Managing Excavation Safety
Introduction

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Group H&S Manager Eric Wright
Agenda

• What is Temporary Works?
• Why are Temporary Works Required?
• Temporary Works Management
• Temporary Works Process
• Impact of a Poor Brief
• Benefits of a Good Brief
Temporary Works is any structure required to enable construction of, protect, support or provide access to, the permanent structure. Examples of temporary works are formwork, propping, scaffolds and excavations. “

(Temporary Works Forum definition)
Who are MGF?

Specialist supplier of shoring and safety equipment to the UK construction industry
Privately owned, family business established in 1981
Operating from 11 locations, directly employing over 350 people
In-house manufacture, transport and engineering services
Why Excavate?

Excavations form a significant part of construction activity. Some common reasons for having to excavate during construction are:

Services

Underground Structures

Foundations

Site Investigation
Why are TW’s required?

Legal requirement to control risks in and around excavations

408 excavation related breaches recorded in 2017

Most deaths / injuries occur in excavations less than 2.40m deep

Careful planning and design of temporary works will lead to greater certainty of costs / programme
Why are TW’s required?
There are 3 stages to managing Temporary Works:

1. Planning and Investigation
2. Design
3. Construction
Stage 1: Planning & Investigation

- Principal/Main Contractor (PC/MC)
- Principal Designer (PD)
- Temporary Works Co-ordinator (TWC)
- Package Contractor Temporary Works Supervisor (TWS)

Flowchart:
- Start
- Notify / Appoint TWC
- Collate Information
- Inspect Site
- Evaluate Risk
- Refer to Specialists
- HIGH
- LOW/MEDIUM
Stage 1: Planning & Investigation

Four main points to consider when collating information for a temporary works design brief:

1. Ground Conditions
2. Surcharges
3. Geometry
4. Installation
Stage 1: Planning & Investigation

How many hazards can be identified?

1. Geometry - Embankment
2. Structure - Building
3. Structure – Retaining Wall
4. Environment – Tree
5. Structure – Boundary Wall
6. Infrastructure - Highway
7. Body of Water – Pond?
Stage 1: Planning & Investigation
Identifying Hazards – Annotated Photos
Table 1: Categories of design check

<table>
<thead>
<tr>
<th>Category</th>
<th>Scope</th>
<th>Comment</th>
<th>Independence of checker</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Restricted to standard solutions only, to ensure the site conditions do not conflict with the scope or limitations of the chosen standard solution.</td>
<td>This applies to the use of standard solutions and not the original design, which will require both structural calculation and checking to category 1, 2 or 3, as appropriate.</td>
<td>Because this is a site issue, the check may be carried out by another member of the site or design team.</td>
</tr>
<tr>
<td>1</td>
<td>For simple designs. These may include: formwork; falsework (where top restraint is not assumed); needling and propping to brickwork openings in single storey construction.</td>
<td>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.</td>
<td>The check may be carried out by another member of the design team.</td>
</tr>
<tr>
<td>2</td>
<td>On more complex or involved designs. Designs for excavations, for foundations, for structural steelwork connections, for reinforced concrete.</td>
<td>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.</td>
<td>The check should be carried out by an individual not involved in the design and not consulted by the designer.</td>
</tr>
<tr>
<td>3</td>
<td>For complex or innovative designs, which result in complex sequences of moving and/or construction of either the temporary works or permanent works.</td>
<td>These designs include unusual designs or where significant departures from standards, novel methods of analysis or considerable exercise of engineering judgement are involved.</td>
<td>The check should be carried out by another organization.</td>
</tr>
</tbody>
</table>
Stage 2: Design

2A

Cofferdams up to 6.00m Deep
Cantilevers up to 2.00m Deep

Simple Frames:
- Tank brace - simple strutting
- Simple excavation geometry (2 / 4 sided)
- Knee braces
- Raking props

Simple Surcharges:
- Typical Domestic Buildings
- Highway Loads
- Slopes / Embankments (< 6.00m inc. depth of excavation)
- Railways
- Buildings > 4 storey domestic
- Walls > 2m high

Low Geotechnical Design Risk:
- Static Groundwater
- Borehole(s) in location of works
- Verbal Soils < 4m
- Problematic Ground Conditions
- Piezometer readings
Stage 2: Design
Stage 2: Design
Stage 2: Design

SOIL PROFILE TAKEN FROM BOREHOLE LOG REF. BH01
(GROUNDWATER ANTICIPATED AT 1.81m AOD).

