SAFETY PUBLICATION SERIES

GOOD PRACTICE GUIDE

Management of Shoring in Excavations

PART 3 - SELECTION of PROPRIETARY SHORING EQUIPMENT

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Shoring Technology Interest Group

GOOD PRACTICE GUIDE for the Management of Shoring in Excavations

Part 3 - Selection of Proprietary Shoring Equipment

CPA Good Practice Guide

Reference No. STIG 1801

First Published: November 2018
Revised: February 2021
Published by:
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Contents

1.0 Introduction

This Document is **Part 3** of a suite of publications on the topic of excavation safety. **Part 1** deals with the management of shoring in excavations and provides guidance on decision making, planning and control of the work. **Part 2** provides expanded guidance on hazard identification and risk assessment to assist contractors with preparations for excavation work on site.

This document provides expanded information on the most commonly available modular shoring systems in the UK to assist designers and contractors with the safe selection of suitable support systems prior to work commencing on site.

A wide variety of proprietary modular shoring systems are readily available throughout the UK for either sale or hire. Suppliers of these systems are widely recognised as experts in their design, manufacture and safe use. Refer to **Appendix B** for CPA member contact details.

Most suppliers have teams of highly skilled temporary works designers who will provide site specific designs and assist with risk assessments and generic safe systems of work / installation guides. As part of this service, it is necessary for the temporary works co-ordinator to produce a comprehensive temporary works design brief for the supplier (refer to **Part 1 Figure 6 - Temporary Works Design Flowchart**). In terms of physical equipment selection, key parts of the brief are identifying the size of excavation, size of excavator, anticipated ground conditions and competency of the site team to install the systems / carry out the excavation works.

Most suppliers provide comprehensive advice and training on the safe use of their products, together with a wide range of safety ancillaries to comply with health and safety good practice.

Alternatively, contact details for specialist training companies are listed in **Appendix B**.

Figure 1 - Heavy Duty Frames and Struts

1.1 Requirements of the CDM Regulations 2015

Under CDM, the designer is defined as anyone preparing or modifying a design. A design can consist of drawings, details or specifications relating to a structure.

As such, a designer includes anyone who specifies a particular method of work, equipment or material. This person will assume the role and responsibilities of a designer under the CDM Regulations and must have the skills, knowledge and experience, necessary to fulfil the role. As a designer, they are duty bound to cooperate with other persons working on a project to enable them to fulfil their duties and maintain the health and safety of themselves and others.

Based on the above definitions, it is clear that great care should be taken when specifying shoring equipment and should only be done by those with a sufficient level of competence to fulfil the role of the designer.

To assist the site team, a number of standard solutions are available for excavations up to 4m deep. It is the responsibility of the person selecting the standard solution to check that the site conditions match those assumed in the solution. In addition, as this person is effectively specifying the solution, they assume the role and responsibilities of the designer under CDM.

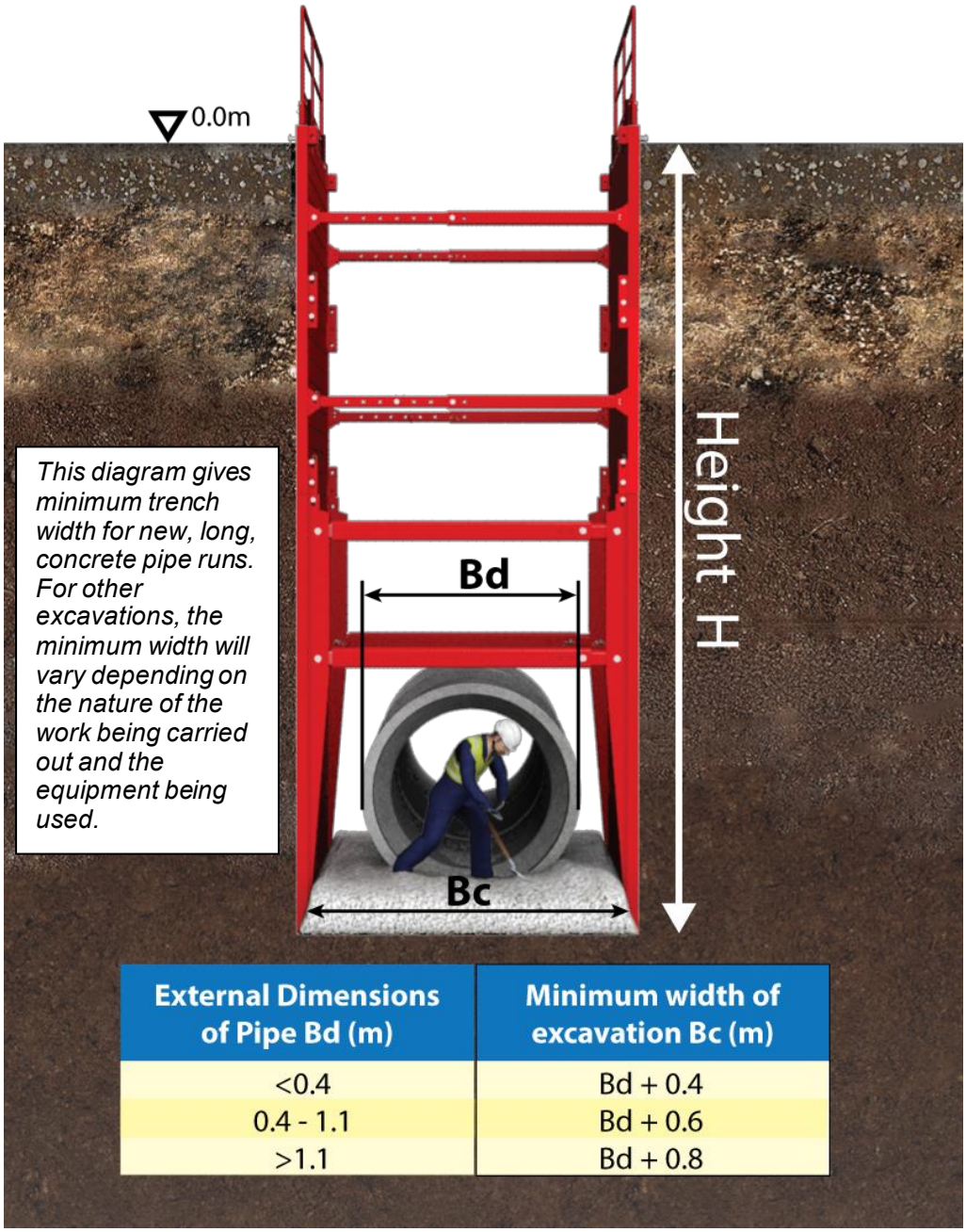
2.0 Use of Proprietary Shoring Equipment for Excavations

2.1 Geometry of Excavation

The size of the excavation is normally dictated by the size of the works to be constructed and should be specified in the contract documentation.

However, the actual trench width should be considered carefully to ensure that there is sufficient space to safely carry out the works, avoid clashes with the permanent works and provide means of access/egress.

Below are some general rules for minimum widths of the excavation.



