A Practical Understanding of Temporary Works!

Charles Hutchison Consulting
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A Practical Understanding of Temporary Works (TW)

What is TW?
Bit of History
BS 5975
TW in the Republic of Ireland
The Mystical ‘Competent’ Temporary Works Co-Ordinator?
Good Old Procedures & Paperwork
Categorising TW
Lots of Pictures!!
Before we start:-
It’s a Good News Day
Temporary Works - Definition

parts of the works that allow or enable construction of, protect, support or provide access to, the permanent works and which might or might not remain in place at the completion of the works
Pick out the TW ?
Managing Temporary Works?

Bridge building fail NZ.wmv
HISTORICAL BACKGROUND TO TEMPORARY WORKS
Newport 1909
Failure of timbered excavation
Exact number of fatalities not certain but at least 38
Barton Bridge – Eccles 1959
Barton Bridge – Eccles  February 1959
Failure of bridge scaffold falsework - 4 fatalities
Barton Bridge – Eccles, December 1959
Bridge girder overturns - 2 fatalities
Almost identical failure to earlier in the year!!
Barton Bridge – Eccles

WHY DID IT FAIL ?
Evidence given at the Inquest:
Scaffolding not installed in accordance with the design drawings
The design drawing was not a working drawing and only gave an indication of the structure
Worn and corroded scaffold tubes had been used
Lack of lateral bracing
Design carried out by an ‘estimator draughtsman’. Not ‘passed’ by an engineer
Bulging of the scaffold noted but not acted upon
Loddon Bridge – Reading – falsework collapse 1972
Loddon Bridge – 3 fatalities and 13 serious injuries
RECOMMENDATIONS:

• Technical
• Procedural
• Training / Competence

• A lack of clarity in the division of responsibility.
• A failure to reflect the ‘high risk’ nature of falsework in the design and site controls.
• The need to provide robust means of ensuring lateral stability.
• The need to discard damaged or distorted items.
• The need for stiffeners at all load bearing points in steel grillages.
• Falsework requires same skill and attention to detail as design of permanent structures, the stability is paramount for safety.
PRINCIPAL RECOMMENDATIONS

• Contractor should have procedures for managing temporary works
• Contractors should appoint a properly qualified temporary works co-ordinator to ensure that procedures have been followed, checks and inspections have been carried out and modifications or changes have been properly authorised.
• Communication between designers and others on and off site must be improved. If temporary works affect on rely on the permanent works for support then the contractor should consult the permanent works designer
• The TW designer, must have proper written brief, which includes all factors that might have to be allowed for.
• Proprietary material suppliers should specify conditions of test, failure loads and mode of failure and any recommendations about safe working loads and how to use the equipment correctly.

THE CONCLUSIONS OF THE BRAGG REPORT WERE TRANSLATED INTO........
Code of practice for temporary works procedures and the permissible stress design of falsework
What are the HSE in UK doing?

The inspection of Temporary Works has been part of work plan for Construction Inspectors for the past few years through targeted initiatives. Even those Inspectors who are not Construction Inspectors have been tasked with identifying any “matters of evident concern”.

The management of temporary works in the construction industry

SIM 02/2010/04

Summary

This SIM provides guidance to Inspectors on temporary works management in the construction industry and how Inspectors should approach enforcement of the topic.
What about ROI?

Temporary Works References

Health & Safety Authority
RELEVANT ROI LEGISLATION & REGULATIONS

Safety, Health And Welfare At Work Act 2005

Safety, Health And Welfare (Construction) Regulations 2013

HSA Codes of Practice

HSA Guidance

Guidelines on the Procurement, Design and Management Requirements of the Safety health and Welfare at Work (Construction) Regulations 2013 (Updated)

British and European Standards

Guides to Best Practice
What about HSA - ?

Guidelines on the
Procurement, Design and Management
Requirements of the Safety Health and
Welfare at Work (Construction)
Regulations 2013

The most common items associated with non-fatal injuries are temporary working platforms, scaffolds, and ladders. Most serious accidents can be avoided by good design, good planning, and the use of tried and tested techniques for building safely.

Actions taken at an early stage of the design process have a significant potential to reduce the level of risk on construction projects. Good co-ordination of activities and co-operation between all parties during design and construction is essential in reducing the high levels of risk found on many construction projects.
What about HSA - ?

