CDM

TW+

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This is not a course

- TWS – supervisor -
- TWC – co-Ordinator – managing all forms of temporary works

- The need for a temporary works co-ordinator
- The day to day roles of others involved in the temporary works procedures
- Risk assessments and method statements
- Best procedures as stated in BS 5975:2019

- The Temporary Works Supervisor course will provide you with knowledge of the role. You will also gain a good understanding of risk management on a temporary works site.

Purpose

- This document should be used as the basis for undertaking operational work on this topic in accordance with Construction Division's current work plan.
- TW is a new topic introduced in to the work plan in order to highlight and better control the risks associated with all types of temporary works on construction sites (although there are clear links to existing priorities, eg tower crane safety and structural stability). As this is new work, the SIM will be reviewed and revised in the light of operational experience and, as such, constructive feedback would be welcomed.
- The aim of the planned work is to:
  - Promote awareness and knowledge of the importance of managing temporary works
  - Improve contractors' management arrangements of temporary works
  - Increase the competence of those engaged in temporary works management and design
  - Reduce accidents arising from temporary works failures

Background

- "Temporary works" is a widely used expression in the construction industry for an "engineered solution" used to support or protect an existing structure or the permanent works during construction, or to support an item of plant or equipment, or the vertical sides or side-slopes of an excavation, or to provide access. The construction of most types of permanent works will require the use of some form of temporary works.

- Temporary works is defined in BS5975: 2008 "Code of practice for temporary works procedures and the permissible stress design of falsework" as "(those) parts of the works that allow or enable construction of, protect, support or provide access to, the permanent works and which might or might not remain in place at the completion of the works".

Background

- Examples of temporary works include, but are not limited to:

  - Earthworks - 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/plant foundations - tower crane bases, supports, anchors and ties for construction hoists and mast climbing work platforms (MCWPs), groundworks to provide suitable locations for plant erection, eg mobile cranes and piling rigs. Further information on temporary works design principles and the consequences and causes of failure are set out in Appendix 1.

Background

- The correct design and execution of temporary works is an essential element of risk prevention and mitigation in construction.
- BS 5975 provides recommendations and guidance on the procedural controls to be applied to all aspects of temporary works in the construction industry and on the design, specification, construction, use and dismantling of falsework.
- Background information on the impact of changes to the construction industry on temporary works management and the history of BS 5975 are set out in Appendix 2.

Temporary works procedures

- Contractors should be able to demonstrate that they have in place effective arrangements for controlling risks arising from the use of temporary works. These are usually captured in a temporary works procedure which will contain most or all of the following elements:

  - Appointment of a Temporary Works Co-ordinator (TWC)
  - Preparation of an adequate design brief.
  - Completion and maintenance of a temporary works register
  - Production of a temporary works design (including a design risk assessment and a designer's method statement where appropriate).
  - Independent checking of the temporary works design.
  - Issue of a design/design check certificate, if appropriate.
  - Pre-erection inspection of the temporary works materials and components.

Temporary works procedures

- Control and supervision of the erection, safe use, maintenance and dismantling of the temporary works – ie, procedures to:

  - Check that the temporary works have been erected in accordance with the design, and issue a formal "permit to load" where necessary.
  - Confirm when the permanent works have attained adequate strength to allow dismantling of the temporary works, and issue a formal "permit to dismantle" where necessary.
  - The procedure should include measures to ensure that the design function, the role of TWC, and Temporary Works Supervisor(s) where appropriate, are carried out by competent individuals.
  - Smaller contractors may not have the experience to operate their own temporary works procedure and may need to obtain external expertise. It is also common for large and medium contractors to outsource aspects of temporary works design and management.

Temporary Works Coordinator (TWC)

- The TWC is responsible for ensuring that the contractor's procedures for the control of temporary works are implemented on site. The TWC is not normally the designer, but is responsible for ensuring that a suitable temporary works design is prepared, checked and implemented on site in accordance with the relevant drawings and specification.
- The principal activities of the TWC are listed in Clause 7.2.5 of BS5975:2008. On some projects, particularly smaller jobs involving lower risk temporary works, it may be appropriate for the TWC and designer roles to be carried out by the same person, provided that he/she is competent to carry out each of the roles.
- The TWC for a project should be formally appointed and have adequate authority to carry out his/her tasks, including stopping the work if it is not satisfactory. It is essential that those selected to act as TWC are competent with relevant up-to-date training, and experience and qualifications appropriate to the complexity of the project.