External Dimensions of Pipe Bd (m)	Minimum width of excavation Bc (m)
<0.4	Bd + 0.4
0.4 - 1.1	Bd + 0.6
>1.1	Bd + 0.8

Figure 2 – Guidance on minimum trench width
(based on British Precast Drainage Association recommendations for laying, jointing and backfilling)

2.2 *Excavator Size and Lifting Operations*

Most excavations are carried out using excavators which come in a huge variety of types and sizes. Excavators are generally also used for lifting operations and therefore require careful sizing to match both the proposed shoring equipment and installation / removal operations. The excavator should have sufficient lifting capacity so that it has sufficient clearance from the side of an excavation.

Excavator manufacturers are required to supply lifting capacity charts with the machine similar to the example below to identify the rated capacities at the various radi and height. The weight of items of shoring equipment are provided within the supplier's technical files. The choice of excavator to carry out the lifting operation can also be influenced by a number of site constraints including overhead cables and restrictions on excavator operating areas around the excavation.

The Strategic Forum Plant Safety Group has produced extensive guidance on lifting operations with excavators which can be downloaded from www.cpa.uk.net and should be referred to during the planning stage of the lifting activity.

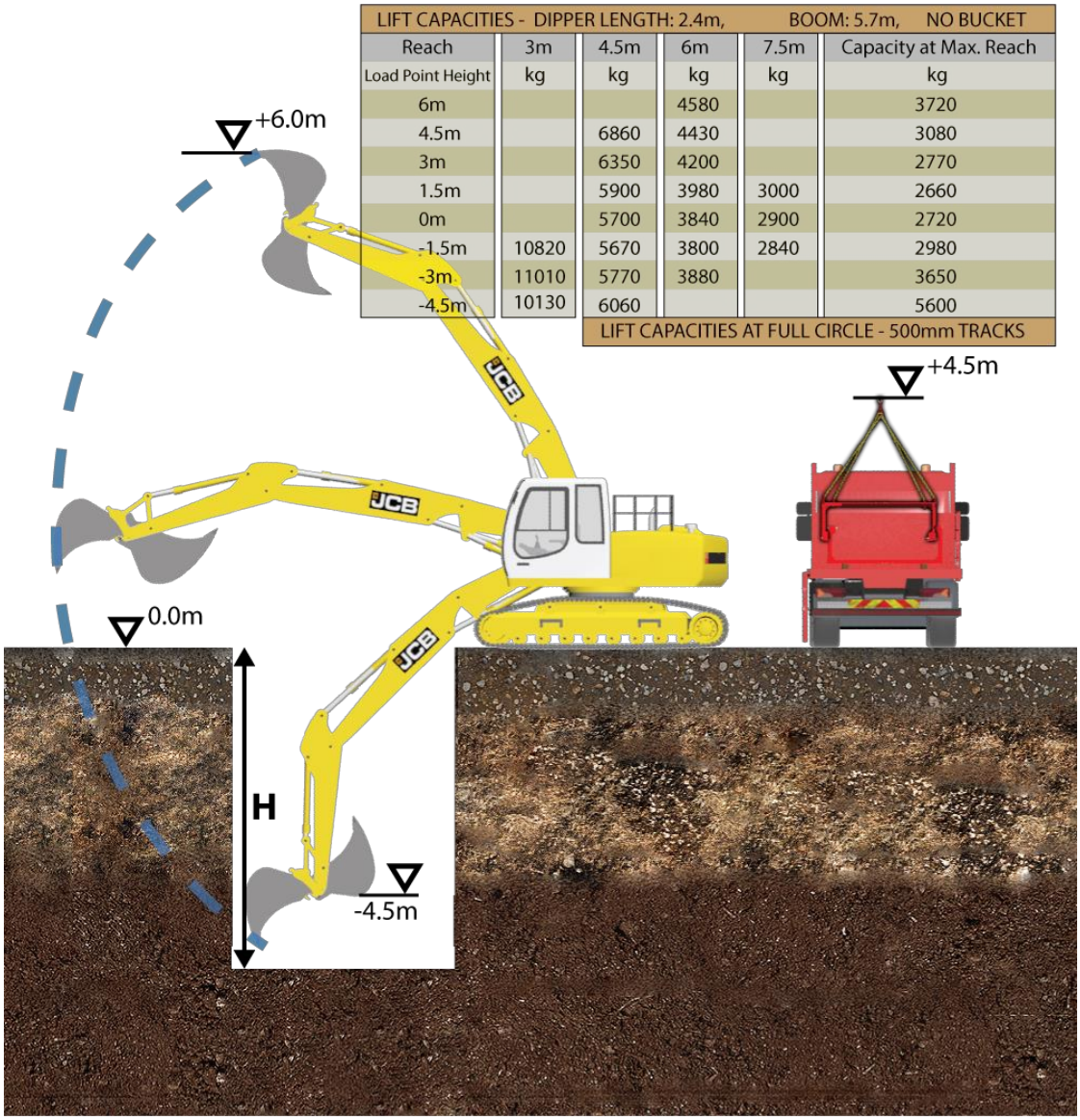


Figure 3 – Lifting capacity chart and working envelope diagram for one model of excavator

2.3 *Ground Conditions and Earth Pressures*

Most shoring equipment suppliers produce technical files that provide safe working loads (SWL) for their equipment. In order to assist with their selection, Figure 4 indicates how earth pressures and hydrostatic pressures can increase with depth.

2.3.1 Typical soil descriptions

Good ground	Reasonable ground	Poor ground
Self-supporting ground with no groundwater	***with easily controllable ground water***	***with or without high ground water***
• Firm or stiff clay • Mudstone and shales	• Soft clays • Sands and gravels • Firm silt • Fill material/Made Ground • Dewatered sands and gravels	• Soft/very soft saturated clays • Saturated sands and gravels • Alluvial muds • Soft silts • Peat/organic soils

Table 1 – Typical soil descriptions for initial selection of equipment

> ***Note:*** *These descriptions should be used only to gain an initial view of the potential solutions available and should not be used for design and construction purposes.*

The earth pressure increases with the depth of the excavation. The following diagram can be used to determine the earth pressure in the majority of cases.

N.B. These pressures could be reduced if a detailed design is procured based on the results of a geotechnical site investigation.

