a temporary condition but self-supporting is obviously just as catastrophic. Both can cause injury or death, as well as loss of time and money.
- 3.2 The causes of many past temporary works and temporary condition failures were foreseeable and could have been prevented by proper consideration when planning, erecting, installing, loading, using or dismantling.
- 3.3 Investigations into incidents, including collapses, have identified that a lack of co-ordination between the various parties, including designers, contractors, sub-contractors, trades and equipment suppliers has contributed significantly if not critically.
- 3.4 Failures often occur during fairly simple work sequences managed by smaller contractors, who may not employ design staff. In some cases, the work sequence was poorly conceived and the permanent structure was rendered unstable. In other cases, excavations or structures were expected to stand up on their own at an interim stage of construction, when they could not: the interim, or temporary, condition had not been considered. In other cases the need for temporary works was identified, but the temporary works were either unstable or not structurally adequate.
- 3.5 Responsibilities here lie with both contractor and designer(s):
- the **contractor** to check that the method of work is safe (and, if the contractor has no design staff, they can employ a specialist temporary works consultant); and
  - the **permanent works designer** (to fulfil what is generally held to be a requirement of responsible design, viz. that there is at least one identified safe sequence of construction) to identify constraints on the construction sequence or method, and when and where temporary works are needed.
- 3.6 The permanent works designer's conclusions in this regard are an important part of the contractor's brief. A review with the contractor, to check that they have understood requirements, is important, whatever the size of the job.

## 4 Management

- 4.1 The principles set out in this document (**Part B**) provide a generalised framework for the management of safe temporary works, temporary loads and temporary conditions. Individual countries, states and localities may have particular requirements. These local requirements should be integrated with the principles so that a simple, logical framework is provided.
- 4.2 The management of safe temporary works requires competence in all those involved; at individual, team and organisational level.
- NOTE: Competence is a combination of knowledge, skills, experience and training.
- 4.3 Communication, both written and verbal, is key to success and many problems result from a lack of dialogue, e.g. between the design and site teams.
- 4.4 Procedures should identify what should happen when things are not as expected, viz. 'change management'.

## 5. Objectives

- 5.1 The main objective for the management of safe temporary works and temporary conditions is to ensure that a safe system of work is maintained on site at all times. The principles described in this document are some of the key elements for such a safe system of work. There may be other requirements, depending on the work situation and the work task being performed.
- 5.2 What matters is that the management system adopted in any given situation is practical and achieves its aims:
- the avoidance of structural collapses;
  - the avoidance of faulty workmanship arising from poorly designed or built temporary works or sequences of work; and
  - the enablement of good practice for matters such as occupational health and safety, safe access, safe work at height and edge protection and safe lifting.

## 6. Elements of a safe system of work

6.1 Key elements of a safe system of work include, but are not limited to, the following:

- Clear expectations set by corporate leadership and client (or client's agent) backed up by appropriate, unwavering behaviours;
- Corporate governance which sets out an operational framework, including the requirement to measure performance and make periodic reviews;
- Design which applies the principles of prevention and is also robust at all stages of construction;
- The use of design and execution codes, and good or best practice methods, applicable to the type of work and operational practices involved;
- Processes for the review of all design changes, innovations and value engineering which are as thorough as those for the original design;
- Proper planning and communication of the plan, with sufficient time and resource;
- The use of trained, competent persons, with proper levels of similarly competent supervision;
- Selection, maintenance and care of appropriate equipment;
- Proper control of working methods, including the following:
  - arrangements for the use of work equipment,
  - provision for emergency procedures,
  - protection of third parties.

## PART B - PRINCIPLES

- 6.1 All organisations involved in the design or site management of construction works<sup>1</sup> should appoint one **responsible person**<sup>2</sup> to establish procedures across the whole company for the design and management of temporary works and temporary conditions, and for the training and competency of all those involved, both in design and on site.

NOTE: The responsible person should give leadership to those involved in the discipline. The company-wide procedures must be sufficiently adaptable so that they can be applied in all circumstances relevant to the company's portfolio of work and forms of commercial involvement, but sufficiently prescriptive, that they remain auditable in all circumstances.

NOTE: The responsible person should provide support and back-up to nominated coordinators.