Guidelines on the
Procurement, Design and Management
Requirements of the Safety Health and
Welfare at Work (Construction)
Regulations 2013

Some temporary structures, e.g. scaffolds, are assembled in conformity with a generally recognised standard configuration, e.g. in accordance with manufacturer’s specifications or drawings, or standard layouts prepared by organisations such as the National Association of Scaffolding Contractors. In many such cases, no co-ordination of the activities of designers is required, as the forces transferred onto the permanent structure during construction may be small. In other cases involving such structures, there will be a need to co-ordinate the activities of designers to ensure that the loads imposed by these temporary structures on the permanent

Temporary works may include such matters as trench shoring, scaffolding, propping, working platforms, gangways and access stairs/ladders, etc. Persons who make decisions on site in respect of these may be deemed to be designers.
The PSDP must co-ordinate, so far as is reasonably practicable, activities of the designers in respect of their duties under the Construction Regulations 2013 and, together with the PSCS, facilitate co-operation between the permanent works designers and the temporary works designers, as may be necessary.

The PSDP should take steps to ensure co-operation between permanent and temporary works designers, in particular that the designs are compatible and that loading from the temporary works will not exceed the loads that can be safely carried by the permanent works at a particular stage of their construction.

The PSDP should pay particular attention to potentially catastrophic issues such as overall instability of the structure during the various stages of construction and after completion. In co-ordinating the activities of the various designers where the integrity of a structure during construction is an important safety issue, the PSDP should insist (and be in a position to insist) that one designer takes overall responsibility for the stability of a structure during the envisaged construction process and that a suitably qualified engineer be employed to liaise with the designer, PSDP, and the PSCS.
Appendix 2 contains templates which could be used by the various different designers, including specialist designers, on a project to allow for unambiguous communication of their assumptions and assurances to the PSDP. This will help the PSDP to fulfil his or her co-ordination role, and will also demonstrate the designer's compliance with the legislation. It is recommended that a permanent works designer should complete a permanent works design certificate with respect to the adequacy, in the context of safety and health, of their design.

Appendix 2 also contains a form, which should be used in the case of temporary works design. It is critical that temporary works designers and contractors base their temporary works design with due regard to the assumptions made in relation to loadings and construction sequence. It is recommended that the temporary works designer should complete a temporary works design certificate to facilitate the provision of adequate information to all parties to allow the structure to be built in safety.

- Temporary Works Design Certificate (RF2) which may be used for co-ordinating the design of the Temporary Works.

Note: These certificates are not mandatory under the legislation but are examples of how the designers and the PSDP can share information and for designers to verify their designs. If these are not used, then alternative means must be used by the PSDP to “take account of the general principles of prevention” and to bring about co-ordination of designers on the project and for designers to provide information as is known.
Temporary Works Design Certificate
(to be completed by the Temporary Works Designer, Permanent Works Designer(s) and the PSDF)

Project: 

Element of Temporary Works to which this certificate applies:

Detail design codes adopted or complied with for these temporary works:

Reference numbers for calculations, completed & checked:

Drawings numbers; completed & checked:

Provide the assumed construction sequence required by the Temporary Works Design:

Requirements for temporary stability, propping, bracing, loading:

We hereby confirm that we have to date carried out, and will continue to carry out as necessary, the design of these parts of the works which we are appointed to design and that we have exercised reasonable professional skill, care and diligence with due regard to our duties under the Safety, Health and Welfare at Work Act, 2005 and under the Safety, Health and Welfare at Work (Construction) Regulations, 2000, if appropriate, and have complied with the PSDF and FSCS as appropriate with all relevant information as required by the Regulations, and have coordinated with the permanent works designer, and with other designers, as necessary.

Signed: 

for & on behalf of the Temporary Works Designer: Date:

We hereby confirm that we have communicated our design assumptions to the Temporary Works Designer. We are satisfied that our permanent works design can be constructed to be safe and without risk to health in accordance with Section 17 of the Safety, Health and Welfare at Work Act, 2005.

Signed: 

for & on behalf of the Permanent Works Designer: Date:

We hereby confirm that we have coordinated the activities of the Designers responsible for this element of the works, in respect of the taking into account the General Principles of Prevention and with due regard to our duties as PSDF under the Safety, Health and Welfare at Work (Construction) Regulations, 2006.

Signed: 

for & on behalf of the PSDF: Date:
We hereby certify that we have exercised reasonable professional skill and care in the preparation of the design of those parts of the works which we have been appointed to design and that we have exercised reasonable professional skill, care and diligence with due regard to our duties under the Safety, Health and Welfare at Work Act 2005 and under the Safety, Health and Welfare at Work (Construction) Regulations 2013. In particular:

1 we have taken account of the General Principles of Prevention;
2 we have provided the PSDP and PSCS as appropriate with all relevant information as required by the Regulations; &
3 through our customers, we have cooperated with the PSDP and PSCS and with other Designers, as necessary.