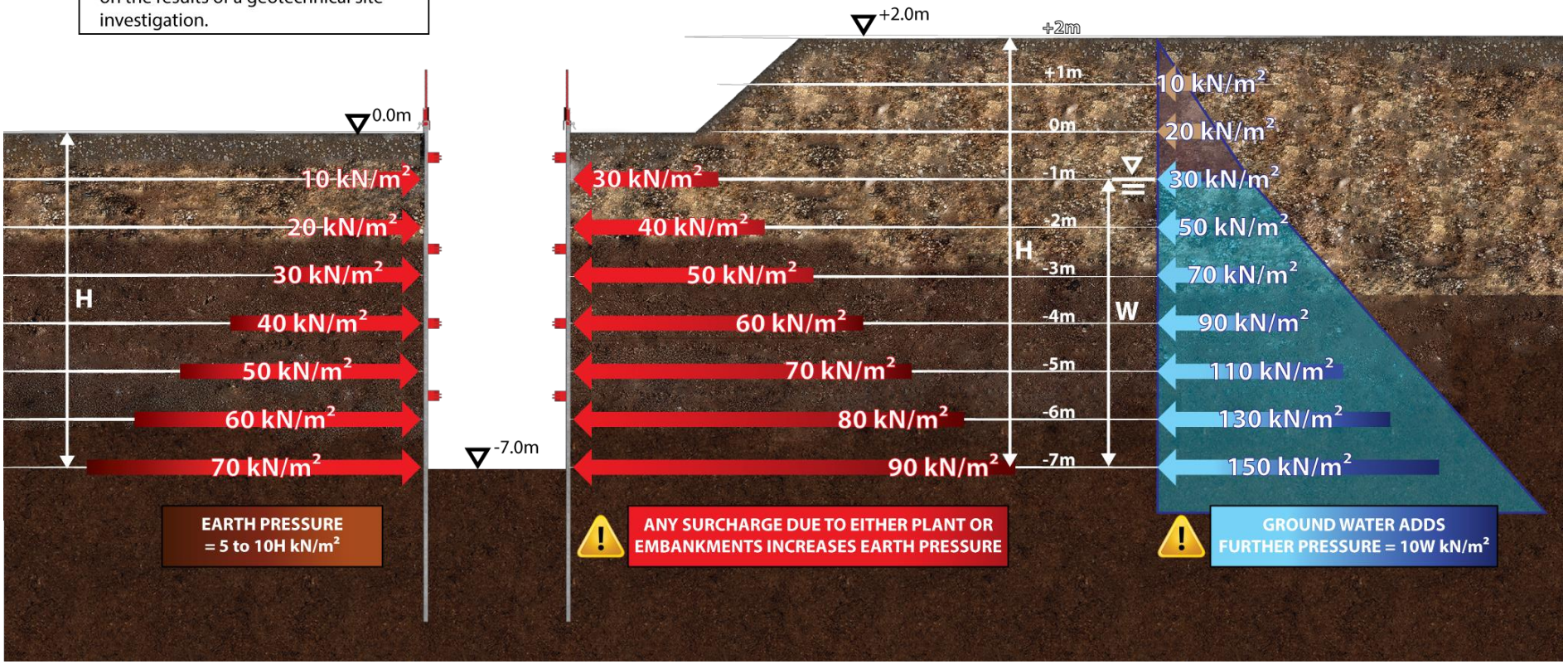


Figure 4 – Lateral pressures vs depth

2.4 *Competency of Site Team*

There is a large and complex range of shoring equipment available. It is essential that the temporary works site team are familiar with the shoring equipment selected and competent to safely handle, assemble, lift, move, install, maintain and remove and store.

Training courses are available (refer to **Appendix A**) as are tool-box talks from a variety of suppliers.

The equipment can be very large and very heavy, often requiring highly experienced and skilled teams to allow the equipment to be used safely. It is the responsibility of the contractor, with advice from the TWC and TWS, to ensure how the equipment should be safely used.

Part 1 Table 1 provides guidance on TWC, TWS and TWD competency requirements.

2.5 *Design Brief*

Most suppliers provide free advice and design services to assist with the safe selection of shoring systems. Normally the supplier's Design Request Form is filled in by the site team, with an example of considerations to the taken into account listed below. It is essential that time and effort is put into producing the brief, otherwise safety and schedules can be compromised.

A good design brief should contain the following information as a minimum:

- Name and address of the site;
- Names and contact details of the relevant parties (e.g. user/contractor, TWC/TWS, Principal Designer, Principal Contractor);
- The purpose of the excavation;
- The geometry of the excavation (length, width, depth, shape etc.);
- Expected duration of the works;
- Relevant details on the size, location and nature of the permanent works;
- The nature of the ground conditions at the site with engineering descriptions of the soils/rocks present and details on any groundwater. This should ideally be provided in the form of a suitable SI report with relevant borehole/trial pit records and field/lab test results;
- Surrounding surcharges that will have an influence on the excavation (e.g. roads, railways, embankments, plant, craneage, buildings, structures). Specific details of each hazard should be provided;
- Other site risks (e.g. waterways, overhead cables, services);
- Access limitations;
- Available plant and preferred methods of installation.

Further guidance on the preparation of a design brief can be found in Section 8 of BS 5975.

3.0 Suitability of Shoring Equipment

Shoring equipment should only be specified by a competent person based on suitable experience and engineering judgement. It is good practice to use a suitable temporary works design produced by a competent engineer. A number of standard solutions are available for excavations less than 4.0m deep.

For excavations deeper than 4.0m or where there may be site specific hazards (poor ground, groundwater, high surcharges etc.), an engineered solution should always be obtained. If in doubt, advice should be sought from a specialist shoring supplier.

Note: *The following matrix is intended for guidance only and is not a substitute for good experience.*

Type of Excavation	Depth (m)	Soil description	Trench & Manhole Boxes *	Drag Boxes *	Slide Rail *	Vertical Shores # and lightweight systems	Waler Frames & Manhole Braces with Trench Sheets	Heavy Duty Bracing Frames with Trench Sheets / Sheet Piles
Trench and Manhole Excavations	< 2.0	Good	✓	✓	×	✓	✓	×
		Reasonable	✓	×	×	✓	✓	×
		Poor	×	×	×	×	✓	×
	< 6.0	Good	✓	✓	⚠	×	✓	✓
		Reasonable	✓	×	⚠	×	✓	✓
		Poor	×	×	×	×	✓	✓
	> 6.0	Good	⚠	×	✓	×	×	✓
		Reasonable	⚠	×	✓	×	×	✓
		Poor	×	×	⚠	×	×	✓
Large Excavations	Any	All ground conditions	×	×	✓	×	×	✓
Multi-sided Excavations	< 6.0	All ground conditions	×	×	✓	×	✓	✓
	> 6.0	All ground conditions	×	×	✓	×	×	✓

* Box and slide rail systems cannot be used in excavations with service crossings due to clashes with the panels.

\# Vertical shores are only able to provide intermittent support to the trench walls. If there is any possibility of the ground falling between the shores additional rated ply panels will be necessary.

⚠ Limited number of solutions

Table 2 - Suitability of Shoring Equipment

4.0 Types of Shoring Systems

Shoring equipment used for excavation support includes the following generic types:

1. Trench & Manhole Boxes;
2. Drag Boxes;
3. Slide Rail systems;
4. Walers and Manhole Braces with Trench Sheets;
5. Heavy-Duty Bracing Frames with Trench Sheets / Sheet Piles;
6. Hydraulic or Mechanical Struts;
7. Lightweight systems for shallow excavations.

In addition to the above, there are a number of more specialist shoring and load monitoring systems available in the UK although these are outside the scope of this guide.

Figure 5 – Trench and Manhole Boxes

4.1 *Trench & Manhole Boxes*

Trench boxes are generally the first choice for the rapid shoring of trench runs with local widenings for manhole chambers.

✓ Ideal for linear shoring of trench runs (generally up to 4m wide) and manhole chambers (generally up to 5m wide);

✓ Boxes are available up to 6m deep (although their suitability will depend on the actual site conditions);

✓ Quick and easy to install and remove;

✘ Not suitable in waterlogged ground or in very soft clays and silts;

✘ Not suitable in some urban conditions particularly in roadways where there can be many statutory services preventing the installation of the box panels;

⚠ Larger 4m high boxes can weigh over 4 tonnes;

⚠ Not recommended adjacent to sensitive structures, railways and highways where the removal operation can cause settlement issues;

⚠ The ends of the trench should either be closed off using suitable trench sheets or end closure panels or battered back at a safe angle of repose.

