Section 1 - General

1 Scope

This British Standard gives recommendations and guidance on the procedural controls to be applied to all aspects of temporary works in the construction industry. It also includes guidance on design, specification, construction, use and dismantling of falsework. This standard gives guidance on permissible stress design of all falsework. The guidance also applies to the design of class A falsework1 defined in BS EN 12812, the design of which is specifically excluded from BS EN 12812.

Section 1 gives recommendations in relation to training and education.

Section 2 gives recommendations for procedures to ensure that temporary works are conceived, designed, specified, constructed, used and dismantled all in a safe and controlled manner suitable for all construction projects. These procedures include clauses relating to all roles involved in temporary works: clients, permanent works designers, temporary works designers, contractors (including construction management organizations), suppliers and manufacturers. Construction sites and methods adopted for controlling the temporary works vary. This British Standard recognizes that the extent of control measures required are greater on the larger or more complex projects, as can be encountered on major infrastructure projects, power stations, airports etc. Generally procedures are to be in accordance with this standard but additional client specific procedures might be required on major infrastructure projects.

Section 3 covers the design of temporary works and in particular the design of falsework and relevant formwork. In addition Section 3 covers: materials including material factors; loads and load factors; design of falsework, including both proprietary equipment and traditional scaffolding solutions; wind loading (reference to temporary and permanent stability) and reference to other British Standards for the design of structural steelwork, reinforced concrete and excavation support. Although Section 3 was written for permissible stress design, the design concepts and the service loads stated are applicable to limit state design. The loads, including wind loads, are the unfactored service loads and conform to both BS EN 1991-1-4 and BS EN 12812.

The structural design element in this British Standard is additional information necessary for the structural design of falsework. It can be used in conjunction with existing structural standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 449-2:1969 (withdrawn), *Specification for the use of structural steel in building — Part 2: Metric units*

BS 648 (withdrawn), *Schedule of weights of building materials*

1BS EN 12812 states that design class A is only to be adopted where: a) slabs have a cross-sectional area not exceeding 0.3 m2 per metre width of slab; b) beams have a cross-sectional area not exceeding 0.5 m2; c) the clear span of beams and slabs does not exceed 6.0 m; d) the height to the underside of the permanent structure does not exceed 3.5 m.

2

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions, together with those given in Annex E, apply.

3.1 adjustable telescopic steel prop

prop comprised of two tubes which are telescopically displaceable one within the other

*NOTE 1 See also **3.39** prop.*

NOTE 2 A prop has coarse adjustment with a pin inserted into holes in the inner tube and a means of fine adjustment using a threaded collar.

3.2 Asset

permanent structure, building, wall, tunnel, rail track, waterway, road, cutting or earthwork which provides support to a structure, rail track, waterway, road or other construction

3.3 Backpropping

propping installed at levels below the slab that supports the falsework in order to distribute the load on the uppermost slab to suitable supports, such as lower slabs or the foundations

3.4 Base plate

rigid plate used for spreading the load in a standard, raker or other load-bearing member over a greater area

3.5 Bay length

distance between the centres of two adjacent standards, measured horizontally

3.6 Beam bearer

spanning member, usually horizontal, used to transfer load to supports, commonly timber, aluminium or steel

3.7 Blinding

layer of lean concrete on soil to prevent local degradation and provide a clean workplace for construction work

3.8 Brace

component placed diagonally with respect to the vertical or horizontal members of a structure to afford stability

3.9 Camber

internal curvature of a beam or formwork, either formed initially to compensate for subsequent deflection under load, or produced as a permanent effect for aesthetic reasons

3.10 Characteristic strength

strength at which members tested would fail, normally associated with a confidence limit that 95% would fail above the value stated

3.11 Check list

document that lists activities that need inspection and/or testing

NOTE 1 This list could be available as either a generic list, as an aide-memoire on a particular subject, or as a specific list sequencing the activities in correct order.

NOTE 2 This can be enhanced with a signature to verify that the work has been completed satisfactorily as part of the management process.

NOTE 3 An example of a specific check list would be the order of activities to operate a climbing or advancing formwork system, to ensure that the correct sequence was carried out.

3.12 Client

organization or person for which/whom a construction project is carried out

3.13 Competent person/organization

person/organization with the necessary skills, knowledge and experience (and organizational capability) of the specific tasks to be undertaken and the risks which the work entails, to enable them to carry out their duties in relation to the project, to recognize their limitations, and to take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work

3.14 Component

part of the temporary works structure used and identifiable as a distinct unit

3.15 Contractor

any person (including a non-domestic client) who, in the course or furtherance of a business, carries out, manages or controls construction work

NOTE 1 Anyone who directly employs or engages construction workers or manages construction is a contractor. Contractors include principal contractors, sub-contractors, any individual, sole

trader, self-employed worker, or business that carries out, manages or controls construction work as part of their business. This also includes companies that use their own workforce to do construction work on their own premises. The duties on contractors apply whether the workers under their control are employees, self-employed or agency workers.
NOTE 2 Where contractors are involved in design work, including for temporary works, they also have duties as designers under the CDM Regulations 2015 [1].

3.16 Coupler
component used to fix scaffold tubes together

3.17 Design certificate
certificate issued by the designer to indicate that the design is satisfactory and conforms to the design brief, and where provided, the design statement

3.18 Design statement
document prepared by the designer outlining the means by which the design is to be developed, the assumptions, method of analysis and other controls
NOTEThe design statement can include the potential of the temporary works to affect/impact operational infrastructure.

3.19 Designated individual (DI)
senior person within an organization with responsibility for establishing, implementing and maintaining a procedure for the control of temporary works for that organization

3.20 Domestic client
client for whom a project is being carried out which is not in the course or furtherance of a business of that client
NOTELocal authorities, housing associations, charities, landlords and other businesses might own domestic properties, but they are not considered to be a domestic client for the purposes of the CDM Regulations 2015 [1]. If the work is in connection with a business attached to domestic premises, such as a shop, the client is not a domestic client.

3.21 Effective length
theoretical length of a compression member as determined by the restraint at its ends

3.22 Factor of safety
ratio of failure load to the maximum working load

3.23 Falsework
temporary structure used to support a permanent structure while it is not self-supporting

3.24 Floor centre
beam of adjustable length, usually a metal lattice or sheet metal box beam, used to support decking for a floor slab

3.25 Joint pin
expanding fitting placed in the bore of a tube to connect one tube to another coaxially

3.26 Joist
small horizontal or sloping member, e.g. the horizontal members that carry decking for a suspended concrete slab

3.27 Kentledge
material placed on a structure to provide stability by the action of its dead weight

3.28 Lacing
generally horizontal members that connect together and reduce the unsupported length of compression members

3.29 Node
theoretical point where two or more members are connected together

3.30 Permissible stress
stress that can be sustained safely by a structural material for the particular condition of service or loading

3.31 Permit

certificate issued to release a hold point
NOTE Examples include permit to load, permit to take out of us

3.32 Primary
principal bearing member transferring load to the falsework

3.33 Prop
compression member used as a temporary support

3.34 Quality control check list
document that lists the elements of an inspection or test, that is endorsed to show that the item of work has satisfied that inspection or test, or that the operation has been witnessed

3.35 Re-propping
system used during construction in which the temporary supports to a recently cast slab are removed and replaced in a planned sequence

3.36 Scaffold
temporary structure that provides access, or on or from which persons work, or that is used to support material, plant or equipment
NOTE See also 3.23 falsework.

3.37 Soffit
underside surface of a concrete member or slab

3.38 Sole plate
timber, concrete or metal spreader used to distribute the load from a standard or baseplate to the ground

3.39 Standard
vertical tube or member

3.40 Strength class
classification of timber based on particular values of grade stress

3.41 Strut
member in compression
NOTESee also 3.39 prop.

3.42 Sub-consultant
individual or organization appointed by a consultant or designer to provide technical advice, including advice on methodology, and/or design in a specialist area of temporary or permanent works

3.43 Sub-contractor
contractor employed by another contractor to carry out or manage construction work
NOTESee also 3.15 contractor.

3.44 Sway
horizontal displacement at the top of the falsework in relation to the bottom, under application of the load

3.45 Temporary works co-ordinator (TWC)
competent person with responsibility for the co-ordination of all activities related to the temporary works

3.46 Temporary works supervisor (TWS)
competent person who is responsible to and assists the temporary works co-ordinator

3.47 Third party
party, independent of the project, whose procedures are to be followed, and approvals obtained, for temporary works proposals affecting their assets, users or their land ownership
NOTEAn example of a third party would be a highway authority, affected by a new rail structure over their asset, required as part of the client's project.

3.48 Top restraint
method by which stability of falsework is provided by surrounding permanent works or specifically designed temporary works

3.49 Tower

tall composite structure, used principally to carry vertical loading

3.50 Wedge

piece of material, timber or metal that tapers in its length and is used to adjust elevation or line or angle

NOTE Folding wedges comprise a pair of wedges laid one above the other so that their outer faces are parallel.

4 Abbreviations and symbols

The following symbols are used in this British Standard:

5Overview of temporary works procedures and training

5.1Overview of procedures

5.1.1General

5.1.1.1 Temporary works can be described as providing an "engineered solution" that is used to support or protect either 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 during construction operations on site or to provide access. It is used to control stability, strength, deflection, fatigue, geotechnical effects and hydraulic effects within defined limits. This description of temporary works includes, but is not limited to:

a) supporting or protecting either an existing structure or the permanent works during construction, modification or demolition;
b) provision of stability to the permanent structure during construction, pre-weakening or demolition (e.g. propping, shoring, facade retention etc.);
c) securing a site, or providing access to a site or workplace on site or segregation of pedestrians and vehicles (e.g. hoarding, haul roads, fencing, stairs);
d) supporting or restraining plant, materials or equipment, including stability of water-borne craft;
e) provision of earthworks or slopes to an excavation or supports to the side or roof of an excavation or supports or diversions to watercourse during construction operations;
f) providing a safe platform for work activity on land or water (e.g. jetty, scaffolding, edge protection or towers);
g) providing measures to control noise, dust, debris, fume, air quality, groundwater or any site discharges during construction or demolition (e.g. screens, bunds, de-watering, demolition debris);
h) providing protection or support to services; and
i) facilitating testing (e.g. pressure testing pipes, pile testing, pre-demolition floor load capacity testing).

5.1.1.2 The temporary works could be removed or left in place (hence becoming sacrificial, e.g. profiled metal decking) after the completion of the permanent works, but in the latter case would not necessarily contribute to the strength of the permanent works.

5.1.1.3 When a project has, or might be anticipated to have, the requirement for any temporary works, all organizations involved in the management of the temporary works, whether implemented by themselves or others, should have and implement a procedure which outlines how they are to discharge their duties in relation to the temporary works.
NOTEThe purpose of the procedures is to manage and control the organization's involvement both within their own organization and when they are employing others or working with other

organizations to carry out temporary works roles.

5.1.1.1 This overview explains the core principles and organizational interfaces which are recommended, before expanding on the procedural control details in Section 2.

5.1.1.2 All types of organizations, from the use of temporary works by small contractors to the very large organizations and/or utilities should use the procedures outlined in detail below. This includes civil engineering companies and building companies. The approach adopted in Section 2 is "organization focused" so the procedures for each organization are separated – it is accepted that this includes some duplication of text.

NOTEThe term "organization" includes clients, designers, permanent works designers, temporary works designers, principal designers, contractors, principal contractors, sub-contractors, specialist contractors, third-party contractors and supplier/manufacturers.

5.1.1.3 To cater for the wide range of knowledge, skills, experience and qualifications which are encountered, this British Standard is drafted in the broadest terms. This should allow the duties, of the TWC and TWS for example, to be carried out by individuals who do not have engineering qualifications.