Installation Stage 1
Installation Stage 2
Installation Stage 3
Removal Stage 4
Removal Stage 5

PACKING!
Customer to provide suitable packing in all corners of the excavation (Not softwood).

INSTALLATION SEQUENCE - PRE-DRIVE METHOD
Stage 3: Construction

- **Principal/Main Contractor (PC/MC) & Principal Designer (PD)**
- **Temporary Works Co-ordinator (TWC)**
- **Package Contractor Temporary Works Supervisor (TWS)**

**Flowchart Description:***

1. **Ensure Permit to Dig Issued**
   - If yes (Y), go to **Ensure Permits to Access/Dismantle Issued**
   - If no (N), go to **Record & Approve Change**

2. **Record & Approve Change**
   - If yes (Y), go to **Inspect & Maintain Shoring**
   - If no (N), go to **Brief Site Team**

3. **Brief Site Team**
   - Go to **Install Shoring**

4. **Install Shoring**
   - Go to **Record**

5. **Ensure Permits to Access/Dismantle Issued**
   - Go to **Finish**

**Notes:**
- Any changes should be recorded.
- Ensure permits are issued for access and dismantling.
- Shoring should be inspected and maintained.

**Conclusion:**
- The process concludes with the finish and record steps.
Overview of MGF Design Process

**Enquiry**
- EDRF
- Soils
- Drawings
- Photographs

**Booking In Process**
- Design
- Management System

**Review**
- Categorised on Complexity & Risk
- 0-3

**Design**
- Senior Engineer allocates work to design team
- Designer completes design documentation

**Drawing**
- Technician produces drawing based on design

**Checking**
- Independent internal checker approves the scheme
Impact of Poor Information

- Longer Design Process
- Cautious Design Approach
- Revisions
- Operational Change / Frustrations
- Increased Cost
- Strained Relationships (Internally & Externally)
Impact of Getting it Wrong
Benefits of Good Information

Value Engineered Solution

Time (Delivery)

Time (Programme)

Economical Solutions

No Revisions Required

Satisfied Customer / Client
What Good Looks Like
Edge Protection
Programme

Planning - process
  • Temporary works management
  • Site investigation
  • Confined space
  • Risk assessment
    • Competence
    • Work area
    • Work method

Construction Phase
  • Safe digging practice
  • Trench support installation
  • Inspection
  • Safe working
  • Emergency arrangements
  • Back fill / reinstatement