Figure 6 - Trench Box with incremental struts

Figure 7 – Typical Manhole Box

Figure 8 – Trench box during lifting operation

Figure 9 – High clearance trench boxes

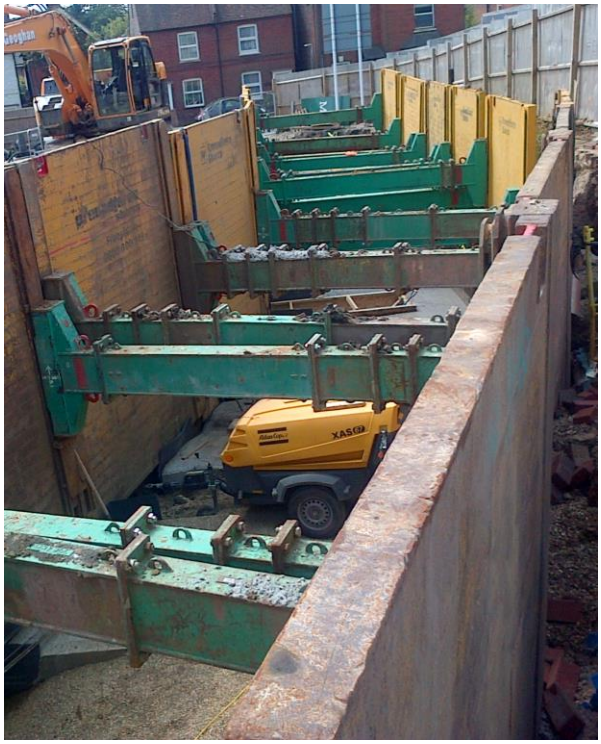


Figure 10 – Rolling strut trench boxes

4.2 *Drag Boxes (Shields)*

Used for short-term protection of the work force in non-urban environments typically for pipeline installation.

- ✓ For use as a single unit to support trenches in good, stable, self-supporting ground conditions;
- ✓ Provide a safe working area for operatives;
- ✓ They are designed with a front cutting edge to enable them be pulled or dragged through the advancing trench by the excavator as work proceeds to enable rapid installation of pipelines;
- ✘ Not suitable in non-self-supporting ground;
- ✘ Not suitable in urban environments;
- ⚠ Larger drag boxes are very heavy and can weigh more than 6 tonnes;
- ⚠ Drag boxes do not provide an effective means of preventing ground movement;
- ⚠ Drag Boxes should not be left in the trench outside of the working day.

Figure 11 – Lifting Drag Box

Figure 12 – Drag Box Base with Top

Figure 13 – Drag Box cutting edge

4.3 *Slide Rail Systems*

A specialist linear shoring system where positive ground support is required.

- ✓ Slide rail is a post and panel system used to support continuous trenches typically up to 10m wide;
- ✓ Can be used typically up to 7m deep (although their suitability will depend on the actual site conditions);
- ✓ Large under strut clearance can be achieved;
- ✓ Specialist tie-back beams can be adopted to allow the rolling struts to be removed for clear openings that require no internal frames;
- ✓ Can be installed/removed in sequence to allow continuous linear runs based on a 'leap frog' method of working;
- ✓ Can be adopted in most ground conditions however where water is present this will need to be controlled and monitored;
- ✘ Not suitable in some urban conditions particularly in roadways where there can be many statutory services preventing the installation of the panels;
- ⚠ Requires a minimum 30t excavator for installation and removal.

Figure 14 - Slide Rail system

4.4 *Walers and Manhole Braces with Trench Sheets*

Waler frames in conjunction with sheeting provide a versatile means of supporting two-sided trenches, giving positive ground support, particularly in urban environments.

For excavations where support is required on all four sides, manhole braces and trench sheeting provide a safe and economical solution for positive earth support.

- ✓ Hydraulically operated frames, installed horizontally for two or four-sided support;
- ✓ Relatively lightweight and versatile system that makes it ideal for use in urban environments where underground services and obstructions are likely to be encountered;
- ✓ Can be used to support excavations generally up to 6m deep (although their suitability will depend on the actual site conditions);
- ⚠ The need to pitch and drive trench sheets can result in a longer installation period than with a Box system;
- ⚠ Careful consideration needs to be given to the installation sequence to ensure that sufficient earth support is provided to prevent rotation of the sheets at each stage of installation.;
- ⚠ The ends of a trench run should either be battered back at a safe angle of repose or sheeted (using suitable end bearers on waler frames). Waler hydraulic struts should never be laterally loaded.