5.1.1.4 One of the main aims of the procedure and the method of work adopted, should be to minimize the chance of errors being made, and to maximize the chance of errors being discovered if they are made. There should be effective communication of information and requirements between all levels of the construction organizations involved, whether they are concerned primarily with the permanent works or the temporary works. An effective system of checking, both for the design and its implementation, should also be implemented.

5.1.1.5 Procedures should be put in place to manage potential problems in temporary works which can arise at interfaces. The interfaces might be:

a)between areas allocated to be managed by different people, controlled by appointing a lead person; between the perimeter of one area and another part of the PC's site, controlled by exchange of design briefs; or

b)between the design of the main temporary works and the design of additional items of temporary works by another designer, controlled by a lead designer.

5.1.1.6 Work on site should be directed, supervised and checked to ensure that the temporary works are constructed safely in accordance with the agreed design and sequence using materials of agreed quality, and that only when all checks have proved satisfactory are the temporary works used/loaded, and then taken out of use/unloaded in accordance with an agreed procedure (see **6.1.4**).

5.1.1.7 It should be recognized that there are three fundamental principles for controlling temporary works.

1)All organizations have a duty to manage and control their work.

2)The contractor is responsible for building the permanent works, and that includes any associated temporary works in order to construct the project.

3)One person should take overall responsibility for managing the temporary works. For very large or technically complex sites, this should be managed in accordance with **5.1.4.6**.

5.1.1.8 The first principle (see **5.1.1.10**) should be managed by the appointment of a "senior person", defined by the term designated individual (DI), who should be appointed to prepare and manage the organization's procedures.

5.1.1.9 The third principle (see **5.1.1.10**) that one person is to be appointed with overall responsibility for managing the temporary works on a site was first established in the Bragg Report [2]. A temporary works co-ordinator (TWC) should be appointed with overall responsibility for managing the temporary works on a site. This person should be appointed by the principal contractor and should be referred to as the "PC's TWC".

NOTEThe TWC can, if necessary, delegate certain day to day activities, such as site inspection, to a temporary works supervisor (TWS).

5.1.1.10 A TWC may be appointed by another contractor to manage their temporary works but this individual should be responsible both to their DI and the PC's TWC.

NOTEThe term "contractor" is taken to mean sub-contractor employed by the PC or a contractor employed directly by the client or a third party (see 3.15).

5.1.1.11 Many of the duties of the DI, the PC's TWC, TWC and TWS detailed in this British Standard are activities already being carried out "as routine" by competent persons in the construction team. The activities of these individuals should be formalized in company procedures in accordance with the various clauses below to ensure the temporary works are implemented in a controlled manner. Only in larger organizations and/or on larger sites, with significant temporary works, is it justified to employ specific staff exclusively in the role of DI or TWC.

5.1.2 Summary of control measures

Control measures should be used to ensure safety for all temporary works; a summary of these are given below.

a) Every organization that has an involvement with temporary works should appoint a senior person to prepare, maintain and implement the organization's procedure for the control of temporary works. This person, usually reporting to the board of directors, is referred to as the designated individual (DI). See 6.1.2.1.

b) Where there is only a single contractor on a site, the contractor should appoint a temporary works co-ordinator (TWC) responsible for all temporary works on that site. See 9.2.3d).

c) Where several contractors are on a project/site, the principal contractor (PC) should have a TWC (PC's TWC) responsible for all temporary works on the project. On particularly large or complex sites more than one PC's TWC may be appointed. See 9.3.2.5, 9.4.1, 9.5.1.6, 11.2.2.1 and 11.3.2.6.

d) The PC's TWC's should be appointed by the PC's DI. See 9.3.2.1.

e) The PC's TWC should be employed by the PC either as an employee, or be an employee of an organization contracted to provide the services of a TWC on behalf of the PC for all the temporary works on the site/project area. See 9.3.2.1.

f) Each PC's TWC should be responsible for a distinct, well-defined area of work. See 9.3.2.5.

g) Where necessary, the PC's TWC may be responsible for several projects if the level of temporary works on each project does not warrant a full-time TWC. See 5.1.4.4.

h) If there are multiple PC's TWC's on a site there should always be one who takes the role of lead PC's TWC. See 9.3.2.5.

i) A sub-contractor to the PC or another contractor (such as a client's contractor) who is contracted to manage their own temporary works and are working within a PC's TWC's area of responsibility should appoint a TWC. See 9.3.3.

The TWC should report to the relevant PC's TWC for

a)the area in which they operate. See 9.5.1.4, 11.2.4.1, 11.3.2.1 and 11.3.2.6The TWC should be appointed by the contracted organization's DI. See 9.3.3.1 and 9.5.1.3.

b)Where there is more than one PC's TWC and/or TWC, the limits of responsibility, interfaces and boundaries should be recorded in writing. See 9.1.2, 9.1.4 and 9.3.2.5.

c)The PC's TWC and TWC should have the same level of management training. Their technical and practical knowledge should be commensurate with the complexity of the work. See 5.2, 9.3.2.2 and 9.3.3.2.

d)Where required, the PC and contractor may appoint temporary works supervisors (TWSs) who report to their TWC. See 9.3.4.1.

e)The organization's DI may delegate the appointment of a TWS to an individual who has the necessary skill, knowledge and experience, for example a contract or project manager or their TWC for the project. The appointment of the TWS should be approved by the DI of the organization for whom the TWS works. See 9.3.4.3 and 9.3.4.4.

f)Except for very low risk temporary works, a design brief should be prepared for the

temporary works by the site team and issued by the TWC to the TWD. See 11.2.3, 11.3.3 and 13.2.

g)Where the category of design check has not been specified, the TWD, in consultation with the relevant TWC, should confirm the category and prepare the necessary design output. See 8.1.4a), 8.4.1.3 and 13.7.

h)The TWDC should carry out the design check of the temporary works, and, in certain categories without reference to the TWD's calculations, before issuing a certificate confirming the design is satisfactory. See 13.7.3.

i)The site team should construct the temporary works in accordance with the certified design. See 11.2.3, 11.3.3 and 14.1.

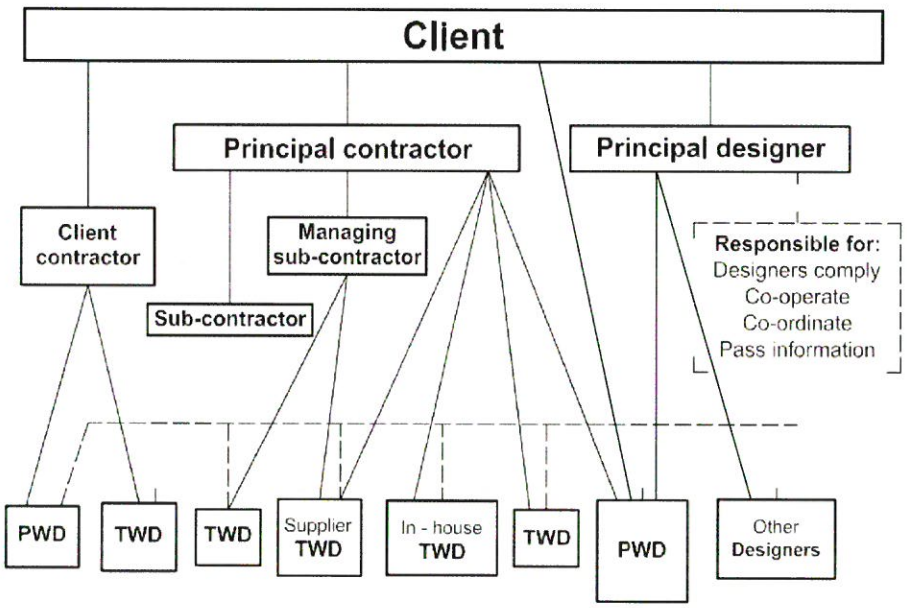
j)The TWC or TWS, as appropriate, should issue a permit to proceed confirming the temporary works have been erected in accordance with the certified design and any agreed revisions. See 11.2.3, 11.3.3 and 12.3.

5.1.3 Organizations involved in temporary works

5.1.3.1 There are many combinations of organizations that can be involved in temporary works. They can include clients, management contractors, contractors, sub-contractors, utility authorities, service suppliers (M&E), equipment suppliers, consultants and specialist contractors. Each have different contractual arrangements from project to project but the over-arching principle is that the PC's TWC has overall responsibility on site.

5.1.3.2 The framework of contractual relationships should be taken into account when planning the management of temporary works; an overview of likely contractual relationships between clients, contractors and designers, including both permanent work designers (PWDs) and temporary works designers (TWDs) is shown in Figure 1. Figure 1 also demonstrates the typical links showing how the designers should co-operate, even when not in a contractual relationship (shown as dashed).

Figure 1 — *Typical contractual interfaces between parties on a project*



NOTE 1 Attention is drawn to the CDM Regulations 2015 [1], which require the principal designer to take responsibility for all designers on that project and to co-operate, co-ordinate and transfer relevant information – this is shown by a dashed line.

NOTE 2 There is rarely a contract between the principal contractor and a client's contractor.

Responsibilities where a contractor co-ordinates the temporary works

5.1.4.1General

The various ways in which the control measures (see 5.1.2) are likely to be implemented on different projects of varying complexity are shown as lines of responsibility in Figure 2. In all the cases the sole contractor or principal contractor should manage and co-ordinate the temporary works on the project themselves.

5.1.4.2Small contracts

Small contracts, including domestic client projects, often have only one contractor. This is shown in Figure 2a) and applies to the majority of small organizations, including builders and scaffolding providers.

The contractor should have a company director responsible for the technical work of the company. This person is effectively the DI and their duties include control of any temporary works. In very small companies the same person might also take on the TWC role.

The temporary works is managed either by a TWC, or, more likely, the site would have a trade-based supervisor handling the day-to-day site temporary works, i.e. performing the TWS role.

5.1.4.3Projects with more than one contractor

If there is more than one contractor, one should be appointed as the principal contractor (PC); and it is the PC who takes the responsibility for the site and all the construction on it, whoever carries it out (see 5.1.1.12). The temporary works should be managed by the PC's appointed TWC, known as the PC's TWC.

Depending on the size or accessibility of the site, the temporary works may be controlled either directly by the PC's TWC or by responsible TWSs [see Figure 2b)]. If the site is large, or there is another site in the local area, then other TWSs could be incorporated into the TW control process. The arrangement at Figure 2b) is common to many construction sites operating with their own staff.

5.1.4.4PC with several sites

Small contractors, such as local house builders and many utility companies, operate with multiple small sites, often with only a few operatives to each site; they should operate in accordance with their organization's procedures, including the control of temporary works, even where they are undertaking routine work.

The PC's TWC should be appointed by the organization to cover the group of sites, and may be based

in a regional office. The day-to-day control should be left to the responsible TWS on each site. This procedure, shown at Figure 2c) is common practice with utility organizations and small building companies.