Review
### Risk Assessment

#### Risk Assessment

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Activity / Task</th>
<th>Hazard</th>
<th>Likelihood / Consequences</th>
<th>Primary Risk Level</th>
<th>Control Measures</th>
<th>Residual Risk Level</th>
<th>Team Member(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Receiving deliveries</td>
<td>Being crushed by large vehicles</td>
<td>Potential fatal injury from being run over by delivery truck. Potential fatal injury from being run over by lifting appliance</td>
<td>High</td>
<td>Establish safe delivery routes including where possible one way systems to minimise reversing, segregated pedestrian &amp; vehicle routes. Establish suitable lay down areas that are as far as reasonably practicable away from pedestrian routes. Competent plant operator (CPCS)</td>
<td>Low</td>
<td>EW Site Manager</td>
</tr>
<tr>
<td>2</td>
<td>Mechanical lifting</td>
<td>Falling equipment / materials</td>
<td>Potential fatal injury from fork lift truck to overturn. Being crushed by falling loads or over turning plant</td>
<td>High</td>
<td>Competent person to develop &amp; establish a lift plan. Competent slinger and signaller (CPCS). Competent person to understand the sequence for building boxes safely.</td>
<td>Low</td>
<td>EW Site Manager / Appointed Person / TWC Subcontractor</td>
</tr>
<tr>
<td>3</td>
<td>Moving and storing materials</td>
<td>Falling or accidental movement of materials</td>
<td>Potential to become trapped or crushed</td>
<td>Medium</td>
<td>Ensure materials have a suitable identified and segregated lay down area. Ensure that the ground can take the imposed weight. Store materials so that they cannot move e.g. chocks under wheels, stand manhole rings up, lift packs of brick and block to just two high. Ensure all pallets are in good order and not damaged. Remove bundling to waste bins / skips. Protect materials as necessary from the weather</td>
<td>Low</td>
<td>EW Site Manager</td>
</tr>
<tr>
<td>4</td>
<td>Machine safety</td>
<td>Mechanical failure</td>
<td>Potential for mechanical failure of lifting appliance or equipment. Being crushed or injured by falling or collapsing plant, equipment or materials</td>
<td>Medium</td>
<td>Ensure all lifting appliances and equipment have been subject to a test, thorough examination and weekly inspections by the relevant competent person. Ensure competent operator (CPCS) for relevant machine. Establish safe lifting techniques including the use of tag lines &amp; preventing lifting over people.</td>
<td>Low</td>
<td>EW Site Manager</td>
</tr>
</tbody>
</table>

This Risk Assessment is to be incorporated into all relevant Method Statements and the operatives briefed on its contents prior to the start of work.

Signed: ____________________________
Avoiding underground services

Planning & prep
- Competent staff & workers
- Current drawings (3 month)
- CAT & Genny
- Mark up
- Hand dug trial holes (backfill with sand)
- Permit to dig

Safe digging practice
- Insulated tools & AR overalls
- 500mm rule
- Don’t dig down on mark up
Confined space?
Confined space?
Confined space?

- Risk Assessment
- Avoid
- Manage the risk
- Competent people
- Emergency arrangements
Logistics & Segregation of works

Trelleborg
Pressure Test Building

- Report to Trelleborg gatehouse and Wait
- A member of Eric Wright Staff will direct you onto the site or to the holding area
- The traffic route is ONE WAY and has pedestrian crossing points and fork lifts operating
- Speed limit of 5mph
- If you need to exit the vehicle you must wear full PPE (Hard Hat, Hi Vis, gloves and safety footwear) if you don’t have PPE remain in your vehicle!

You are not to stand on the rear of the vehicle without adequate fall protection i.e. guard rails or air bags.

- If using a HIAB all outriggers must be deployed and a valid certificate of thorough examination must be shown to a member of EWC
- Only off load materials in areas agreed with Fineturret or EW staff

- A banksman must be in place whilst reversing in the construction zone.
- Smoking only in designated areas – not in vehicles.
- Welfare and first aid available at the Blue compound area
Deliveries & storage

EWG HS F-114 - Lifting Plan for Non-Crane Actives

<table>
<thead>
<tr>
<th>Plan no</th>
<th>Revision</th>
<th>Sheet no</th>
<th>Project name</th>
<th>Project no</th>
<th>Location or site</th>
<th>Preparation date</th>
<th>Work supervisor</th>
<th>Plan prepared by</th>
</tr>
</thead>
</table>

### Schedule of Lifts

<table>
<thead>
<tr>
<th>Description of load</th>
<th>Approx. weight (kg)</th>
<th>Approx. reach (m)</th>
<th>Approx. height (m)</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
</table>

### Equipment

- Telehandler
- Forklift
- Lorry Loader
- Excavator

- Make
- Model
- Serial no.