Figure 15 - Trench with Walers

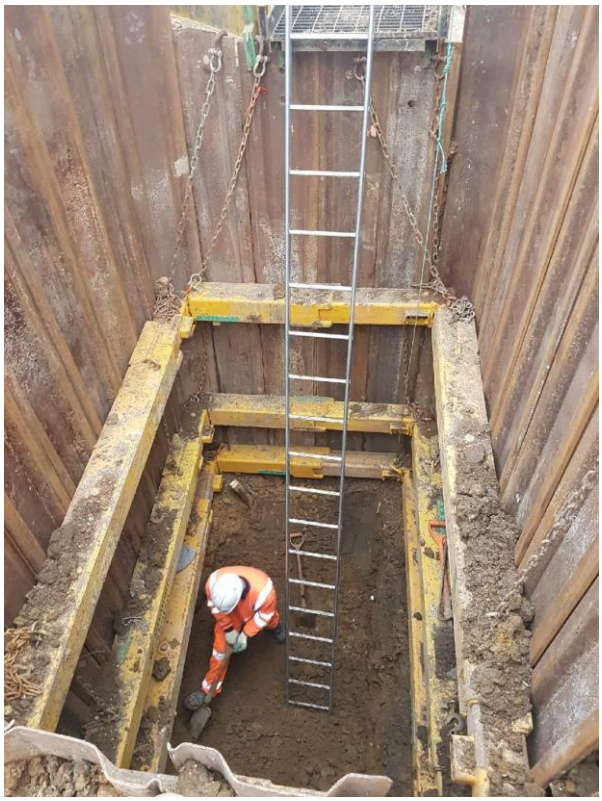


Figure 16 - Manhole Brace

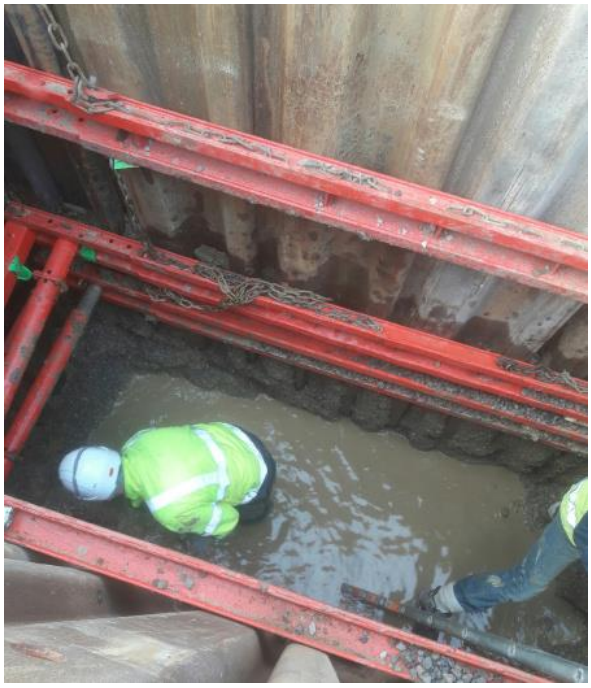


Figure 17 - Sheets and walers for sewer trench

Figure 18 – Manhole brace with access/egress

Figure 19 - Sheets and walers for trench run

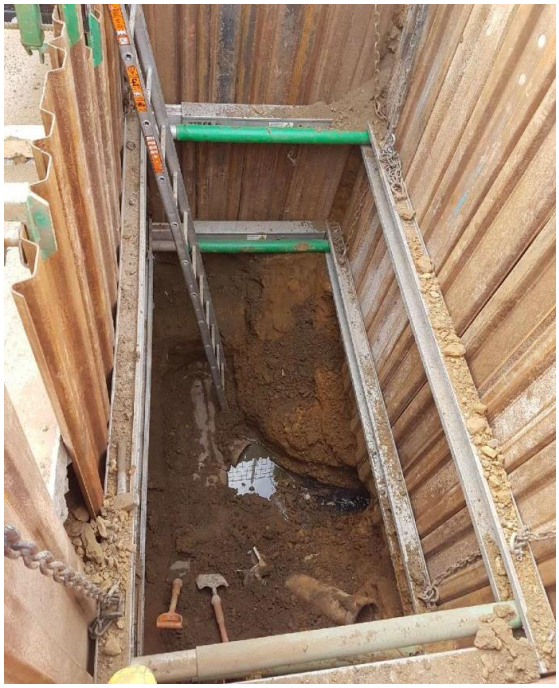


Figure 20 – Walers with end bearers

4.5 Heavy-duty Bracing Frames with Trench Sheets / Sheet Piles

Heavy-duty bracing frames and legs can be combined to provide support for larger excavations and cofferdams.

✓ Hydraulically operated structural frames, used for supporting larger and deeper excavations and shafts providing support to all sides;

✓ Four or more individual legs or leg assemblies that are combined to form square, rectangular or multi-sided frames;

⚠ Heavy-duty bracing legs are available in lengths exceeding 20m; however, these would generally need to be combined with cross-strutting for greater strength and reduced deflection;

⚠ Careful consideration should be given to the installation sequence to ensure that sufficient earth support is provided to prevent rotation of the sheets at each stage of installation;

⚠ Large excavators and cranes may be necessary to install and remove this equipment;

⚠ This equipment should only ever be used with a formal temporary works design produced by a competent temporary works engineer.

Figure 21 - Large excavation with clear span bracing frames

Figure 22 - Large excavation with bracing frames and cross-strutting

Figure 23 - Cofferdam for storm water attenuation tank on a housing development

Figure 24 – Braced drive pit for pipe jacking operation

4.6 *Heavy Duty Hydraulic or Mechanical struts*

Hydraulic or mechanical struts are generally used for high axial load propping applications such as cross strutting to supporting frames or supporting concrete structures.

- ✓ Hydraulically or mechanically operated telescopic members used in cross strutting, knee bracing or raking prop applications;
- ✓ Proprietary equipment is available up to 500 tonnes axial load capacity;
- ✓ Struts incorporate a hydraulic adjustment/pressurising facility or means of mechanical adjustment;
- ✓ Struts assemblies are available in unsupported lengths exceeding 50m;
- ⚠ Large excavators and cranes may be necessary to install and remove this equipment;
- ⚠ This equipment should only ever be used with a formal temporary works design produced by a competent temporary works engineer;

Figure 25 - Struts to concrete piles

Figure 26 - Struts supporting a bracing frame with sheet piles

Figure 27 – Cofferdam with hydraulic struts acting as knee braces in corners

4.7 *Lightweight systems*

Lightweight shoring systems are generally used for shallow short-term applications, where quick installation by hand or using small machines is required.

✓ Suitable for short-term use in good ground conditions to a depth of 2.0m;

✓ Consist of components that can be manually handled but is able to be assembled into larger units that may require machine handling;

✓ These systems are generally of aluminium or plastic construction;

✘ Not suitable in poor ground or where groundwater is present.
These systems tend to be placed into a pre-dug trench. In poor or free flowing ground pre-driven or progressively driven support will be needed;

⚠ Not recommended adjacent to sensitive structures, railways and highways where the installation and removal operation can cause settlement issues;

⚠ Hit & miss systems (e.g. Vertishores) require the soil to arch between supports so need careful assessment by an experienced geotechnical engineer to make a decision about spacing. In addition, these systems may require additional panels to increase bearing surface/protected face width.

Figure 28 – Modular Aluminium panel system

Figure 29 – GRP trench box and Vertishores

Figure 30 – Aluminium Vertishores

Figure 31 – GRP Vertishores

Annex A - Definitions

appointed person

person with sufficient training and experience to enable them to carry out the planning of lifting operations

competent person

person with sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail, and with sufficient experience and ability to enable them to carry out their duties in relation to the works, to recognise their limitations, and to take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work

hazard

something with the potential to cause harm, (this can include the site situation and layout, substances or machines, and other aspects of work organisation)

manhole

collective/industry-accepted term for a utility hole, maintenance hole or sewer hole

principal contractor (PC)

person appointed as the principal contractor under Regulations 12 to 14 of the Construction (Design and Management) Regulations 2015

safe system of work (SSOW)

a formal procedure which should be followed to ensure that work is carried out safely and is necessary where risks cannot be adequately controlled by other means

surcharge

a vertical load or weight caused by spoil, overburden, vehicles, equipment, or activities that may affect stability, incurring additional lateral loading on the shoring system

temporary works

engineered structures 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

temporary works co-ordinator (TWC)

competent person with responsibility for the co-ordination of all activities related to the temporary works

temporary works designer (TWD)

competent person who carries out the design of temporary works

temporary works supervisor (TWS)

competent person who is responsible to and assists the temporary works co-ordinator

Annex B – Further Information and Guidance

Legislation *(The following can be downloaded free via the HSE website)*

Health and Safety at Work etc. Act 1974. London: The Stationery Office

The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)

Provision and Use of Work Equipment Regulations 1998 (PUWER)

L22 Safe use of work equipment, HSE Books

The Management of Health and Safety at Work Regulations 1999 as amended (MHSWR)

Work at Height Regulations 2005 (WAHR)

The Pressure Systems Safety Regulations 2000

The Control of Noise at Work Regulations 2005

The Control of Vibration at Work Regulations 2005

The Manual Handling Operations Regulations 1992 (as amended)

Electricity at Work Regulations 1989

The Construction (Design and Management) Regulations 2015 (CDM)

L153 Construction (Design and Management) Regulations 2015. Guidance on Regulations, HSE Books

The Confined Spaces Regulations 1997 (CSR)

L101 Safe work in confined spaces, HSE Books.