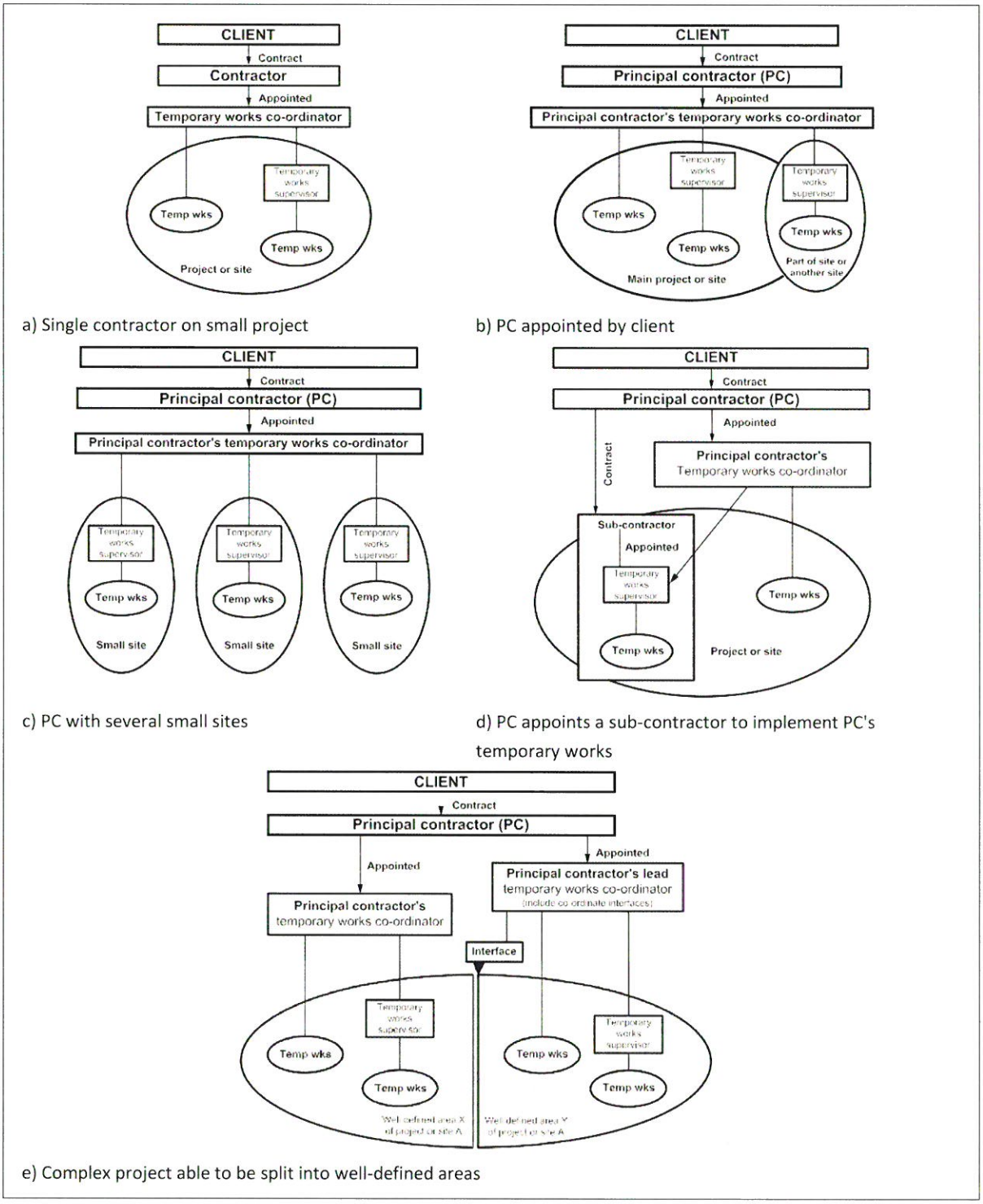
5.1.4.5PC appoints a sub-contractor

Where the PC appoints a sub-contractor to provide the labour, and possibly also the equipment to be used for the temporary works, but retains the management role for the temporary works, the contractual relationship changes. This is shown in Figure 2d).

The sub-contractor should manage their own work (see the first principle in 5.1.1.10) and should appoint TWS(s) to assume day-to-day responsibility. The sub-contractor's TWSs should report to the PC's TWC on all temporary works matters.

The management, design and control of the temporary works, along with any other temporary works on the site, should remain with the PC's TWC.

Figure 2 — *Lines of responsibilities where a single contractor or a principal contractor (PC) is co-ordinating the temporary works*



5.1.4.6 Splitting large/complex projects

Whereas the third principle (see 5.1.1.10) limits one person for ultimate control, this British Standard accepts flexibility for particularly technically or logistically complex projects. It would be unrealistic to give individual responsibility for knowing all that was going on to one person for a major project.

A project or site can be split into more than one well-defined area and a PC's TWC be

appointed for each area, e.g. a length of motorway or railway [see Figure 2e)]. Each individual PC's TWC should be responsible for all the temporary works in the area allocated, irrespective of which organization carries out the temporary works in the area (see 9.3.2.5). The principle remains (see third principle in 5.1.1.10) that only one PC's TWC should be responsible for a specific area at any one time. The interfaces should be clearly established and a lead PC's TWC should be appointed to manage the interfaces between the areas.
NOTEIt is extremely rare that a building project would justify more than one PC's TWC.

5.1.5 Responsibilities where a contractor co-ordinates their own temporary works

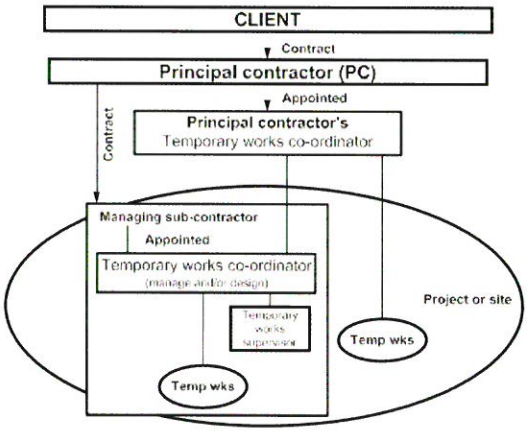
5.1.5.1General

Certain specialist sub-contractors, such as reinforced concrete (RC) frame contractors, ground workers or demolition contractors, have the experience and competence to organize their temporary works and have management capability, often including specialist temporary works design facilities; they can, therefore, be deemed competent to co-ordinate their temporary works.

Where a client appoints a contractor directly, for example an M&E contract, and that contract involves temporary works, then the temporary works should be controlled and managed. Both the managing sub-contractor appointed by the PC and the client's contractor should manage their own works responsibly. The lines of responsibility are shown in Figure 3. The contractor should appoint a TWC with a responsibility to the PC's TWC. They should also co-ordinate their temporary works with or through the PC's TWC to ensure no temporary works is affected adversely by any other temporary works or plant or other adjacent activities. Where necessary the contractors should also appoint their own temporary works supervisor(s) to manage the day-to-day site activities.

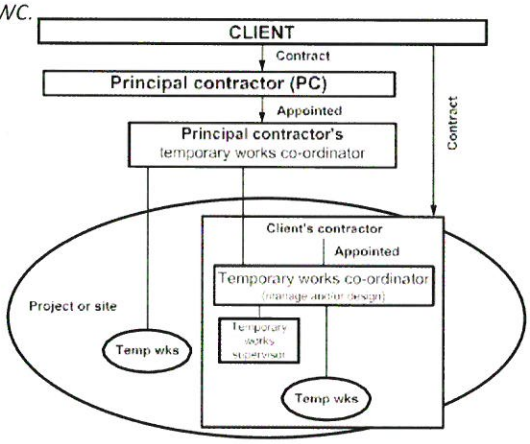
The relationships between the PC and contractor (i.e. a PC appointed sub-contractor or a client appointed contractor), including the roles of PC's TWC and TWC are summarized in Figure 4, but the full details of the relationships, actions and responsibilities are as outlined in Clauses 7, 9 and 11.

Figure 3 — *Lines of responsibility where either a principal contractor's (PC) appointed sub-contractor or a client's contractor co-ordinate their own temporary works*



a) PC appoints a sub-contractor to co-ordinate their own temporary works

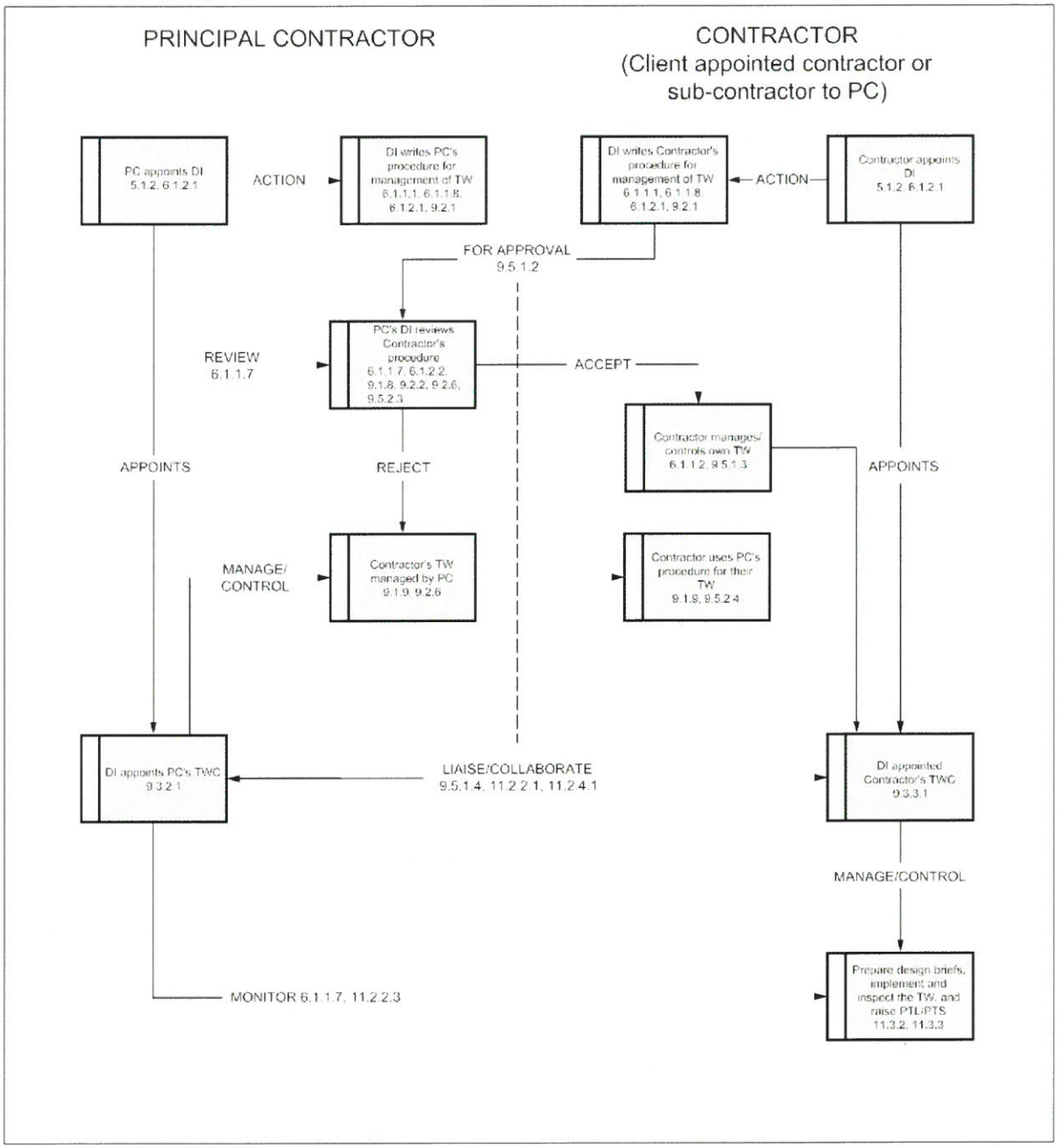
NOTE The PC's designated individual (DI) has to approve the managing sub-contractor's temporary works procedures before appointment of the TWC.



b) Client-appointed contractor to co-ordinate their own temporary works

NOTE The PC's designated individual (DI) has to approve the client contractor's temporary works procedures

Figure 4 — *Schematic representation of relationships between principal contractor and contractor (client appointed or sub-contractor) including PC's TWC and contractor's TWC*



5.1.5.2 PC appoints a managing sub-contractor

The PC should check that the contracting organization has the ability and processes in place to manage temporary works; only then should the organization be contracted to manage the temporary works under their specific control [see Figure 3a)]. In particular, the PC's DI should confirm that the sub-contractor's procedure for the control of temporary works is satisfactory.