Temporary Works Coordinator (TWC)

- **Ideally** a TWC would:
  - Have experience of the relevant types of temporary works.
  - Have completed formal TWC training.
  - Hold a Degree / HND in civil/ structural engineering.
  - Be a Chartered Civil / Structural Engineer
- Although a Chartered Civil or Structural Engineering qualification is desirable, the numbers with these qualifications and with experience of the co-ordination of temporary works, is unlikely to be sufficient to provide cover for all projects.
- The key attributes of a competent TWC are in order of priority:
  - relevant experience,
  - formal TWC training and
  - professional qualifications.
  - TWCs should have the competence and authority to be effective

Temporary Works Supervisor (TWS)

- On larger sites, or where a number of subcontractors are involved, it may be appropriate for one or more Temporary Works Supervisors (TWS) to be appointed. A TWS should be responsible to the TWC and assist the TWC in the supervision of temporary works.

Temporary Works Register

- It is useful for a temporary works register to be prepared for any project. It should contain a list of all identified temporary works items associated with the project. These can be set out as a table using appropriate headings, which could include:

  - Design brief number (for each item) and date issued
  - Short description of temporary works
  - Date required
  - Category of temporary works
  - Designer
  - Design Checker
  - Date design complete
  - Date design checked/approved
  - Erection complete and checked or "Permit to Load" "Permit to Dismantle"

Design brief

- A design brief should be prepared for each item of temporary works to serve as the focus for subsequent decisions, design work calculations and drawings.
- It should include all data relevant to the design of the temporary works and should be prepared in good time to allow for all subsequent activities.
- The brief may be relatively simple for the smaller schemes, but for major work, more information will need to be collected and collated before design work can commence.
- The TWC should ensure that an adequate design brief is provided to the designer and design checker of the temporary works.

Temporary works design

- The design of the temporary works should be based on the agreed design brief. Any proposed alteration or modification of the design brief by the designer should be referred back to the TWC.
- The temporary works should be designed in accordance with recognised engineering principles. The preparation of design calculations, drawings and specification should be undertaken with similar rigour to the procedures applied to the design of the permanent works.
- Temporary works designers include; the manufacturers and suppliers of proprietary temporary works equipment and those working in a contractor's temporary works department or office.

Examples

Temporary works designs are sometimes categorised to indicate the complexity/simplicity of the specific temporary works structure and the potential risk.

Simple and/or potentially low risk temporary works

- Standard scaffold
- Formwork less than 1.2m high
- Hoarding and fencing up to 1.2m high
- Simple propping schemes – 1 or 2 props
- Internal hoarding systems and temporary partitions not subject to wind loading
- Shallow excavations less than 1.2m deep/high

More complex and/or potentially medium risk temporary works

- Falsework up to 3m high
- Formwork for columns and walls up to 3m high
- More complex propping schemes – multiple props at single level
- Needling of structures up to 2 storeys high
- Excavations up to 3m deep/high
- net systems not fixed to robust primary members
- Hoarding and fencing up to 3m high
- Simple designed scaffold
- Temporary roofs

Examples - Complex and/or potentially high risk temporary works

- Falsework and formwork over 3m high
- Trenchless construction, including headings, thrust bores, mini tunnels
- Working platforms for cranes and piling rigs
- Tower crane bases
- Façade retention schemes
- Flying and raking shores
- Complex propping schemes – multiple props and multiple levels
- Needling of structures greater than 2 storeys high
- Ground support schemes greater than 3m deep
- Complex designed scaffold
- Cofferdams
- Bridge erection schemes
- Jacking schemes
- Complex structural steelwork and precast concrete erection schemes
- Hoarding and fencing over 3m high

Consideration

- In practice, even relatively simple temporary works may require careful consideration in their design, construction, commissioning, inspection and loading.
- An apparently simple temporary works job could lead to failure and even to fatalities if it is not competently executed.
- The choice of the appropriate temporary works solution, including the use of "standard solutions," is discussed in Clause 9.4 of BS5975: 2008.
- A "standard solution" is an arrangement for which the basic design work has already been carried out and is presented in a tabular or similar form, and for which no further calculations are required.