- Attachments
  - such as bucket or grab
- Test certificate
- Date of last inspection
- Lifting capacity
- Maximum safe working loads (kg) – optimum
- Maximum height (m) – Maximum reach

None of the information in this plan is of any use unless it is communicated to all persons involved in the lifting operation.

<table>
<thead>
<tr>
<th>Operator details</th>
<th>Name</th>
<th>Competence</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Decleration by personnel</th>
<th>Role</th>
<th>Declaration Name</th>
<th>Signed</th>
<th>Date</th>
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General Notes for the use of telehandlers, cranes and manlifts

1. The following rules apply to these sites and will be made known to all persons involved in non-crane lifting operations:
   - The only authorized operations are as detailed in this document.
   - A member of the operation should be on hand to assist in any lift.
   - The designated operator is responsible for any lift and should be present at all times.
   - The lift must be in good condition – using special attention to points required for safety.

2. The maximum capacity must be correct and verified by the operator.
Trench support installation

Equipment on site & ready for use

Competent installers

Following a plan
Types of shoring

Sheets & frame

Boxes
Trench support
Battering / stepping back

- Drained clay or rubble: 45°
- Gravel: 40°
- Shingle: 39°
- Dry sand: 38°
- Dry earth: 28°
- Gravel with sand: 25°
- Wet sand: 22°
- Wet clay: 16°

All angles are from horizontal.
Permit to proceed

Completed by the TWC

Part 3 Permit to strike
### Inspection

**Before each shift**

**After any event likely to affect its stability**

**After any earth fall or fall of material**
**Permit to proceed**

**Part 3 Permit to strike**

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**Temporary Works Checks & Permits**

<table>
<thead>
<tr>
<th>Contract</th>
<th>Contract No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWG</td>
<td>TUG</td>
</tr>
</tbody>
</table>

**Locational Description of Works**

**I.0 Construction Stage Checks (by TWG or TUG)**

**I.1 At each stage the works should be checked for the following:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>The works are constructed as designed</td>
</tr>
<tr>
<td>b.</td>
<td>The materials are as specified</td>
</tr>
<tr>
<td>c.</td>
<td>The workmanship is to the standard required</td>
</tr>
<tr>
<td>d.</td>
<td>Site conditions (ground, water, etc.) are as assumed in the design</td>
</tr>
<tr>
<td>e.</td>
<td>Testing has been undertaken as specified by the designer to ensure the design has been verified</td>
</tr>
<tr>
<td>f.</td>
<td>Method of use and loading are as assumed in the design</td>
</tr>
</tbody>
</table>

**II.0 Permit to Load Proceeded (by TWG)**

The temporary works described in this certificate may be loaded (subject to the specific conditions below).

**III.0 Limitations of Use (i.e., load, method of loading, specific loading regime, etc.)**

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**Final Stage 3-1**

- Pump out (F2) at -3.10m and lock off hydraulics.
- Push & dig to formation level (-4.60m).

**Final Stage 3-2**

- Cast minimum 200mm thick concrete base up to face of sheets.
- Remove (F2) once concrete base has reached a minimum strength of 5N/mm².

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**Ensure personnel on site are aware of the specific limitations etc. via briefed method statements and/or site risk assessments**
Emergency arrangements

We must have and practice an emergency evacuation
We cannot rely on the emergency services!
Part 3 Permit to strike
Backfill & reinstatement

Surcharge
Stop blocks
Damage to services
Density / settlement
Review

We don’t do enough of this

What went well & what never!
Summary – we’ve looked at

Planning - process
  • Temporary works management
  • Site investigation
    • Contamination
    • Ground water
    • Ground strata

Design process
  • Confined space
  • Risk assessment
    • Competence
    • Work area
    • Work method

Construction Phase
  • Safe digging practice
  • Trench support installation
  • Inspection
  • Safe working
  • Back fill / reinstatement

Review
Thank you

Heath McHugh
David McNair

Any questions?

I would like to thank our sponsors today

MGF (link)
M&P Surveys (link)