The contractor/sub-contractor should appoint a TWC to control their own temporary works. In effect, the PC has delegated certain duties to the TWC with ultimate control for temporary works remaining with the PC's TWC.

The PC's TWC should control the other temporary works on the site, and liaise with other contractors, to control the various interfaces.

NOTEFor example, a RC frame contractor would not necessarily be aware that a ground work sub-contractor was digging a trench across the site close to the RC frame construction.

5.1.5.3 Client-appointed contractor

Where a client appoints a contractor directly and where the work has a temporary works element, such as installing M&E equipment, the implications for the site and the PC can be significant and the effect on procedures should be considered to ensure the PC's TWC can discharge their responsibility in relation to temporary works (see 7.1.3).

The PC's DI should confirm that the contractor's procedure for the control of temporary works is satisfactory and the client's contractor should appoint a TWC to control their temporary works [see Figure 3b)].

The TWC should report to the PC's TWC and provide a method of communication to liaise between the site and the other contractors for temporary works.

As there is no contract between the parties involved in the temporary works (see Figure 1), the client should take into account that any such appointed contractor should be made aware of the implications and the continuing role of the PC's TWC on the project. This should be made clear to any contractor appointed by the client at an early stage in the procurement/management process.

5.2 Training

*COMMENTARY ON **5.2***

Competence assumes a sufficient up-to-date knowledge of temporary works relevant to the complexity of the project. Although it is desirable that temporary works is included in college and university courses, detailed practical knowledge of the subject is gained through practice. This knowledge is gained by observation, by CPD, or by experience, supplemented by regular training.

It is desirable that universities and colleges include temporary works within the syllabus for building, construction and civil engineering courses.

Although detailed technical knowledge on temporary works has historically been considered necessary for contracting staff, the experience and understanding of the effect of temporary works on design and construction leads to a broader based understanding and a more informed student. This promotes better design of permanent works and better informed engineers joining the construction industry.

A syllabus would be expected to include an introduction to the types of temporary works, both above and below ground; an understanding of likely management processes to be adopted to control the temporary works, with, where possible, indications of the cost implications of temporary works. Temporary works involves assessment of risk, and it is expected that risk management would already be included in the syllabus.

In addition to a general awareness of temporary works, the more commonly occurring temporary works of trenches, scaffolding, backpropping, crane pad foundations, hoardings etc. might justify more detailed coverage on most courses. It is desirable that the principles of stability of temporary works structures are included in this syllabus.

It is also desirable that non-technical courses at colleges and universities for subjects such as quantity surveying, building management etc. include awareness in temporary works. This significantly improves the recognition of temporary works as an important element in construction, contributing to safer, more economical construction.

College and university lecturers are advised to use CPD to keep up-to-date with the latest temporary works subjects, to ensure they have relevant knowledge and technical experience in temporary works.

5.2.1 All those managing temporary works should have, as a minimum, an understanding of:

a) the procedures outlined in Section 2 of this British Standard;
b) the specific procedures for the organization for whom the person works;
c) the risk management aspect associated with the management of temporary works;
d) technical knowledge relevant to both the role and the complexity of the work; and
e) practical knowledge relevant to the complexity of the work.

5.2.2 Technical and practical knowledge training to satisfy 5.2.1 d) and 5.2.1 e) should be related to the role and depend on the scale and specialization of the works. The depth of knowledge varies from general awareness training through to courses for detailed temporary works design and identification and rectification of defects in temporary works. Certain projects might require job-specific technical training (e.g. railway work, demolition, airports, tunnelling, oil and gas): where required, this should be established at an early stage of the project.

NOTE 1 Typical courses for general awareness and practical and technical knowledge are often only one day, increasing to two days for more technical design and awareness courses. Detailed temporary works design courses and practical courses that include the inspection and rectification of known defects in temporary works can be up to three or four days duration and are often in-house.

NOTE 2 Temporary works is essentially very practical, with attention to details often being critical, so on-line training or self-taught with mentoring might also require practical assessment.

5.2.3 Those procuring training should assess the actual trainer for competency, not the training provider; to ensure that the trainer has the relevant and up-to-date technical or practical experience in temporary works.

NOTE 1 Whereas risk management and procedural aspects of temporary works training can be carried out by safety professionals and/or competent skills centre tutors, they are unlikely to have the necessary understanding in technical and/or practical aspects of temporary works to satisfy the minimum training requirements identified in 5.2.1 d) and 5.2.1 e).

NOTE 2 The TWf (Temporary Works Forum), although not maintaining a specific list of competent temporary works trainers, does provide a useful source of knowledgeable members on the subject.

Section 2: Procedural control of temporary works

6 Procedures

6.1 Introduction to procedural control

6.1.1 General

6.1.1.1 When a project has, or might be anticipated to have, the requirement for any temporary works, the organizations listed in 6.1.1.2 should have and implement a procedure which outlines how that organization is to discharge its duties in relation to the temporary works. A description of what temporary works can entail is given in 5.1.1.1.

6.1.1.2 responsibilities clear. (Domestic clients are a special case and the organizations they employ and their roles and responsibilities are addressed in 7.4.)

a) Clients.
b) Management/cost consultants (this includes architects acting for a client).

c) Contractors/sub-contractors/specialist contractors (including demolition contractors) all of which manage their own temporary works. This includes third-party employed contractors, such as utility providers and their contractors.
d) Temporary works designers and permanent works designers.
e) Manufacturers/suppliers.

NOTE Some organizations have multiple responsibilities, e.g. utility providers, management contractors.

6.1.1.3 Any organization employing another organization to carry out design or construction, in relation to temporary works, should check that they are competent to do so (see 3.13 for a definition of competent person). Specific requirements, roles and responsibilities of each of the parties identified within each organization are set down in 6.1.4.

NOTE This general recommendation is used in various clauses of the HSE Guidance L153 [4].

6.1.1.4 Where more than one contractor is present during the construction phase, each contractor should co- ordinate the planning, management and monitoring of their own work with that of the PC in relation to their temporary works.

6.1.1.5 Where there is an interface identified at the pre-construction phase between two or more projects, the PDs involved should co-ordinate their activities. Where there is an interface during the construction phase between two or more sites, the PCs involved should co-ordinate their activities.

NOTEAttention is drawn to Regulation 15 of the CDM Regulations 2015 [1] and paragraph 153 of the HSE Guidance L153 [4].

6.1.1.6 Where the method of construction of the permanent works differs from that which has been proposed by the permanent works designer, the temporary works design should include an assessment of the permanent works for the various stages of construction, modification or demolition to determine adequacy of strength and/or stability.

6.1.1.7 The PC has an overall duty for the safe execution of all works on site, including temporary works. Although the PC's duty is retained, the responsibility may be delegated by the PC (or by the actions of the client or a third party) to one or more sub-contractors or contractors or third-party employed contractors. The PC should, before appointment or permitting these other organizations to co-ordinate their own temporary works, carry out a robust and auditable vetting process to check the competence of these other contractor(s), and then be proactive in monitoring the performance of the contractor(s) and their compliance with their own procedures.

NOTEThe PC's responsibility for the safe execution of temporary works on site can be dependent upon or affected by the involvement of other parties, typically clients, designers and project management organizations, which are not necessarily employed by or responsible to the PC.

6.1.1.8 Where a party/organization undertakes two or more roles (see 6.1.4) the DI should establish and maintain suitable and separate procedures for each of the roles for which the party or organization is responsible or can constrain or influence.

6.1.1.9 During the conceptual or design stage, either the client's or the PD's procedures should be

used, but once the PC is appointed, the PC's procedures should take precedence over the client's or the PD's.

NOTEProcedural control of temporary works can vary during the life of a project. This can change again during on-going maintenance of the permanent works during its lifetime and eventual demolition.

6.1.1.10 The organization's procedure should cover the management of the approval (by clients and/or third parties) of design and design checking processes, and include measures for ensuring that the design function and the roles of the TWC/TWS, where relevant, are carried out by competent individuals.

6.1.1.11 To understand, control or mitigate the risks, organizations involved in temporary works should write their own procedures relevant for their type of work, its complexity and the level of operator performance. Procedures should be regularly reviewed and updated as necessary.

6.1.2 Designated individual

6.1.2.1 All organizations which are party to a contract or otherwise involved in a project which has a requirement for temporary works are involved in temporary works (see 6.1.1.2) and should appoint a designated individual (DI). The DI should be either a member of or directly responsible to a member of the organization's main supervisory board (of directors) and should have both responsibility and authority for establishing and maintaining a procedure to control those aspects of temporary works (and associated risks) for which the organizations have responsibility or which they can constrain or influence. The temporary works procedure should be approved by the main board or a main board director.

6.1.2.2 The DI should be responsible for ensuring that any organizations that they employ or recommend to be employed have adequate temporary works procedures if they are designing, carrying out and/or managing temporary works.

6.1.3 Control of risk

*COMMENTARY ON **6.1.3***

*This clause relates to implementation risk and is not to be confused with the category of design check as outlined in **13.7** and specifically Table 2, for example, the implementation risk for the same temporary works structure erected in two different locations can vary significantly depending on proximity to local assets, such as an adjacent railway line, thus justifying different levels of risk, and changing the risk classification – in contrast the temporary works design might be unchanged requiring the same category of independent design check.*

6.1.3.1 The risks associated with temporary works can be considered to arise from their design, their construction and use, and the consequences of their failure. Risks associated with design relate to the complexity of the design. Mitigation of design risk is addressed through the selection of the category of design check (see 13.7). Risks associated with the construction, use and removal of the temporary works relate to such aspects as workmanship, materials, experience and manner of use. These are termed execution risks. Risks associated with the consequence of failure of the temporary works come from the location of the temporary works, and what might be affected by the failure. Execution risk and consequence of failure risk combine to form an implementation risk.

6.1.3.2 To assess the risks associated with temporary works on a project, each item of temporary works should be classified and appropriate procedures adopted to control the risks. The classifications used should be “very low”, "low" "medium" or “high” (see Table 1).

6.1.3.3 Each organization should determine the level of control for each risk class of temporary works, depending on their experience (including that of operatives), competence and the location of the particular temporary works and the consequence of its failure. The approach to be taken when managing risk under each of the implementation classes should be defined in the company procedures. Examples are given in Table 1.

6.1.3.4 Interfaces, in both design and execution, are one of the key areas where problems can occur in temporary works and should be controlled by all who can affect the interface to ensure the risk to the temporary works can be managed effectively. The PC's TWC should be responsible for classifying temporary works, where there is an interface between contractors. Where there is no interface, the TWC of the organization carrying out the temporary works should be responsible for classifying the temporary works.

6.1.3.5 Classification should be done in consultation with other relevant parties, such as the construction team or the design team.