Design Checks

- Before erection commences, the temporary works design should be checked for:
  - Design concept
  - Strength and structural adequacy (including foundations and lateral stability)
  - Compliance with the design brief.
  - The design check should be carried out by an independent competent person(s) . The ability and independence of the checker should be greater where the temporary works are more complex or where new ideas are incorporated.
  - Recommendations for various categories of design check are given in Table 1 of BS5975:2008

Temporary works management arrangements suitable for small contractors

- For smaller contractors, the principles of BS5975 should be in place if not the formal and specific procedures, in particular:
  - ensuring a suitably competent temporary works designer/adviser is in place to supply an engineered solution,
  - adequate information flow,
  - design checking to an appropriate level,
  - suitable verification of correct erection of the temporary works and someone overseeing and co-ordinating the whole process.
- Smaller contractors may not have anyone sufficiently experienced to plan effectively all but the most simple temporary works. There should be clear evidence that appropriate external expertise has been engaged.
- This includes obtaining the services of a suitably competent TWC and temporary works designer to ensure temporary works are effectively designed, constructed, inspected, loaded and managed. On some projects, particularly smaller jobs involving low risk temporary works, it may be appropriate for the TWC and designer roles to be carried out by the same person.

The role of CDM co-ordinators

- CDM co-ordinators should take reasonable steps to ensure co-operation between permanent and temporary works designers, in particular to ensure that arrangements are in place to ensure that designs are compatible and that the permanent works can support any loadings from temporary works.
- CDM co-ordinators also have a duty to advise clients on the suitability of the initial construction phase plan.
- Amongst the topics that need to be considered when drawing up the construction phase plan, as listed in the ACOP, are the arrangements for controlling significant site risks including, the "stability of structures whilst carrying out construction work, including temporary structures and existing unstable structures" and "work on excavations and work where there are poor ground conditions".

Design principles

- In order to ensure the strength and stability of any temporary works structure, there are 3 fundamental aspects that need to be considered which can be simplified as follows:
  - Foundations – the ability of the ground to carry the loads transmitted from the temporary works structure without failure or excessive deformation or settlement.
  - Structural integrity – the ability of the temporary works structure itself to carry and transmit loads to the ground via the foundations without failure of the structural elements, including fixings and connections (eg by buckling, bending, shear, tension, torsion), and without excessive deflection.
  - Stability – the ability of the temporary works structure to withstand horizontal or lateral loading without sway, overturning or sliding failure (stability may be inherent in the temporary works structure itself or provided by the permanent works).

Consequences of temporary works failure

- Failure to adequately design, construct and maintain temporary works can lead to:
  - Collapse or failure of the temporary works
  - Structural failures and collapse of the permanent works
  - Uncontrolled ingress or egress of materials, spoil and water
  - Collapse of adjacent structures (buildings, transport systems, infrastructure)
  - Risk of single/multiple fatalities and serious injuries to workers and members of the public
  - Risk of significant delay and increased costs to construction projects
  - Significant financial and commercial risks to contractors, sub-contractors, designers, suppliers, and clients

Causes of temporary works failures

- The main causes of temporary works failures include:
  - Absence of or an inadequate temporary works procedure
  - No temporary works coordinator (TWC) appointed
  - Inadequate site investigation (including geotechnical investigation, identification of underground services, assessment of the structural condition of existing and/or adjacent buildings)
  - Inadequate, or lack of, design brief
  - Inadequate, or lack of, design for the temporary works
  - Inadequate, or lack of, appropriate level of checking of temporary works designs
  - Lack of awareness on site of temporary works design assumptions
  - Unavailability of temporary works equipment
  - Inappropriate use of temporary works equipment
  - Poorly constructed temporary works and/or absence of checking of adequate erection.
  - Unauthorised changes to an approved temporary works design
  - Overloading of temporary works, ie failure to control loading or lack of awareness of the capacity of the equipment (eg Acrow props)
  - Inadequate communication of details of the temporary works design to the erectors
  - Inadequate foundations for the temporary works
  - Lack of adequate lateral stability for the temporary works

For more info - The management of temporary works in the construction industry

- SIM 02/2010/04 is currently being revised but this work is on hold pending publication of the next revision of BS5975.
- The content of the SIM remains valid. However readers should note that the listed legislation has been updated and reference should be made to the Construction (Design and Management) Regulations 2015 which has replaced the 2007 version referred to.
- Changes affecting this SIM are largely limited to changes to the applicable Regulation number - with the exception that, in this SIM only, the term 'Principal Designer' can be directly substituted for the listed term 'CDM Coordinator'.
- This can be done without affecting the accuracy of the text. Where the SIM refers to an Approved Code of Practice (ACOP) reference should instead be made to HSE Guidance publication L153 which is freely available via the HSE website.