Standards *(Priced documents available from BSI)*

BS 5975:2008 + A1:2011, *Code of practice for temporary works procedures and the permissible stress design of falsework*

BS 6031:2009, *Code of practice for earthworks*

BS 8002:2015, *Code of practice for earth retaining structures*

BS EN 13331 (parts 1 & 2) 2002, *Trench Lining Systems*

BS EN 14653 (parts 1 & 2) 2005, *Manually operated hydraulic shoring systems for groundwork support.*

Other Publications *(The following can be downloaded free from either the CPA or HSE websites)*

HSE Leaflet INDG163 – *Risk assessment - A brief guide to controlling risks in the workplace*

Management of Shoring in Excavations Part 1 - Management, Construction Plant-hire Association

Ground Conditions for Construction Plant, Construction Plant-hire Association

Risk Assessment for Shoring and Piling Operations, Construction Plant-hire Association

Lifting Operations With Excavators, Strategic Forum Plant Safety Group (Construction Plant-hire Association)

Safe Use of Quickhitches, Strategic Forum Plant Safety Group (Construction Plant-hire Association)

Safety in Shoring. The proprietary shoring and piling Equipment Manual, Construction Plant-hire Association

Construction Plant-hire Association Shoring Technology Technical Information Notes:

TIN 201 - *Definition of Engineering Terms Relating to Piling, Excavations and Temporary Works Design*

TIN 202 - *Schedule of Cold Formed Steel Sheets*

TIN 203 - *The Use of Restraining Chains to Support Shoring Equipment*

TIN 204 - *The Correct Use of Lifting and Other Attachment Points for Shoring Equipment*

TIN 205 - *Schedule of Plastic Piles*

TIN 206 – *Shoring Equipment and Construction Products Regulations*

TIN 207 - *Shoring Designs based on Verbal Soil Descriptions*

TIN 208 - *Safe Use of Excavator Mounted Vibrators.*

Useful Websites

Construction Plant-hire Association	www.cpa.uk.net
CITB	www.citb.co.uk
Health and Safety Executive	www.hse.gov.uk/construction/index.htm
Strategic Forum for Construction	www.strategicforum.org.uk
Temporary Works Forum	www.twforum.org.uk

STIG Members (2021) Websites

Actavo	www.actavo.com
CITB	www.citb.co.uk
CPA	www.cpa.uk.net
GAP	www.gap-group.co.uk
Leada Acrow	www.sunbeltrentals.co.uk
Mabey Hire	www.mabey.com
MGF Ltd	www.mgf.ltd.uk
NTS	www.ntsafety.com
ProMech Hire	www.promechhire.co.uk
ProShore	www.proshore.co.uk
RMD Kwikform	www.rmdkwikform.com
Site Equipment Ltd	www.siteequipment.co.uk
T.H.E. Plastic Piling Company Limited	www.plasticpiling.co.uk
Vp plc Groundforce Shorco	www.vpgroundforce.com

Annex C – Examples of Good Practice Shoring Documents

DESIGN REQUEST FORM

1. GENERAL INFORMATION

CUSTOMER:		DATE REQUESTED:		1a. Please ensure that all the contact and site details are completed.
SITE:		DATE DESIGN IS REQUIRED:		
PRINCIPAL/MAIN CONTRACTOR :		APPROXIMATE START DATE:		
POSTCODE:		Tender ☐	Live Scheme ☐	
SITE CONTACT DETAILS: (NAME + FAX + TEL)				
CONTACT EMAIL:				
PRINCIPAL DESIGNER : Name and Email		TWKS CO-ORDINATOR(S): Name and Email		1b. This information is mandatory for us to comply with CDM 2015 requirements. Note that a Principle Designer (s) has to be appointed by the client for all notifiable projects.

2. EXCAVATION INFORMATION

DESIGN NAME:					
SUPPORT SYSTEM TYPE: (Other please specify in section 7)	CLIENT SPECIFIED FRAME ☐	MULTIPLE FRAMES: ☐	PROPPED CANTILEVER: ☐	CANTILEVER: ☐	2a. Please only select one of the excavation type options. 2b. For durations > 12 weeks more onerous design parameters may apply. 2c. If clear opening dimensions are specified, we will make an additional allowance for deflection when specifying the overall excavation size.
EXCAVATION DIMENSIONS:	LENGTH: (m)	WIDTH: (m)	DEPTH: (m)	OVERDIG: (m)	
APPROX EXCAVATION DURATION:				N/A ☐	
Weeks	MUCK TO MUCK ☐	SHEET TO SHEET ☐	CLEAR OPENING INSIDE FRAMING ☐		

3. SHEET & FRAME DETAILS

EQUIPMENT TYPE:	MOST ECONOMICAL:	☐		LIGHTEST:	☐	3a. The options specified are to assist with ensuring we provide the most cost effective design proposal, however it must be stressed that the solution will be subject to design approval. 3b. This information is only required if limitations apply. * Specify any additional handrail requirements if applicable Section 8. ** Interlocking sheet piles only
BOXES:	STRUTS ALLOWED:	NO ☐	YES ☐	LOWER FRAME(S) ONLY ☐	NO KNEE BRACES ☐	
FRAMES:	CLEARANCE BELOW LOWEST FRAME: (m)		N/A ☐	CORNER PILES REQUIRED**:	☐	
STRUTS:	MAX SHEET LENGTH: (m)		N/A ☐	SHEET UPSTAND*: (m)		N/A ☐
SHEETS:	MAX SHEET TOE IN: (m)		N/A ☐	NO TOE SOUTION:	☐	

4. PREFERRED METHOD OF SHEET INSTALLATION

PRE DRIVEN:	☐	DIG & PUSH:	☐	SLIT TRENCH:	☐	2 STAGE: (See note 4)	☐	4. The 2 stage option is when the lower frame(s) is removed once a blinding slab has been cast and cured.

Page ___ of ___

Figure C.1 – Typical Design Brief Form

5. GROUND INFORMATION

INFO PROVIDED:		BH OR TP REF TO BE USED FOR THIS DESIGN:		GROUND REDUCTION / REDUCED LEVEL: (Specify or indicate below)	
BH/TP or WS:	☐				
Distance from excavation:					
VERBAL: (Fill out verbal Soil Description sheet)	☐	GROUND DATUM LEVEL: (m AOD)		DE-WATERING METHOD:	
WATER LEVEL: (m BGL)		REDUCED DATUM LEVEL: (m AOD)		LEVEL OF EXTERNAL DE-WATERING	

5a. Please ensure that ONLY the relevant ground information is supplied.
It is the contractor's responsibility to provide representative ground information on which the design will be based.

6. SURCHARGE / SITE INFORMATION

PLANT SURCHARGE:		≤ 30 TONNE (10kN/m²) ☐	≤ 45 TONNE (15kN/m²) ☐	≤ 60 TONNE (20kN/m²) ☐
SPECIFIC SURCHARGE:		**DISTANCE FROM EXCAVATION (m)**	**SURCHARGE DETAILS**	
RAILWAY:	☐			
ROAD:	☐			
BUILDING:	☐		Type of Foundation: Depth of Foundation : No. of Storeys:	
CRANE:	☐			
EMBANKMENT:	☐			
OTHER:	☐			

6a. The excavator size / type should be specified.

6b. Please ensure that if a surcharge is present this section is completed to the fullest extent to ensure economic design.

6c. Provide specific details of building loads e.g. foundation details.

6d. The cranes outrigger specifications MUST be provided to ensure an accurate surcharge is allowed for.

7. ADDITIONAL INFORMATION

7. For all additional information and specific requirements not allowed for on the request form please complete in this section.

8. ANCILLARY REQUIREMENTS

9. CUSTOMER DECLARATION

I confirm that the above information comprises the design brief that should be used to prepare a temporary works shoring scheme.

CUSTOMER SIGNATURE: (print name underneath)	POSITION:	DATE:

Page ___ of ___

Figure C.2 – Typical Design Brief Form (cont.)