Table 1 — *Implementation risk classes for temporary works and examples of mitigation measures*

Implementation risk class	Risk	Permits required	Other control measures
Very low	• No identified practical mode of failure. • No impact if failure occurs.	N/A	Control via RAMS. Inspection by site team, not necessarily recorded on the temporary works register and might not require a design brief.
Low	• Minor structures with high levels of robustness. • Very experienced workforce. • Failure is entirely within the site, of low impact. Inconvenient, but personal injury unlikely.	Permits can be signed by a TWC or an authorized TWS.	Follow company procedures, including inspection and test plan (see Clause 14).
Medium	• Conventional structures. Conventional construction methods. • Relatively experienced workforce. • Failure would be major, potentially involving injury, fatality or significant economic loss. Would not initiate secondary events.	Permits can be signed by the PC's TWC or an authorized TWC.	Follow company procedures, including inspection and test plan (see Clause 14).
High	• Schemes with dependency on critical structural details, with little or no redundancy, or with stability reliant on critical elements. • Schemes with complex interfaces where various items of temporary works impact on one another • Inexperienced workforce. • Unfamiliar processes or equipment. • Failure would be catastrophic in its own right, or if minor might initiate a secondary or chain reaction of major or catastrophic events.	Permits signed by PC's TWC.	Follow company procedures, including inspection and test plan (see Clause 14). PC's DI to ensure the scheme is reviewed, e.g. HAZOP or peer review.

NOTE 1 The TWC's and TWS's scope of work is covered in 11.2.2, 11.3.2 and 12.2 respectively.
NOTE 2 The PC's TWC agrees the signatory for each permit applicable to the item of temporary works.
NOTE 3 It is outside the scope of this British Standard to classify temporary works.

6.1.4 Organization roles and procedures

The procedure for each type of organization and role of DI should be in accordance with the relevant clause(s) as follows.

a) Clients (see Clause 7).

- General (Commercial/public clients) (see 7.1).
- Appointing contractors other than PC (see 7.2).
- Client's DI (see 7.3).
- Domestic clients (see 7.4).

b) Designers (see Clause 8).

- Designers' DI (see 8.2).
- Permanent works designers (see 8.3).
- Temporary works designers (see 8.4).
- Lead designers (in relation to temporary works designs) (see 8.4.2).
- Principal designers (see 8.5).

c) Contractors (see Clause 9).

- Contractors' DI (see 9.2).
- Contractors' responsibilities (see 9.3).
- Principal contractor (see 9.4).
- Contractors other than PC (see 9.5).
- Third-party employed contractor (see 9.6).

d) Suppliers/manufacturers (see Clause 10).

- Suppliers' DI (see 10.2)

6.2 Temporary works register

*COMMENTARY ON **6.2***

Registers are generally available as a company spreadsheet. This allows continuous monitoring and is usually on a project-specific database. It gives the opportunity for several different staff to monitor progress of the temporary works, but it remains the responsibility of the PC's TWC throughout the project.

The register is also an aide memoire to assist categorizing, designing and checking all the relevant temporary works. Correct use of such a register is an important management tool for the site. The register is also useful as verification that a safe procedure is in use on the site. There is no standard format of a register; each organization needs to relate its register to the type of work carried out and the nomenclature/forms, etc. used in the company procedures. What is important is how it is used and the way in which it is maintained and kept up to date as the project progresses.

6.2.1 The PC's TWC should ensure that a temporary works register is prepared and maintained throughout the project. The register should identify what temporary works are needed on the contract. The register, often commenced at tender stage in outline, is not expected to identify all the details of all the temporary works to be required. As the project progresses the register should be maintained as an "active document" and the PC's TWC should ensure that it is kept up to date.

6.2.2 Where a contractor has been appointed to manage their own temporary works the relevant TWC should also prepare and maintain a local temporary works register. The TWC should provide relevant information to the PC's TWC to enable the master temporary works register to be maintained. It should be provided each time it is updated and at a regular agreed

interval. The register should be in a common format to allow incorporation of the TWC's data into the PC's TWC's master register for the project.

6.2.3 A temporary works register should include:

a) reference number and short description;
b) date design brief issued;
c) date required;
d) risk classification of temporary works (see Table 1);

NOTE 1 The implementation risk classification might be influenced by the client's requirements, such as increasing the risk level for a particular section of temporary works.

e) designer (company and/or individual);
f) design checker (company and/or individual);
g) design check category;

NOTE 2 The design check category can be influenced by the client's or third-party's requirements (see 13.7) or by a minimum category of check for a particular type of temporary works set by the PC or contractor.

h) date design completed;
i) date design checked/approved;
j) erection complete and checked with date of permit to load (bring into use);
k) date of permit to unload (take out of use) as necessary; and
l) third-party approvals.

6.2.4 The register is an important management tool, and the company should have a process by which such registers are regularly audited. The auditing should be carried out by someone familiar with temporary works.

7 Clients' procedures

7.1 General (Commercial/public clients)

7.1.1 There are three possible scenarios for client roles.

a) The client takes on the role of PD, or the client employs the PC to construct the works (this implies that the PC is paid for all work, however it is procured, and is responsible for the whole project).
b) The client appoints a PC but retains the appointment of contractors and suppliers.
c) The client does not appoint a PC and appoints contractors and suppliers directly, and therefore the client takes on the role of PC.

7.1.2 All clients initiating construction projects where temporary works are involved should have in place a procedure to define their duties in relation to the management of temporary works and assist the PC in controlling any temporary works.
NOTE A domestic client is not normally expected to carry out the same *duties as placed on a commercial client (see 7.4)*

7.1.3 The client's procedure should ensure client-appointed contractors are informed that they should provide their procedure to the PC's DI for approval before undertaking the management of their own temporary works and should work to the PC's procedure in the event that approval is not given. In addition, the contractor should be informed that the contractor's TWC should work under the direction of the PC's TWC where temporary works' interfaces have to be managed.

7.1.4 If the client fails to appoint a PD the client should fulfil the duties of the PD, in relation to the development and implementation of a PD's procedure for temporary works (see 8.5).

7.1.5 If the client fails to appoint a PC, the client should fulfil the duties of the PC and should develop and implement a PC's procedure for temporary works (see Clause 9). This should include the appointment of a PC's TWC.

7.2 Clients appointing contractors other than PCs

7.2.1 Where the client directly appoints a contractor, other than the PC, where temporary works are involved in the contract, the contractual obligations and responsibilities should be carefully considered, detailed and communicated. Although the client is responsible for the contractor, the PC's DI should have ultimate control of the management of all temporary works on the project, in spite of the fact that the PC has no contract with the contractor.

7.2.2 The client should take into account at a minimum the following when appointing the client contractor:

a) the contractor's procedures, competence of contractor, the contractor's designer and proposals for design checking, including competence of any checking organization;

b) acknowledgement that the appointed PC has ultimate decision on design check category, construction risk category etc.;

c) the client should not place commercial or contractual constraints on the PC's ultimate responsibility; and

d) acceptance that the PC appoints a PC's TWC and that the PC's TWC or PC's TWS (subject to limits of authority) can be the final signatory on permits.

7.3 Client's DI

7.3.1 Clients should establish and maintain a procedure to control those aspects of temporary works (and associated risks) for which they have responsibility or can constrain or influence. The senior person responsible is defined as the client's DI (see 6.1.2).

7.3.2 The client's DI should establish a procedure detailing how the main items for which the client has responsibility should be managed. The main items to be addressed are as follows.

a) The PD and PC and any other organization directly employed by the client should have in place a temporary works procedure in accordance with the recommendations of this British Standard.

b) The client's DI should ensure that the PD's and PC's procedure(s) for the control of temporary works are being implemented.

NOTE 1 Implementation can be checked either by using the client's own staff during the contract, by using a consultant or an independent third-party audit and/or certification scheme.

c) Any assets belonging to the client or third party that might be affected by any temporary works should be identified.

d) Any requirement for review or formal acceptance of the temporary works by the client, including design brief and/or design statement and/or design output should be defined.

e) The client should provide all necessary information to enable the PD and/or the PC to design, construct and remove temporary works and, where necessary, protect any assets which belong to the client or a third party.

NOTE 2 This information could include site investigation information (including that for the design of working platforms), computer models (including BIM [building information modelling] and/or design package input) to allow the temporary works designer to input the new information in relation to the temporary works, information on the assets which might be affected by the temporary works (drawings, results of any invasive investigations of the assets and any calculations which might be available).

f) Any requirement for client-specified hold points for temporary works, including signing of an acceptance certificate to release any hold point (as a permit to proceed), should be defined.
g) The procedures should define the actions to be taken in the event that a client does not accept a TW proposal, or withholds or delays the release of a hold point.
h) Any other constraints or criteria, performance or otherwise, should be defined.

7.3.3 Where the client directly appoints organizations, other than the PD and PC, that are involved in temporary works, the additional items for which client responsibility should be established are as follows.
a) Any organization directly employed by the client should be informed that they should adhere to the PD's or PC's procedures unless their own procedures are approved by the PD's DI or PC's DI, as appropriate, for use.
b) The arrangements should include provisions for the organization's management to both liaise with and be responsible to the PC's TWC on matters related to their temporary works input (see 9.5.2).

7.4 Domestic clients

*COMMENTARY ON **7.4***

A domestic client is one for whom construction work is being carried out on their own home, or the home of a family member that is not being done in connection with a business, whether for profit or not. A domestic client is not normally expected to carry out the same duties as placed on a commercial client and hence would not be expected to have a formal temporary works management procedure. The duties of a domestic client are normally transferred to:
a)the contractor on a single contractor project; or
b)the principal contractor on a project involving more than one contractor.
However, the domestic client can choose to have a written agreement with the PD to carry out the client duties.

7.4.1 Whoever takes on the duties of the client (PD or PC) should have a suitable temporary works management procedure to suit the complexity of the project. This should incorporate their own duties as well as the clients' duties relating to temporary works as outlined in this document.

7.4.2 Householders who carry out work themselves by hiring or obtaining temporary works equipment, such as scaffolding for access purposes to their home, or a relative's, are not covered by the CDM Regulations [1] and the householder should ensure they comply with the manufacturer/supplier's recommendations for use of the equipment.

7.4.3 The role of a designer, PD, contractor or PC on a project for a domestic client should be no different to the role undertaken for a commercial client. The various duty holders should carry out their duties in proportion to the risks involved in the project.

8 Designers' procedures

*COMMENTARY ON CLAUSE **8***

This clause applies to individuals or organizations designing or influencing permanent works; designing or influencing temporary works; carrying out design checks; arranging for or instructing others to carry out design; or any combination of the above.

8.1 General

8.1.1 Designers should have the qualifications, skills, knowledge and experience required to carry

out the design and co-ordination roles and the passing/receiving of information relevant to any temporary works. Design organizations should verify the competence of both designers and checkers of temporary works within their organization.

8.1.2 Designers should address the buildability of permanent works, temporary works, their interfaces, their proposed methods of construction and any related design assumptions.
NOTE 1 This is to identify foreseeable hazards to health or safety associated with their design contribution, such that measures for elimination or mitigation can be identified. Attention is drawn to the duties of designers under the CDM Regulations 2015 [1] and the expectation that they provide and receive relevant information on temporary works.
NOTE 2 An example of buildability would be consideration of transfer of loads through slabs in multi-storey construction and use of back propping.

8.1.3 Designers should apply the general principles of prevention to the identified risks, and highlight any residual risks. Appropriate and proportionate information about the residual risks should be provided to those who need it.
NOTEUnnecessary information (risks that a competent contractor could readily identify) can prevent the clear communication of key messages.

8.1.4 Designers should:
a) liaise with the PC's TWC, or TWC where appropriate, including agreement of the category of temporary works design check (see Table 2);
b) respond promptly and clearly to any reasonable request from the PC's TWC, or TWC where appropriate, for information or design criteria in respect of temporary works to allow the PC's TWC to manage and discharge their responsibilities by providing the information to the TWC or temporary works designer, as appropriate. This allows the co-ordination of all temporary works by all parties across the site;
c) clearly communicate the design, in accordance with any agreed format, to the PC's TWC, or TWC where appropriate. The design output includes the residual risks associated with the design; any hold points required by the designer, and which criteria allow their release; limitations of the use of the design and/or an outline methodology on how the temporary works should be constructed (where this is not obvious to a competent contractor); and data required by other designers interfacing with this design, for example loads on foundations; and
d) ensure that any areas of temporary works design responsibility which are excluded for whatever reason are clearly highlighted and communicated.
NOTE 1 Typical exclusions can include stability of top restrained falsework systems, foundations to support proprietary falsework equipment, scaffolding or cranes, make-up sections in timber, make-up pieces in access.
NOTE 2 3D and 4D (3D+time) models can be used to communicate the design intent and sequencing to enable better communication and identify residual risks.