Signed: _______________ for & on behalf of the Temporary Works Designer: _______________ Date: _______________

We hereby confirm that we have communicated our design assumptions to the Temporary Works Designer. We are satisfied that our permanent works design can be constructed to be safe and without risk to health in accordance with Section 17 of the Safety, Health and Welfare at Work Act 2005.

Signed: _______________ for & on behalf of the Permanent Works Designer: _______________ Date: _______________

We hereby confirm that we have coordinated the activities of the Designers responsible for this element of the works, in respect of the taking into account the General Principles of Prevention and with due regard to our duties as PSDP under the Safety, Health and Welfare at Work (Construction) Regulations 2013.

Erection of the Temporary Works may proceed, subject to the provision of a Temporary Works Method Statement agreed by the Contractor, Temporary Works Erector and PSCS as being adequate.

Signed: _______________ for & on behalf of the PSDP: _______________ Date: _______________
Is there any references to Temporary Works Co-ordinators in Health & Safety Authority Guidance?
What about HSA?

Temporary works refer to any site installations needed to facilitate the construction of permanent works but which do not remain as part of the permanent works. In this section, we are particularly referring to falsework (i.e., scaffolding or other temporary structural support for concrete formwork). Temporary works generally require formal design, and an appointed competent temporary works coordinator will normally oversee, coordinate and manage the process of temporary works.
SLAB BEARING

Slab bearing must be sufficient to ensure that the component is stable and not likely to crack, break or shift during further construction works. Insufficient bearing may require the slab to be replaced, or adequate propping may be needed until further reinforcement has been put in place to render the slab safe. Any slab propping or remedial works require detailed design. A detailed method statement must be prepared to enable such works to be planned and carried out safely. A temporary works coordinator should manage and oversee such works.
Some organisations have procedures which differ to BS5975

NETWORK RAIL or CROSSRAIL

LONDON UNDERGROUND

BNFL

ENVIRONMENT AGENCY

HIGHWAYS AGENCY

UTILITY COMPANIES
Temporary Works Forum (TWf)  
Chairman: Bill Hewlett MA CEng FICE  
Secretary: John Carpenter CEng, FICE, FInstRoyE, CIOSH

TW/11/027 Rev F (issued: February 12). Rev G (minor changes March 12)

COMPETENCIES OF THE TWC¹

1 Background  
It is important that those individuals appointed to the roles of Temporary Works Co-ordinators (TWC) and Temporary Works Supervisors (TWS) are competent. It is a legal requirement notwithstanding the good business aspect to such appointments.

At present there is no definitive manner of assessing or prescribing individual competency. This note aims to provide guidance on this subject. It should be noted that regardless of any such guidance, ultimately the competency of an individual will be a matter of judgement on the part of the organisation’s Designated Individual (DI) and in accordance with the management procedures put in place by him/her.

2 Competence  
2.1 Although it is necessary to consider both ‘corporate’ and ‘individual’ competence, this note concentrates on the latter. However it is the company’s responsibility to train, equip, brief and supervise its employees in accordance with the law, and that means that

Twforum.org.uk
BS 5975: 2008 +A1 2011 PROCEDURES

Provides a template for managing your Temporary Works

This is not a law, or indeed a ROI HSA guidance document but it is a set of guidelines which has been used by a wide range of organisations globally to manage their TW.
BS 5975: 2008 +A1 2011 PROCEDURES

• Designated Individual
• Identify TW – Tender stage & schedule
• Appointments – TWC + TWS
  – By whom, competence, in writing, acceptance, responsibility
• Classify TW according to risk
• Appoint competent designer
• Provide written design brief
• Design + Residual risks + Checking + Certification / Approval
• Site review
• Procurement + Equipment Inspection + Assembly (RA,MS)
• Significant on site modifications need designer approval
• Inspection by competent person
• Permit to Load
• Inspection + Monitoring + Maintenance
• Permit to Dismantle
• Review procedure, audit, feedback
ROLE OF TWC

Coordinate the design, erection, inspection, use, monitoring, maintenance & dismantling of temporary works
Ensure adequate design briefs are produced
Ensure those involved in temporary works process are competent
Ensure temporary works register is established
Ensure various responsibilities are allocated and accepted
Ensure design brief is prepared with full consultation, is adequate and in accordance with actual site conditions
Ensure residual risks are identified
Ensure satisfactory temporary works design is carried out

Plus a lot more !!!
WHAT IS A COMPETENT TEMPORARY WORKS CO-ORDINATOR?
For the purpose of the Regulations, “competence” means a person or organisation is deemed to be competent where, having regard to the task he or she is required to perform and taking account of the size or hazards (or both of them) of the undertaking or establishment in relation to which or in which the person or organisation undertakes work, the person or organisation possesses sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken.