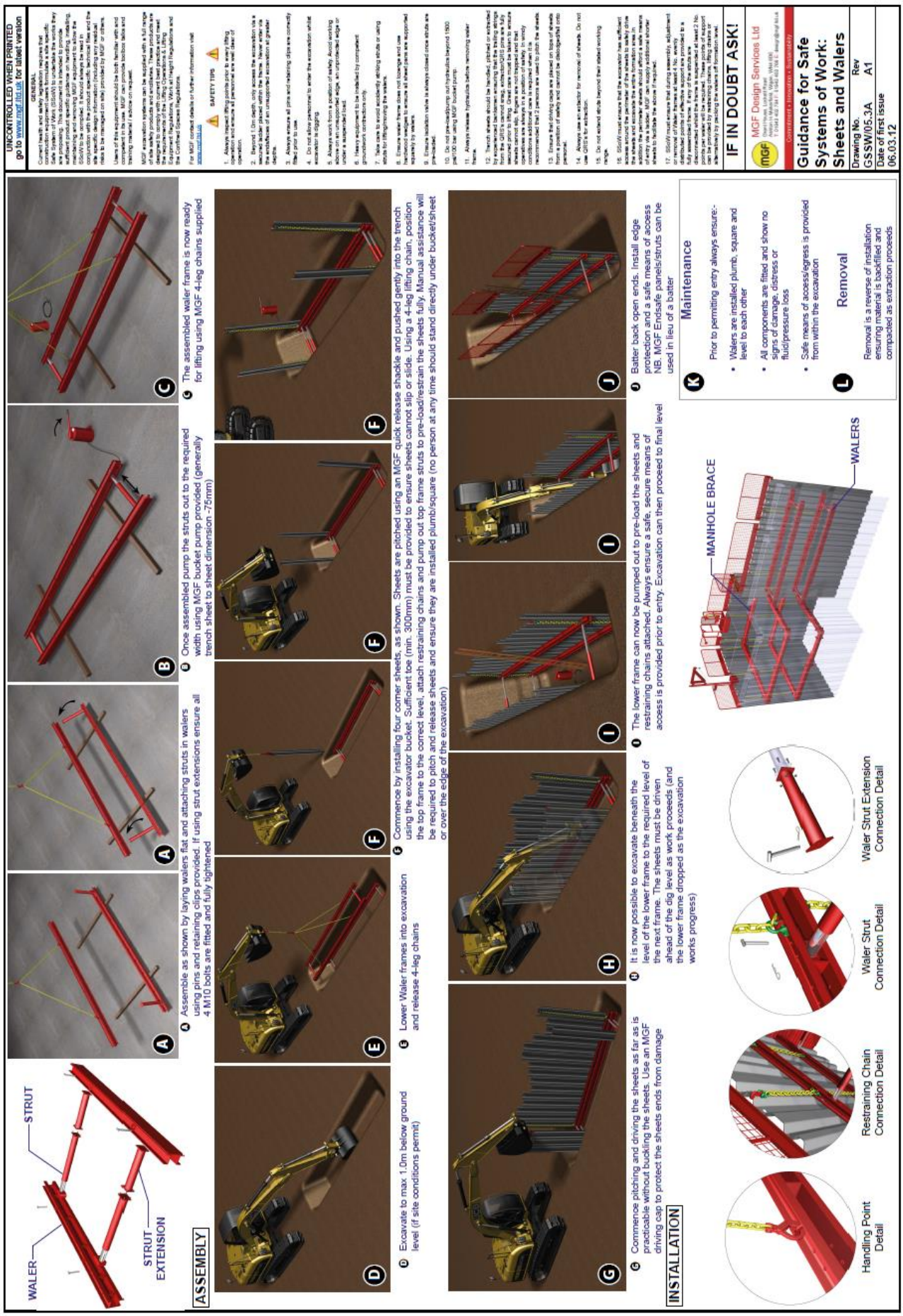


Figure C.3 – Guidance for Safe Systems of Work

GENERAL METHOD STATEMENT

To be read in conjunction with any relevant notes relating to the specific scheme within the full design submission and the contractor's own site specific safety method statement.

1 GENERAL STATEMENT

1.1 Identify the works area, safety zones & access requirements prior to commencing work on the excavation.

1.2 Survey the works area for overhead / buried services prior to commencing work on the excavation & take appropriate action as deemed necessary.

1.3 Enclose the total works area using suitable barriers & provide appropriate pedestrian / vehicle barriers where necessary.

1.4 Identify a suitably qualified & competent person to inspect the works at regular intervals and to ensure that the design parameters as stated in the design brief are not exceeded

1.5 Set out the extent of the excavations.

1.6 Ensure adequate lifting facilities are available for all stages of the support operation.

1.7 Carry out additional risk assessments as appropriate. Also refer the generic risk assessment attached in this manual.

1.8 All equipment is to be installed in conjunction with the specific equipment installation instructions as supplied with the delivery documentation.

2 SUPPORT SEQUENCE – PRE-DRIVE METHOD OF INSTALLATION

INSTALLATION

2.1 Pitch, plumb & align each trench sheet / pile and drive to full depth using the appropriate piling hammer ensuring that the minimum specified toe in has been achieved below formation level.

2.2 Excavate down inside the sheets and create a level working platform at the first frame level.

2.3 Install and fully pressurise the first frame.

2.4 Secure the first frame at the approximate positions indicated by hanging from the top of the trench sheets / piles using the primary hanging chains provided.

2.5 Excavate down through the frame(s) and create a level working platform at the next frame level (if applicable).

2.6 Install and fully pressurise the lower frame as shown on the relevant drawings supplied by Groundforce Shoring (if applicable).

2.7 Hang the lower frame from the first frame using the secondary hanging chains provided (if applicable).

2.8 Excavate down through the shoring frame(s) to formation level, complete the excavation by manual trimming to avoid over digging & undermining the trench sheet / pile toe in.

2.9 Ensure that the trench sheets / piles have been pushed / driven down to achieve the specified toe-in.

2.10 It is recommended that at the first opportunity cast a blinding layer across the full base of the excavation (preferably within the same shift) to protect the base from passive softening caused by surface / groundwater ingress.

REMOVAL

2.11 Backfill the excavation to the underside of each shoring frame in sequence depressurising and removing each frame in turn. If the backfill material is concrete ensure a suitable de-bonding agent is applied to the trench sheets / piles.

2.12 Backfill to existing ground level.

2.13 Extract the trench sheets / piles.

3 SUPPORT SEQUENCE – SLIT TRENCH METHOD OF INSTALLATION

INSTALLATION

3.1 In small sections (say 3.0m) excavate a narrow trench to formation level.

3.2 Pitch the trench sheets / piles against the back face of the trench and backfill the trench with the previously excavated material.

3.3 Repeat steps 3.1 & 3.2 until all the trench sheets / piles are in position around the perimeter of the excavation.

3.4 Using the excavator & driving cap provided push / drive the trench sheets / piles down to achieve the minimum specified toe-in. Note:- If the specified sheet toe-in cannot be achieved using the excavator bucket then use either a air driven impact hammer or machine mounted vibratory hammer to achieve the specified toe-in.

Figure C.4 – General Method Statements

GENERAL METHOD STATEMENT CONT.

3.5 Excavate down inside the sheets and create a level working platform at the first frame level.

3.6 Install and fully pressurise the first frame.

3.7 Secure the first frame at the approximate positions indicated by hanging from the top of the trench sheets / piles using the primary hanging chains provided.