8.2 Designers' DI

8.2.1 Organizations carrying out permanent and/or temporary works designs should have a DI to ensure that a procedure suitable to their organization is in place and managed.

8.2.2 The designers' DI should establish a procedure describing how the main items for which the designer has responsibility should be managed. The main recommendations to be addressed, in addition to those in 8.1, are as follows.
a) Procedures should be appropriate to the type and complexity of work, and associated risks, which the designer is to consider.
b) Sub-consultants should have adequate procedures for managing the temporary works design.
c) Any temporary works design commissioned by a PC or other organization should be

initiated with a design brief, from the PC's TWC or TWC. The designer should prepare a design statement or approval in principle (AIP) or equivalent where so required.
d) Any temporary works design checker commissioned by a PC or other organization should be provided with the design brief, design statement or AIP or equivalent where prepared and the necessary drawings and other documents [as noted in 8.1.4c) but not calculations] before the design check is undertaken.
e) The designer should respond promptly and clearly to any request from the PC or a contractor, appointed to manage part of the temporary works, for information or design criteria, in respect of temporary works, to allow the TWD to complete the design and allow the PC or other contractor to manage and discharge their responsibilities.
f) The designer should liaise fully and clearly with all parties, initially with the TWC, but this may be extended to cover other designers and/or design checkers.

8.3 Permanent works designers

8.3.1 Permanent works designers should address the buildability of the permanent works and identify, and make provision for, any temporary works and temporary conditions required by their design and their assumed method of construction. This should include:
a) a proposed method and sequence of construction which should have no adverse effects on the permanent works;
b) deciding on and communicating the intended construction process, giving particular attention to new or unfamiliar processes;
c) considering the stability of existing structures and partially constructed/erected/ demolished structures and, where this is not immediately obvious, providing information to show how temporary stability could be achieved;
d) identifying where standard industry details are not suitable, and where detailed structural design is to be carried out by others;
e) considering the effect of the proposed work on the integrity of adjacent/existing structures, particularly during refurbishment;
f) ensuring that the overall design takes account of temporary works which might be needed, no matter who is to develop those works;
g) ensuring that consideration has been given to the availability of sufficient space required or maintain the structure; and
h) clearly stating loads for which the structure has been designed including the proposed plant installation loads and plant routes.

8.3.2 The designer should liaise with the PD to provide all necessary information relevant to any temporary works or temporary condition(s) to the PC through the PD.

8.4 Temporary works designers

8.4.1 General

8.4.1.1 TWDs and TWDCs (temporary works design checkers) should confirm that the design details and outline methodologies are accurately translated into the design output, and that the design follows appropriate engineering principles. This includes any assumed construction methods, sequences, temporary works requirements, and loads to be either imposed on or supported by the permanent works.

8.4.1.2 TWDs and TWDCs should confirm that the design output adequately describes the design in a design check certificate or other suitable form of record (see 13.7.5).

8.4.1.3 Where the category of design check is not specified by the contractors' procedures or the client, the TWD, in consultation with the TWC, should advise the minimum category of design check (see 13.7).

8.4.2 Lead designers (in relation to temporary works design)

8.4.2.1 Where a temporary works scheme involves design contributions from more than one designer, one of the designers should undertake the role of lead designer, and manage the design interfaces. The name of the nominated lead designer should be recorded. The lead designer for a temporary works scheme might not necessarily be the principal designer. On completion of the design, a single design certificate should be issued (see 13.7.5).

8.4.2.2 The lead designer should ensure that:

a)there is a distribution of design tasks amongst appropriate designers, especially where the design of temporary works is an integral part of the permanent works methodology;
b)the communication of design data between organizations is controlled and any iterations are completed to the required levels;
c)design contributions from all designers are compatible with each other;
d)they have a holistic understanding of the whole design;
e)the design output is complete and clearly communicated; and
f)the principal designer and TWC are informed about significant residual risks associated with the design.

8.4.2.3 The same approach, as outlined in 8.4.2.1 and 8.4.2.2, should be taken where the check of a temporary works scheme involves contributions from more than one design checker.

8.5 Principal designers

In relation to temporary works, the PD should ensure that:
a)there is a coherent construction method which identifies all key temporary conditions and temporary works;
b)the finally agreed construction method, sequence and temporary works are not deleterious to the permanent works design;
c)designers follow the recommendations of the relevant clauses within this British Standard (see 8.2, 8.3 and 8.4);
d)they share information with designers, and the PC's TWC and TWC, that might influence the
design of temporary works or the selection of construction methods;
e)designers take account of the construction phase plan;
f)they retain appropriate information relating to temporary works that would be required for the health and safety file; this should include information on construction method or sequence including associated temporary works which might impact on future maintenance or deconstruction; this information should be obtained from the PC's TWC; and
g)they carry out the domestic client's duties with respect to temporary works, where these have been transferred to the principal designer (see 7.4).

9 Contractors' procedures

9.1 Organizational interfaces

9.1.1 The design and construction of permanent works and the attendant temporary works often involves several organizations, therefore introducing a number of organizational interfaces. Common arrangements include the following and combinations thereof:
a)equipment can be hired, with the supplier carrying out the design, or supplying the basic design data;
b)equipment can be erected using operatives who are not direct employees of the main construction organization, e.g. the supplier of the equipment might also erect it; and
c)use of a design produced by another organization.

9.1.2 When work is being carried out by different organizations, the organizational interfaces can be manifested on site as physical interfaces between different phases of the scheme, e.g. it is common for one organization to prepare and provide the foundations upon which another subsequently erects
the main temporary works structure. The physical interface in this example is particularly critical, but in all cases the physical constraints and interface conditions should be clearly defined and the work procedures adopted should take account of these interfaces.

9.1.3 The TWC should manage these interfaces and retain an overview of the whole scheme to ensure each step of the procedure is completed and does not adversely affect the scheme.

9.1.4 Details of the interfaces should be included in the construction phase plan.

9.1.5 When work is being carried out at a number of small sites, a TWS with an appropriate level of authority may be appointed for each individual site, under the overall responsibility of a single TWC.

9.1.6 Contractors are appointed by clients, or by other contractors to carry out the works. Where there is more than one contractor appointed by the client, one contractor should be appointed PC. In all cases the contracting organization's procedures should recognize that, whatever the method of
procurement, the PC has ultimate responsibility for the safe execution of all temporary works on site.

9.1.7 The contractor's procedure should cover the management of any temporary works and include measures for ensuring that the roles of a TWC and TWS are carried out by competent individuals.

9.1.8 Where contractors are appointed by the client and/or PC, the PC's DI should ensure that contractors' temporary works procedures are satisfactory. The contractor should supply evidence of how the procedure has been implemented on previous contracts and which type of temporary works the contractor has been responsible for.
NOTEAttention is drawn to the CDM Regulations 2015 [1] and the HSE Guidance Notes on the Regulations [4].

9.1.9 If the contractors' procedures are deemed not acceptable by the PC's DI, then they should work to the temporary works procedures of the PC.

9.2 Contractors' DI

9.2.1 All contractors involved in temporary works (PCs, sub-contractors and those appointed by clients and third parties) should appoint a DI (see 6.1.2) to ensure that a procedure suitable to their organization is used to control those aspects of temporary works (and associated risks) for which the contractor
is responsible. In addition the DI should verify the competence of the individuals to be appointed as TWC. The DI should ensure the proposed TWC has a full understanding of the procedure and their specific responsibilities.

9.2.2 The PC's DI should have ultimate responsibility for the temporary works procedures on the project so that, although other contractors are required to appoint their own DIs, any other DIs are aware of the responsibilities and procedural requirements of their contracts. Where

contractors are appointed either by the PC or by the client or by a third party, the PC's DI should ensure that contractors' temporary works procedures are satisfactory (see 9.2.6).

9.2.3 The DI should ensure that:

a)for the type, scale and complexity of work/projects undertaken by the organization, the TW risks

can be identified, classified and effectively managed;

b)there is a clear process for on-site management of the design, design checking, erection, use, maintenance, monitoring and dismantling of temporary works;

c) the risks, roles and responsibilities associated with the sub-contracting of any elements of temporary works are addressed;

d) a TWC is appointed for each project who is: competent; given clear written authority; technically responsible to the DI; responsible for the implementation of the organizations procedure; and the final authority on site for the safe use of any temporary works;

e) provision is made for the appointment by the organization of one or more TWSs, where required; and

f) the TWC is given sufficient time and resources to fulfil the role.

9.2.4 Where the PC appoints contractors or they are appointed by the client or third parties, the PC's DI should ensure that the PC's procedure includes details of:

a) when the contractor's procedure should be provided (generally with any offer to carry out works on the PC's site);

b) how the PC's DI should check the contractors' procedure, and associated evidence of its implementation on previous contracts to verify that it is in accordance with the recommendations of this British Standard;

c) how the PC should proceed in the event the contractor's procedure is found to be inadequate in any way;

d) how the PC's TWC should interact with the TWC of other contractors, including acceptance of design briefs, verification that designs and design checks have been carried out and the implementation is in accordance with the certified design;

e)how the PC's TWC should verify the contractors' temporary works are being managed and take account of all operations across the site;

f)when and how the PC's TWC should check, including checking it does not adversely affect other temporary works by the PC or other contractor, and accept each design brief submitted by the contractor, where appropriate; and

g)when and how the PC's TWC should verify that each temporary works scheme has been designed and design checked before its implementation.

9.2.5 The PC's DI should be provided with a copy of the contractor's DI assessment of the organization's

TWC and confirm acceptance or otherwise via the PC's TWC.

9.2.6 The PC's DI should confirm that any other contractor's procedure for the control of temporary works is satisfactory and that evidence has been provided which confirms that the procedure has been satisfactorily implemented elsewhere. This should include the appointment of a TWC where relevant,

i.e. the contractor is deemed to have the knowledge, skills, experience and organizational capability to manage its own temporary works.

9.3 Responsibilities

9.3.1 General

9.3.1.1 The contractor's procedure should ensure that responsibilities are properly allocated and

communication arrangements established. The key items are:

a)responsibilities should be clearly defined;
b)all instructions should be clear and complete; and
c)documented records of responsibilities allocated, instructions given and actions taken should be maintained.

9.3.1.2 The main items for which responsibility should be established are as follows:

a) the appointment of a TWC and, where appropriate, a TWS;
b) the limits of authority of the TWC, any TWC appointed by contractors other than the PC and TWS, where appointed, including any authorization to release hold points, such as permits to load (bring into use) or unload (take out of use) the temporary works;
c) the preparation of an adequate design brief, including where appropriate the establishing of the
scheme concept and risk classification;
d) the design, including calculations, sketches, drawings, specification, preparation of a risk assessment and where necessary a designer's construction sequence for the temporary works scheme;
e) the independent checking of the design; this should include the design check category (see 13.7.3);
f) the issue of a design/design check certificate or other suitable form of record, where appropriate;
g) obtaining acceptance of the temporary works scheme directly from third parties as required;
h) the procurement of materials in accordance with the TWD's specification;
i) the control of erection, safe use, maintenance and dismantling on site;
j) the checking of the erected temporary works, and control of their use, maintenance and dismantling, in stages where necessary, to ensure compliance with the design and any hold points; and
k) where necessary, the issue of a formal "permit to load" or permit to proceed.