Skills, knowledge, experience - CDM 2016

hence any training course is merely one part of the requirement for competence
Temporary Works Coordinator (TWC)

The TWC is responsible for ensuring that the contractor’s procedures for the control of temporary works are implemented on site. The TWC is not normally the designer, but is responsible for ensuring that a suitable temporary works design is prepared, checked and implemented on site in accordance with the relevant drawings and specification.

The principal activities of the TWC are listed in Clause 7.2.5 of BS5975:2008. On some projects, particularly smaller jobs involving lower risk temporary works, it may be appropriate for the TWC and designer roles to be carried out by the same person, provided that he/she is competent to carry out each of the roles.

The TWC for a project should be formally appointed and have adequate authority to carry out his/her tasks, including stopping the work if it is not satisfactory. It is essential that those selected to act as TWC are competent with relevant up-to-date training, and experience and qualifications appropriate to the complexity of the project. Ideally a TWC would:

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

1. relevant experience,
2. formal TWC training and
3. professional qualifications.
4. TWCs should have the competence and authority to be effective.
HSE - SIM 02/2010/04 – Competence

Site Safety Plus (CITB GB not ROI ?)

Temporary Works General Awareness Course

Temporary Works Co-ordinators Course

Temporary Works Supervisors Course
Simple and/or potentially low risk temporary works

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

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

- Falsework and formwork over 3m high
- Trenchless construction, including headings, thrust bores, mini tunnels
- Working platforms for cranes and piling rigs
- Tower crane bases
- Façade retention schemes
- Flying and raking shores
- Complex propping schemes – multiple props and multiple levels
- Needling of structures greater than 2 storeys high
- Ground support schemes greater than 3m deep
- Complex designed scaffold
- Cofferdams
- Bridge erection schemes
- Jacking schemes
- Complex structural steelwork and precast concrete erection schemes
- Hoarding and fencing over 3m high
In practice, even relatively simple temporary works may require careful consideration in their design, construction, commissioning, inspection and loading. An apparently simple temporary works job could lead to failure and even to fatalities if it is not competently executed. The choice of the appropriate temporary works solution, including the use of “standard solutions,” is discussed in Clause 9.4 of BS5975: 2008. A “standard solution” is an arrangement for which the basic design work has already been carried out and is presented in a tabular or similar form, and for which no further calculations are required.
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BS5975:2008 + A1:2011 recommends that temporary works are classified to select an appropriate level of independence of the temporary works design check.
Flange failure blamed for Injaka bridge collapse

SHEAR FAILURE at temporary supports is blamed for the catastrophic collapse of a partially constructed concrete box girder bridge in South Africa last July.

Early investigations into the disaster had pointed to insufficient temporary prestressing in the incrementally launched deck as the most likely cause (NCE 16 July).

But according to sources close to the project, consultants working for Concor Construction and the bridge's designer VKE Engineers have now agreed that the collapse was triggered by the lower concrete flange failing above temporary bearings on the intermediate pier.

The collapse happened in Mpu malanga province in the north-east of the country as main contractor Concor Construction was close to completing the second span of the seven-span, 300m long Injaka bridge. Fourteen people died – among them the bridge's 27 year old designer – and 13 others were left seriously injured.

The recent conclusions by experts for the contractor put the bearings on the bridge's second pier.

Their investigations have shown that failure occurred first at the western bearing over pier 2, causing the deck to list sideways. According to a Concor Construction worker who was on a temporary platform next to the bearing before jumping to safety, the deck fell 300mm to the top of pier 2.

Moments later, the latest theory suggests, concrete sheared at the eastern bearing, effectively removing the support at pier 2 (see diagram). This meant that the 90m long deck was propped only at the abutment and by the steel launching nose resting over pier 3.

The dramatically increased sagging moment in the deck would then have caused the 27m long steel nose to buckle and bend 45°, a third of the way from its tip, and the deck to fall over pier 2. The rest of the deck would then have collapsed progressively, dropping workers and a party of site visitors 30m to the ground.

Latest investigations do not explain why the segment failed where it did. Possibilities include...
Lack of understanding between TW/PW load transfer

Six dead in Spanish motorway bridge falsework collapse

An incorrectly positioned section of travelling formwork was this week thought to have triggered a catastrophic temporary works collapse during construction of a motorway bridge in Spain last week.