NOTE: Design practices (of both permanent and temporary works) should have such a person, as well as contractors and sub-contractors. In a permanent works design practice, procedures will be needed to eliminate hazards and reduce risks from the temporary states of permanent works and from temporary works. In a temporary works design practice, procedures will be needed to eliminate hazards and reduce risks from the temporary works themselves, giving consideration to their handling, erection, use and dismantling sequences. In all cases, where there is residual risk, either the risk and its controls must be obvious beyond reasonable doubt, or else the designer must make clear where temporary works or prescribed sequences of work are needed, and what the performance requirements (e.g. strength and stiffness) of any temporary works are.

NOTE: Client organisations should give thought to appointing such a person. Even if not, a person in this role, championing the safe execution of the works, will help to safeguard programme and cost, and will help ensure that the right priorities are established in the procurement process and followed during construction.

- 6.2 Company procedures should address the following:

- (i) On each project there should be a nominated **coordinator**<sup>3</sup>, to establish the project's management controls for temporary works, temporary loads and temporary conditions.

NOTE: This person is appointed by the main contractor. They must have relevant and up-to-date training and both the qualifications and the experience appropriate to the complexity of the project. They must be given authority

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<sup>1</sup> It is assumed here that all construction work will involve temporary works, temporary loads and/or temporary conditions  
<sup>2</sup> In the UK, this is the **designated individual** (DI)  
<sup>3</sup> In the UK, this is the **temporary works coordinator** (TWC); in Germany a 'person responsible for the technical coordination of the work' must be nominated





as well as responsibility. It is recommended strongly that on major sites this person be an appropriately qualified engineer<sup>4</sup>.

NOTE: It is good practice that each project has one, and only one, nominated person who is given single point responsibility to lead and co-ordinate the project's temporary works. On smaller projects, the company-wide procedures should address how this person could work across many projects or combine temporary works responsibilities with other roles. On bigger projects, the company-wide procedures should address how a team should be structured.

- (ii) How **assistant(s)**<sup>5</sup> to the co-ordinator are appointed and managed.

NOTE: It is good practice that each contractor involved in a project should appoint one or more person in this role. The main contractor may opt also to appoint one or more such persons within their own organisation.

NOTE: Depending upon the level of risk and complexity a sub-contractor's **assistant** may require the competence of a **coordinator**.

- (iii) Identifying early what temporary works items or controlled sequences of work are required, and where they will be located on site.

NOTE: While some reliance may be placed on the designer of the works (permanent or temporary) to identify the need for temporary works or critical sequences, contractors should make an engineering review of the work sequence and form their own judgement on the safety of the proposal.

NOTE: Where they stand up on their own, identify the temporary condition of permanent works as 'temporary works'. In these circumstances, ensure that any critical sequences of work are documented and controlled.

NOTE: Consider early on the integration of temporary works, permanent works and construction methods.

- (iv) Listing the temporary works items or controlled sequences of work, in a **schedule**<sup>6</sup>.

NOTE: Break the items into sub-items where design and/or procurement will be broken into parts.

- (v) Preparing a **specification**<sup>7</sup> for each item and sub-item of temporary works.

- (vi) Appointment of the **designer**<sup>8</sup> to design each item, or sub-item, of temporary works.

NOTE: Designers should consider constructability. They should identify and communicate significant residual risks, state any assumed methods and limitations, as well as identify temporary loads and conditions.

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4 In the UK, this would mean a Chartered Civil and/or Structural Engineer  
5 In the UK, this is the **temporary works supervisor** (TWS)  
6 In the UK, this is the **temporary works register**, maintained by the TWC  
7 In the UK, this is known as the **design brief**  
8 In the UK, known as the **temporary works designer** (TWD)



NOTE: Any design(s) should conform to the specification. Where appropriate the temporary works designer(s) will need to liaise with the **permanent works designer(s)** and, if there are more than one group of temporary works designers involved, with one another.

NOTE: Where the design is broken into sub-items, one of the temporary works designers should act as the 'lead designer' to coordinate the various elements of temporary design and act as the lead in liaison with the permanent works designer(s) and the site team.

NOTE: Any company procedures should address how temporary works designers sub-let elements of design.

NOTE: All designers must be competent and company procedures should address how competence is assessed, both the competence of the design practice as a whole, and the competence of individuals.

NOTE: Where a complex item of temporary works is designed in more than one design package, particularly if this means two or more designers are involved, then the item should be broken down into sub-items, such that there is only one designer per sub-item. Note that 'designer' in this context is the responsible party, which might be a design practice.

NOTE: Not all design is bespoke. Standards solutions may be available and appropriate.