9.3.1.3 Those who are allocated responsibilities should have the authority to take and enforce decisions, including to stop the works.

9.3.2 Appointment of the PC's TWC

9.3.2.1 The PC's TWC should be appointed by the DI of the PC. The PC's TWC should be either an employee, or be an employee of an organization contracted to provide the services of a TWC on behalf of the PC for all the temporary works on the site/project area. The PC's TWC can be proposed by a contracts director/manager or senior manager, but the DI should be satisfied that the proposed PC's TWC has the relevant competence (see 5.2.1), before making the appointment.

9.3.2.2 The PC's TWC should be competent and have relevant up-to-date training and the necessary skills, knowledge and experience appropriate to the complexity of the project and anticipated temporary works.

9.3.2.3 The PC's TWC should be responsible to the PC's DI for the implementation of the organization's procedure.

9.3.2.4 The appointment of the PC's TWC should be confirmed in writing and the post formally accepted. Copies of the appointment confirmation document should be provided to the site, the PC's DI, the client and the principal designer as a minimum.

9.3.2.5 Where a particularly technically or logistically complex project can be split into more than one well- defined area, then a PC's TWC may be appointed for each area. Each individual PC's TWC should be responsible for all the temporary works in the area allocated, irrespective of which organization carries out the temporary works in the area. Only one PC's TWC should be responsible for a specific area. One of these individuals should be appointed as lead PC's TWC to manage the interfaces between the areas.

NOTE On a contract such as a motorway or railway the project could be split into sections, having a PC's TWC for each section, provided that the interface is clearly established. It is extremely rare that a building project would justify more than one PC's TWC.

9.3.3 Appointment of the TWC (not appointed by the PC)

9.3.3.1 Where either the PC has appointed a sub-contractor to manage and/or design temporary works, or a client has appointed a contractor other than the PC, a TWC should be appointed by the DI of the organization for whose work the TWC is responsible. The TWC should be either an employee, or be an employee of an organization contracted to provide the services of a TWC on behalf of the contractor for all the organization's temporary works on the site/project area. The TWC can be proposed by a contracts director/manager or senior manager, but the DI, for whom the TWC is employed, should be satisfied that the proposed TWC has the relevant competence, as outlined in 5.2.1, before making the appointment.

NOTE Where the appointment of the organization does not involve management or design of the temporary works, no TWC is required as the PC's TWC is responsible for overall co-ordination.

9.3.3.2 The TWC should be competent and have both relevant up-to-date training and the necessary skills, knowledge and experience appropriate to the complexity of the project and anticipated temporary works. As the TWC is taking on management roles similar to those of the PC's TWC, the training and experience should be appropriate.

9.3.3.3 The appointment of the TWC should be confirmed in writing and the post formally accepted. The confirmation should include the name of the PC's TWC. Copies of the appointment confirmation document should be provided to the PC's DI, the PC's TWC and the principal designer as a minimum.

9.3.3.4 Figure 3 in 5.1 shows the various lines of responsibilities that can occur when PCs appoint sub-contractors to manage and/or design and where client-appointed contractors manage temporary works.

9.3.3.5 It is important that where the appointment gives the TWC the authority to carry out management tasks, that authority should be included to allow the TWC to stop the work if it is not being carried out satisfactorily.

9.3.4 Appointment of the TWS

9.3.4.1 On larger sites or where the site manager or project manager considers it necessary, or where the PC's TWC or TWC requests assistance, one or more TWS's may be appointed. The TWS may also be appointed by a contractor or sub-contractor, provided the PC's DI has approved their procedure.

9.3.4.2 The TWS should be appointed by the organization for whose work the TWS is responsible (see Figure 2 and Figure 3 in 5.1 for lines of responsibility). The TWS should be an employee of the organization. Copies of the appointment confirmation document should be provided to the PC's TWC with any limits of authority noted.

9.3.4.3 The TWS should have relevant up-to-date training and the necessary skills, knowledge and the experience appropriate to the complexity of the project. The person appointed should be aware of the limitations of their knowledge and have the language and literacy level to raise any query with more knowledgeable persons.

9.3.4.4 The TWS can be proposed by a contracts director/manager, PC's TWC, TWC or senior manager, but the DI of the organization for whose work the TWS is responsible should be satisfied that the proposed TWS has the abilities outlined in 9.3.4.3 before approving the appointment.

9.4 Principal contractor

9.4.1 The PC has ultimate responsibility for all work on site, irrespective of how the work is procured/managed commercially. The PC's recommended lines of responsibilities are shown in Figure 2 and Figure 3 in 5.1.

9.4.2 The PC's procedures or others approved by the PC's DI should take precedence during the construction phase.

9.4.3 The PC's TWC should decide the implementation risk classification (see Table 1). The risks and mitigation measures should be communicated to temporary works designers and contractors managing the execution of the works on site.
NOTEThe various risks might have been identified in documents including design output and/or RAMS which may be used during briefings to contractors and temporary works designers.

9.4.4 In the assessment of TWDs or TWDCs (employed directly by the PC or via a contractor), the PC should check the designer's procedures to ensure that the design is undertaken by competent persons.

9.5 Contractors other than PC

9.5.1 General

9.5.1.1 In addition to the procedural items outlined in 9.1 applicable to all contractors, the contractor should be aware that the PC checks the capability of any contractor to plan and implement any temporary works which might be required under their contract.

NOTE Typical lines of responsibilities are shown in Figure 1 in 5.1.

9.5.1.2 The contractor should ensure that the PC's DI is provided with a copy of their temporary works procedure, and associated evidence, to verify that it is in accordance with the recommendations of this British Standard.

9.5.1.3 Where the contractor is appointed to both manage and design the temporary works, in addition to the recommendations at 9.3.1.2, the organization's procedure should cover the management of any temporary works design process, and include measures for ensuring the roles of TWD, TWC and TWS are carried out by competent individuals and how they interact with the PC's TWC.

NOTE Typical lines of responsibilities for sub-contractors managing temporary works are shown in Figure 3a) in 5.1.

9.5.1.4 A temporary works protocol should be established, at the start of the contract, between the PC's TWC and the TWC, which defines the appropriate degree of control, by each party, to ensure the co- ordination and safe execution of the temporary works on the project.

NOTE The protocol might include who is to review design briefs, permitted signatories, etc.

9.5.1.5 The protocol should include how the interfaces between the contractor's temporary works with other temporary works and permanent works should be managed in order that none has an adverse effect on the other.

9.5.1.6 The contractor's procedure should recognize that the PC has ultimate responsibility for all work on site, irrespective of how the work is procured/managed commercially.

9.5.1.7 The contractor's procedure for the management of temporary works should address the type, scale and complexity of their work/projects so that the associated foreseeable risks can be identified, classified and effectively managed (see 6.1.3).

9.5.2 Contractor(s) appointed by the client

9.5.2.1 The client contractor's roles and responsibilities are the same as those for the contractor appointed by the PC and should be in accordance with 9.5.1.1 to 9.5.1.7.

9.5.2.2 The client contractor's DI should be aware of the responsibilities and procedural requirements of their contract.

NOTE Typical lines of responsibilities for a client's contractor are shown in Figure 3b) in 5.1.

9.5.2.3 The PC's DI has a responsibility to ensure the client contractor's procedures are satisfactory (see 9.2.4 and 9.5.1.1).

9.5.2.4 If the client's contractor does not have their own procedures, or they are deemed not acceptable by the PC's DI, then they should be required to work to the temporary works procedures of the PC.

9.6 Third-party employed contractor

*COMMENTARY ON **9.6***

There might be occasions when a third-party organization, for example a utility company or archaeologist, is required to carry out planned work associated with or required by the "works", where a PC is appointed. They might or might not appoint their own contractor to carry out the works.

9.6.1 The third-party organization should have an appointed DI and an established procedure with lines of responsibility established.

9.6.2 The third party should take the following points into account.

a)The procedure should address the role and responsibility of the PC.
b)The procedure should accept that the PC remains responsible for co-ordination of all temporary works on the site and the PC should satisfy themselves of the correctness/suitability of the specialist proposals before permitting the works.
c)Where the third party appoints a separate TW contractor for their works, they should assess their procedures, competence of the contractor, the contractor's designer, and proposals for design checking including competence.
d)The third party and any appointed third-party contractors should recognize that the PC retains ultimate responsibility for all aspects of the temporary works. The third party should provide justification to the PC of their safe system of work including any necessary temporary works.
e)The procedures should accept that the PC's TWC (subject to limits of authority) might be required as final signatory on permits.
f)When a third-party contractor supplier is employed for complex or specialist temporary works the PC may seek advice and/or support from specialists.

9.6.3 For emergency works the third party, or their contractor, should work within an area cordoned off from the rest of the PC's area of control to allow them to work without affecting/being affected by other temporary works. In this case the provisions of 9.6.2 b), d), e) and f) do not apply. Any
temporary works within the third party's area should otherwise be in accordance with the provisions of this British Standard.

10 Supplier/manufacturer procedures

10.1 Suppliers of temporary works equipment

When suppliers carry out other services such as design or installation then they should also comply with the recommendations of 8.4.1 and 9.5.1.

10.2 Suppliers' DI

Suppliers should appoint a DI responsible for establishing, implementing and maintaining procedures to manage those aspects of temporary works with which they are involved.

10.3 Suppliers' procedures

The supplier's procedure should cover:
a) ensuring their equipment conforms to their published technical data;
NOTEWhere multiple versions of similar equipment are available, the supplier should ensure that each version can be easily identified and conforms to the appropriate technical data. Limitations on use of mixing versions should be identified in the data.
b) the original design of the components, verification and production of technical information for individual and assemblies of proprietary items;
c) ensuring that manufactured and repaired items conform to the original design requirements for the initial and all subsequent production through the application of robust quality control;
d) material handling and transportation;
e) maintenance and repair of items that are hired or offered for second-hand sale; and f) equipment substitutions when the original component is not available.

Table 2 — *Categories of design check in temporary works*

Category	Scope	Comment	Independence of checker
0	Restricted to standard solutions only, to ensure the site conditions do not conflict with the scope or limitations of the chosen standard solution. These may include standard trench boxes.	This applies to the use of standard solutions and not the original design, which requires both structural calculation and checking to Category 1, 2 or 3, as appropriate.	Because this is a site issue, the check may be carried out by another member of the site or design team.
1	For simple designs. These may include formwork; falsework; needling and propping to brickwork openings in single storey construction.	Such designs would be undertaken using simple methods of analysis and be in accordance with the relevant standards, supplier's technical literature or other reference publications.	The check may be carried out by another member of the design team.
2	On more complex or involved designs. Designs for excavations including excavation support using sheet piles, for foundations, for structural steelwork connections, for reinforced concrete. Designs where stability is obtained by restraint at the top of the temporary works (e.g. top restrained falsework).	Category 2 checks would include designs where a considerable degree of interpretation of loading or soils' information is required before the design of the foundation or excavation support or slope is carried out.	The check should be carried out by an individual not involved in the design and not consulted by the designer.
3	For complex or innovative designs, which result in complex sequences of moving and/or construction of either the temporary works or permanent works. It also includes basement excavations and tunnels.	These designs include unusual designs or where significant departures from standards, novel methods of analysis or considerable exercise of engineering judgment are involved.	The check should be carried out by another organization and should include an overall check to assure co-ordination of the whole design.

13.7.4 Where different organizations, or individuals, have prepared different parts of a design, the category of design check should be appropriate to the part of the design being checked. (See also 8.4.2 for the role of the lead designer.)