Failure to position the formwork properly is presumed to have caused it to overbalance and crash to the ground, killing six workers and injuring three.

Ahead of the collapse, deck contractor Puentes y Calzadas was preparing to move a massive travelling formwork system that was being used to cast a 60m section of the 300m viaduct deck.

The travelling formwork system was moving from west to east as contractors cast the deck. It comprised a rail-mounted mobile chassis, mounted in turn, moved beneath it into their next position (see box). Piers would normally be close enough to each other to allow the trusses to straddle three at once.

This is thought to have been the case for the rest of the viaduct, where the piers were spaced closer together at 108m
Worldwide stage collapses trigger calls for safety review

A UK review of temporary structures likely after 11 killed in three separate disasters.

By Alexandra Wynne

Structures experts said this week that the UK was likely to seek to review its procedures and codes for temporary structures following a month of catastrophic stage collapses worldwide triggered by extreme weather.

Dramatic stage collapses during festivals in Canada, the USA and Belgium have left 11 people dead and dozens more injured.

Last week saw five people killed by collapsing stages at the Indiana State Fair in the USA and six killed at the Pukkelpop music festival in Belgium. Fatalities were narrowly avoided during a similar stage collapse at the Ottawa

Image: The blue roof of the structure seen immediately after the collapse.
Collapse leads to manslaughter charge for geotechnics firm

By Alexandra Wynne

Ground engineering specialist Cotswold Geotechnical Holdings last week became the first company to be charged with corporate manslaughter under the Corporate Manslaughter and Corporate Homicide Act 2007.

Geologist Alexander Wright died in September last year while taking soil samples in a pit which had been excavated as part of a site survey.

The sides of the pit collapsed, crushing him to death.

Cotswold Geotechnical director Peter Eaton has also been charged with gross negligence manslaughter, which carries a maximum sentence of life imprisonment.

Under the new corporate manslaughter charge, an organisation is guilty if a breach in duty of care to the person who died is substantially down to a senior management failing.

Ann Metherall, a partner at law firm Burges Salmon said the corporate manslaughter charge could be more easily levelled at a small firm.

“It is unsurprising that the first prosecution under the Act is against a small company, not least because there is unlikely to be any issues in defining senior management,” said Metherall. “I wonder whether a big company in similar circumstances would find itself prosecuted.”
Company director guilty of manslaughter after steel worker was crushed to death during £500,000 basement conversion at £3.9million Fulham townhouse

- Conrad Sidebottom, 46, guilty of manslaughter at Southwark Crown Court
- Employee Anghel Milosavlevici killed by falling wall during refurbishment
- 37-year-old was killed while working at £3.9million townhouse in Fulham
- Sidebottom failed to inspect and address dangerous conditions at the site

By EMMA GLANFIELD FOR MAILONLINE

A company director has been found guilty of manslaughter after a steel worker was crushed to death during a £500,000 basement conversion at a £3.9million London townhouse.

Conrad Sidebottom, commercial director of construction company Siday, was found guilty at Southwark Crown Court after employee Anghel Milosavlevici, 37, was killed by a falling wall during a property renovation.

Mr Milosavlevici, a manual labourer, was killed in front of his father Gheorghe as the pair carried out refurbishment works at a £3.9million home in Fulham, south west London, in December 2010.
Hot off the Press

18th May 2017

N Ireland

A Dungannon building contractor given a suspended sentence after the death of a worker in a fall has been jailed for two years by the Court of Appeal.

XXX was sentenced in March after he admitted the manslaughter of Petyo Hristanov, 57. He was also fined £3,000.

On Thursday, the Court of Appeal ruled that sentence was unduly lenient.

Mr Hristanov fell from a partially-constructed farm shed in Portadown in January 2015.

The court heard that Mr Hristanov, who was originally from Bulgaria, and workmate Millen Dimov, were given no safety precautions to protect themselves while on the roof, such as scaffolding, a safety net, an elevated platform or harnesses.
Scaffold collapse 1st October 2015 on Galliard Homes refurbishment project in Hayes West London
TW – from the Simple to the very Complicated – it is sometimes the very simple that causes the problems?

Fencing and hoarding are temporary works.
HOARDINGS – A guide to good practice
Cranes on Site

A8 MOBILE CRANES ON SITE.pptx

A9 AUSTRALIAN CRANE COLLAPSE.pptx
Scaffolding

A10 SCAFFOLDING SLIDES.ppt
Thank You

Any Questions?

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