(vii) Appointment of **design checkers**, to check the design of each item and or sub-item, of temporary works.

NOTE: It is recommended that different levels of design check<sup>9</sup> be adopted, depending upon the consequence of failure, the design complexity and the execution criticality.

NOTE: Any check(s) should confirm that the design meets the specification, and that the design outputs are to an adequate level of detail and clarity, and identify the residual risks.

(viii) Signing and issuing a design check certificate<sup>10</sup> for each item, or sub-item, of temporary works.

NOTE: This certificate should be signed by both the designer and design checker.

NOTE: For low risk temporary works a signed drawing may be a suitable check.

(ix) Where the design is in sub-parts, ensuring that the overall design is checked holistically and that the lead designer issues a check certificate confirming its adequacy as a whole.

NOTE: The overall check certificate should collate the specifications and check certificates for all the items and sub-items and be signed by the coordinator, as well as the checker.

(x) Appointment of a competent site team.

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<sup>9</sup> In the UK, refer to **Table 1** in **BS 5975:2008+A1:2011**  
<sup>10</sup> In the UK, this is the **design check certificate**



- (xi) Ensuring that there is a document control system in place; and that the site is issued with the correct drawings, etc.  
NOTE: Risk assessment(s) and method statement(s) should be job-specific.
- (xii) Assurance that the correct drawings and documentation are used on site.
- (xiii) Assurance that the correct materials and equipment are procured.
- (xiv) Briefing the site team, including the workforce, on the relevant hazard identification, risk assessment, method of work, drawings, etc.
- (xv) Appropriate planning and preparation of the site; checking the reality of the circumstances assumed by designers.
- (xvi) Competent construction, erection and installation of the temporary works in compliance with the drawings and other design outputs.
- (xvii) Periodic inspection of the temporary works; with appropriate use and maintenance.  
NOTE: The works should be inspected against the correct documentation.
- (xviii) Utilisation of hold points<sup>11</sup> to ensure that critical sequences are followed and any prior-identified checks have been undertaken before work is allowed to proceed beyond critical points.  
NOTE: In all cases the hold point must be used prior to the loading or unloading of any temporary works, or similar load bearing structure. It must be signed by the coordinator, or an assistant (as permitted beforehand in writing). The coordinator and lead designer must be satisfied that the entire temporary structure is built as designed.  
NOTE: Great care should be taken to control interim effects on temporary works from a 'temporary temporary condition'. For example, during concrete pours on falsework, the live load is many times greater than the dead load and, part way through the pour, part of the falsework is 100% loaded and the rest is hardly loaded at all; add to this that imbalanced horizontal loads from side shutter reactions can develop early before the main stabilising mass is present. Another area of risk is from load re-distribution, e.g. during pre-stressing.
- (xix) Once the permanent works are sufficiently complete, having gained the required strength and so forth, there should be a planned safe method to dismantle, decommission or take it down (and transfer the load from the temporary works into the permanent works).

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<sup>11</sup> In the UK, examples of hold points include permit-to-load, permit-to strike, permit-to-fix, etc.



NOTE: Some temporary works, by agreement with the designer and coordinator, may be left in position, e.g. they are sacrificial or become part of the permanent works.

NOTE: A proper removal sequence should be given, not just stated as 'the reverse of installation'.

- (xx) Methods to collate any feedback and learning; and disseminate any lessons learnt to the appropriate parties and, where appropriate, the industry as a whole<sup>12</sup>.
- (xxi) Methods to close the item, or sub-item, in the register.

## SOURCES OF ADVICE

1. UK Temporary Works Forum, [www.twforum.org.uk](http://www.twforum.org.uk)
2. Hong Kong Temporary Works Forum, [www.twforum.org.hk](http://www.twforum.org.hk)
3. DIN 4421:1982-08, Title (German): Traggerüste; Berechnung, Konstruktion und Ausführung (withdrawn)
4. BS EN 12812:2008, Falsework. Performance requirements and general design<sup>13</sup>
5. BS 5975:2008+A1:2011, Code of practice for temporary works procedures and the permissible stress design of falsework<sup>14</sup>

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10.9.17

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<sup>12</sup> In the UK, issues can be reported to **CROSS** (<http://www.structural-safety.org/>); although this can be used globally also

<sup>13</sup> <https://shop.bsigroup.com/ProductDetail/?pid=000000000030171945>

<sup>14</sup> <https://shop.bsigroup.com/ProductDetail/?pid=000000000030240690>