NOTE For example if a proprietary supplier is carrying out a falsework design for their equipment, and stability is assumed by being fixed at the head to the permanent work (i.e. top restrained), the check on the falsework would be Category 1 but the check that the structure is able to resist the applied horizontal load might be Category 2.

13.7.5 On completion of the design and design check, a certificate should be issued for Category 2 and Category 3 checks and, depending on the organization's procedures, might also be required for a Category 1 check. The certificate should confirm that the design conforms to the requirements of the design brief, state the standards/technical literature used and list the constraints or loading conditions imposed. The certificate should state the category of

check and identify the
drawings/sketches, specification and any methodology that are part of the design and it should be signed by the designer and design checker. The package of information issued to the TWC should include this certificate.

NOTE 1 Neither the designer's nor the design checker's calculations form part of the design compliance items listed on the signed design certificate.

NOTE 2 Table 2 can be developed by each organization's procedures to suit their particular range and scope of work and the examples given under scope are indicative.

NOTE 3 Where a standard solution (Category 0) is used, a certificate is issued when the solution is originally developed (see 13.7.1).

13.8 Resolution of queries raised by the design checker

13.8.1 In all categories of check the design checker should withhold signature of the design check certificate until they are completely satisfied that the design output contains all necessary information to allow the temporary works to be constructed without the site team having to develop it further. In addition the design checker should be satisfied that the design output is in accordance with the requirements of the design brief and has been produced in accordance with recognized engineering principles, relevant British Standards and other appropriate specialist guidance.

13.8.2 The design checker should identify areas in the design output where their calculations indicate an element (including connections) might be overstressed or exceed the allowable load in a proprietary member. The design checker should identify also any area where further or additional detail is required.

13.8.3 For Category 0 or Category 1 design checks queries should be raised directly with the designer and resolved before the design output is issued as a certified design. For Category 2 and Category 3 design checks a more formal process should be adopted.

13.8.4 For a Category 2 design check a schedule of queries should be prepared and issued directly to the designer with a copy of the query schedule issued to the TWC and copied to the PC's TWC as appropriate. The schedule should not contain references to calculations, but could indicate levels of stress in members or forces or ground pressures. The designer should respond to the queries and provide additional and/or revised details where necessary.

13.8.5 For Category 3 designs and design checks the design parameters (loads, idealized structures, soil parameters and design standards/guidance) should be identified in an AIP or similar document (design statement) prepared by the designer and agreed by the client's technical advisor before commencement of the design. In the event that the client does not appoint a technical advisor, the PD should agree the AIP (design statement). The design statement should form the basis for the design and checking and should assist in the resolution of queries.

NOTEThis procedure is generally in accordance with the requirements of Highways England's BD2 [6].

13.8.6 For a Category 3 design check a schedule of queries should be prepared and copied to the PC's TWC, via the TWC as appropriate. It should then be issued to the designer. The schedule should not contain references to calculations, but could indicate levels of stress in members or forces or ground pressures. The designer should respond to the queries revising the design output where appropriate and copy the schedule with the responses to the PC's TWC, or TWC as appropriate, and ensure it is issued to the design checker. The design checker should review the schedule and annotate it to accept or reject the designer's response. When there is an impasse over particular queries the PC's TWC, after consultation with the client, should confirm whether the designer and design checker should discuss the outstanding query(ies) and how these discussions should be recorded.

The design checker should confirm all queries have been resolved and the designer should issue the revised design output in order that the design and design check certificate can be signed by the design checker.

13.9 Alterations

13.9.1 Changes in the requirements of the design brief should be recorded in writing, with reference to the original design brief, and issued to the designer. The designer should check the proposals against the certified design and incorporate the requirement for these alterations into the design and drawings (see also 20.2). If there is no significant change to the design, the designer should confirm the acceptability of the proposals to the appropriate TWC.

13.9.2 Any alterations to the temporary works, proposed by the site team, should be referred to the PC's TWC or TWC as appropriate, who should contact the TWD for incorporation of the change into the design.

13.9.3 Where the designer considers that the alteration is significant, the alteration should be referred to the design checker. Any revised design or design check documentation should be recertified when considered appropriate by the PC's TWC or TWC as appropriate.

13.10 Standard solutions

13.10.1 An organization might publish technical data in the form of arrangements of temporary works of their equipment based on certain conditions of use; these arrangements, known as standard solutions and often presented in a tabular or readily assimilated format, should relate to the organization's products only. The organization should carry out the structural design calculations and verify the arrangements with design check certificates.

NOTE *Provided the equipment is erected, used and operated within the limitations placed in the standard solution, a TWC does not need to further verify the actual design calculations of the standard solution (see design checks at 13.7 and Table 2).*

13.10.2 For each standard solution the organization should identify the limitations of their use and of their design responsibility.

NOTE *For example, a standard solution for a proprietary soffit system might not include design of the foundations, or the method by which top restraint is obtained for lateral stability. Equally it might not include design of any face contact material, although the standard solution might assume a certain grade of material is used.*

13.10.3 Users of standard solutions should ensure that the:

a) solution assumes that the equipment specified is used, without substitutions;
b) concept is acceptable for the location;
c) conditions of use and limitations on use are within the specified limits;
NOTEFor trench support systems this includes verification that the ground conditions (including groundwater level) are as specified for the equipment
d) assembly is erected to the expected tolerances;
e) solution is within the experience of the workforce and its supervision; f)equipment is not damaged and does not show signs of excessive wear;
g) method of loading the system is as stated in the standard solution;
h) ancillary items, or additional temporary works (such as foundations), by others have been designed and supplied as required; and
i) arrangement, prior to use, has been separately checked for compliance with the guidance

provided by the supplier or organization responsible for the standard solution.

14 Site considerations

14.1 Co-ordination, supervision and checking of work on site

14.1.1 Work on site should be the subject of careful direction, supervision and inspection and checks to ensure that the temporary works is constructed safely in accordance with the design and specified materials and equipment, and that only when all checks have proved satisfactory is the works loaded, used, maintained, unloaded and then dismantled in accordance with an implementation plan.

14.1.2 The PC's TWC or TWC should ensure that a temporary works implementation plan is in place covering the erection/assembly, use, unloading and dismantling of the temporary works including what inspections, checks, hold points, permits and certification are required. This should include defining the regular inspections which are required during the use (loading) of the temporary works.

NOTE 1 The implementation plan could consist of the method statement, task specific risk assessment, inspection and test plan (ITP), checklists and other certification (for example, quality control check lists).

NOTE 2 The inspection and test plan can be used to define hold points, where works stops for an inspection or testing to take place. A permit is used to release the hold point and allow work to continue.

14.1.3 The implementation plan should be developed taking into account the site conditions, programme, original design brief and the construction phase plan and use of the drawings, specification and methodology supplied by the designer.

14.1.4 The plan should define hold points at which the structure should be checked for conformity and who is authorized to do so, including issuing permits to load or unload (release the hold point), signing of quality control check lists etc. by the PC's TWC, the TWC or the TWS, and how the results of these inspections should be communicated and acted upon. If the implementation plan has been produced by others it should be approved by the PC's TWC or TWC.

NOTE A TWS may issue the permit for a defined scope and range of work as described in the individual's appointment.

14.1.5 The PC's TWC or TWC should ensure that the guidance on the implementation of the design provided by the designer or supplier, including any residual risks [see 8.1.4c) and 13.6], are incorporated into the implementation plan. The design residual risks should be addressed in the method statement.

14.1.6 The design documentation and method statement should be followed but those responsible for work on site should bear in mind the need to compare conditions experienced on site during construction with those assumed by the design in order that appropriate action can be taken if it becomes apparent that they are different.

14.1.7 At all stages during fabrication/pre-fabrication, construction/erection, use and dismantling of the temporary works, the information being used should be checked to ensure that it is correct, and that the work carried out is in accordance with the design details (drawings/sketches) and is as specified to ensure that the completed structure will function as intended. This is necessary, not only to ensure that the temporary works are safe to use, but also to facilitate remedial work should this prove necessary; it is often difficult to do this later.

NOTE Details of checking procedures for falsework are given in 20.4.

14.1.8 Prior to bringing temporary works into service a final inspection should be carried out to verify that it has been constructed in accordance with the requirements of the design and

any subsequent approved modifications. The results of these inspections, together with any requirements for improvement, should be recorded by the appropriate person as allowed by the implementation plan. For complex or innovative designs consideration should be given to an inspection by the TWD.
NOTE It might be necessary to carry out inspections of the temporary works at points during assembly/erection.

14.2 Loading and unloading temporary works

14.2.1 Loading (bringing into use)

14.2.1.1 As a means of exercising control over bringing the temporary works into use a formal procedure for giving permission to load, or proceed to the next stage in the implementation sequence should be part of the implementation plan.

NOTEIn simple cases a single "permit to load", when the temporary works has been checked, might be appropriate. In complex or larger cases, permits might be required at different stages, both as regards loading or for different areas or for excavation. It is normally desirable to limit the period of validity of the permit, as subsequent modifications or changes in circumstances (soil wash out under footings or similar) may take place, For example, a permit to load for a falsework is normally valid for 24 hours. The area over which loading can take place, and to what extent, is set down in the permit, e.g. it might be "reinforcement only".

14.2.1.2 The PC's TWC, an authorized TWC or authorized TWS as identified in the implementation plan, should ensure that a permit to load or proceed (bring into use) is issued to the site team prior to its use [as stated in 11.2.3r), 11.3.3w) and 12.3j)].

14.2.1.3 The permit to load (or proceed), issued prior to release of the hold point, should confirm that:

a) the temporary works have been constructed in accordance with the certified design (design and design check certificates have been issued and the drawings and specification used are the ones referenced on the certificates);
b) any modifications to the temporary works have been approved by the designer; and
c) the water, ground and environmental conditions and use are as envisaged by the design.

14.2.2 Unloading (taking out of use)

14.2.2.1 Where the temporary works is used to provide support to the permanent works until it is self- supporting, the PC's TWC, TWC or TWS, as identified in the implementation plan, should determine that the permanent works have attained adequate strength and/or stability, with reference to the PWD's specification or in conjunction with the PWD if necessary, prior to ensuring that a permit to unload or proceed (take out of use) is issued, as stated in 11.2.3t). A TWC or TWS may issue the permit for a defined scope and range of work if authorized to do so by the PC's TWC in the implementation plan [see 11.3.3x) and 12.3k)]; for example they might need to verify concrete strength or that all structural steelwork elements and connections are completed or that any post-tensioning has been carried out prior to issuing the permit.

14.2.2.2 The sequence and order of removing temporary works, where critical, should be defined in

the design output and/or confirmed in the implementation plan. The sequence should be referenced in the permit to unload or permit to proceed.

14.2.2.3 The sequence and order of removing temporary works supports can be critical to avoid damage to the permanent works under construction. Generally the supports to spanning members should be removed starting mid-span, and for cantilever sections, should be removed starting at the tip. The PC's TWC, or TWC where appointed, should refer to the permanent works and/or temporary works designer if in any doubt about the sequence.

14.2.2.4 The sequence and level of props removed during backpropping operations (see 19.3.4) is particularly important to avoid overloading of the completed slabs. The sequence should be agreed by the PC's TWC or the TWC with the permanent works designer and be included in the implementation plan (see also 14.1).

14.3 Dismantling

When the structure being supported by the temporary works has become self-supporting, or the excavation has been backfilled or other condition, the temporary works should be dismantled (removed) in accordance with any restrictions imposed by the permanent works designer as set out in the implementation plan. As at the loading stage, a permit to dismantle the temporary works might be appropriate, particularly where this takes place in stages. Care should be taken to ensure that the temporary works remains stable during all stages of the dismantling process.