3.8 Excavate down through the frame(s) and create a level working platform at the next frame level (if applicable).

3.9 Install and fully pressurise the next frame as shown on the relevant drawings supplied by Groundforce Shorco (if applicable).

3.10 Hang the lower frame from the first frame using the secondary hanging chains provided (if applicable).

3.11 Excavate down through the shoring frame(s) to formation level, complete the excavation by manual trimming to avoid over digging & undermining the trench sheet / pile toe-in.

3.12 Ensure that the trench sheets / piles have been pushed / driven down to achieve the specified toe-in.

3.13 It is recommended that at the first opportunity cast a blinding layer across the full base of the excavation (preferably within the same shift) to protect the base from passive softening caused by surface / groundwater ingress.

REMOVAL

3.14 Backfill the excavation to the underside of each shoring frame in sequence depressurising and removing each frame in turn. If the backfill material is concrete ensure a suitable de-bonding agent is applied to the trench sheets / piles.

3.15 Backfill to existing ground level.

3.16 Extract the trench sheets / piles.

4 SUPPORT SEQUENCE – DIG & PUSH METHOD OF INSTALLATION

INSTALLATION

4.1 From existing ground level excavate down approximately 0.5m around the perimeter of the excavation.

4.2 Place the first level of shoring in the excavation and extend out to the approximate size of the excavation.

4.3 Pitch the trench sheets / piles between the frame and the face of the excavation and push / drive down to refusal using the excavator & driving cap provided. (Note:- on deeper excavations it may prove more practical to start excavation with shorter sheets / piles to ease machine bucket access).

4.4 Pressurise the frame such that the trench sheets / piles can just be pushed down behind the frame, alternatively place wedges between the frame and the trench sheets / piles at the corners of the frame to allow the remaining central trench sheets / piles to be pushed down.

4.5 Hang the frame from the corner trench sheets using the primary hanging chains provided.

4.6 Carefully excavate down inside the frame until it is possible to install the next frame (if applicable) ensuring that the central trench sheets / piles are pushed down as the excavation proceeds maintaining the minimum specified toe-in.

4.7 Once the lower frame level has been reached pressurise the frame as detailed in step 4.4 (if applicable).

4.8 Hang the lower frame from the first frame using the secondary hanging chains provided (if applicable).

4.9 Excavate down through the shoring frame(s) to formation level, complete the excavation by manual trimming to avoid over digging & undermining the trench sheet / pile toe-in.

4.10 Ensure that the trench sheets / piles have been pushed / driven down to achieve the specified toe-in.

4.11 Now secure the first frame from the top of the central trench sheets / piles using the additional primary hanging chains provided.

4.12 Remove hanging chains and any wedges from the corner sheets and remove the remaining earth from the corners of the excavation whilst at the same time pushing down the corner trench sheets / piles.

4.13 Ensure that the corner trench sheets / piles have been pushed / driven down below formation level to achieve the specified toe-in.

4.14 Pressurise all of the shoring frames fully.

4.15 It is recommended that at the first opportunity cast a blinding layer across the full base of the excavation (preferably within the same shift) to protect the base from passive softening caused by surface / groundwater ingress.

REMOVAL

4.16 Backfill the excavation to the underside of each shoring frame in sequence de-pressurising and removing each frame in turn. If the backfill material is concrete ensure a suitable de-bonding agent is applied to the trench sheets / piles.

4.17 Backfill to existing ground level.

4.18 Extract the trench sheets / piles.

Figure C.5 – General Method Statements (cont.)

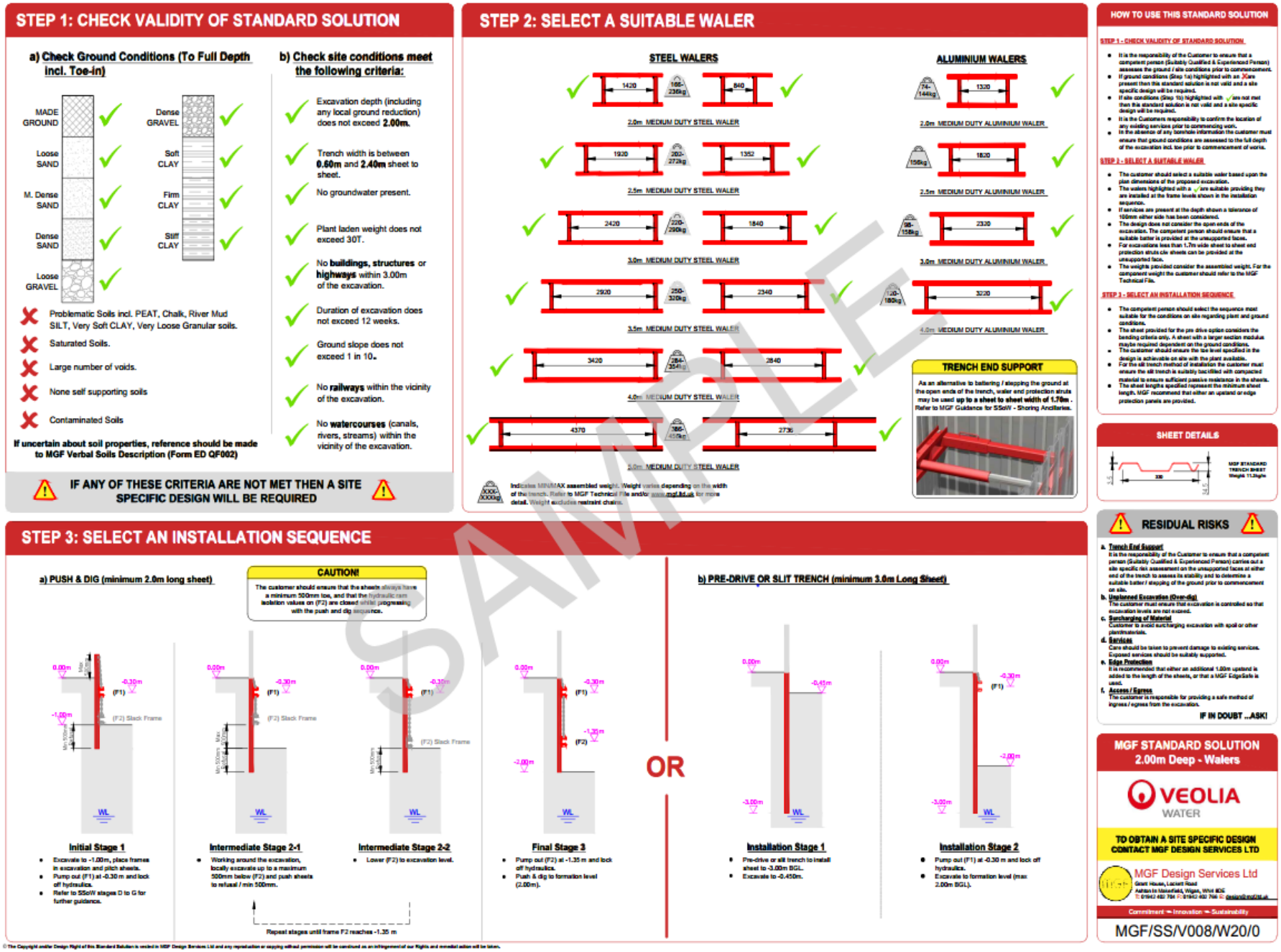


Figure C.6 – Standard Solution for Walers

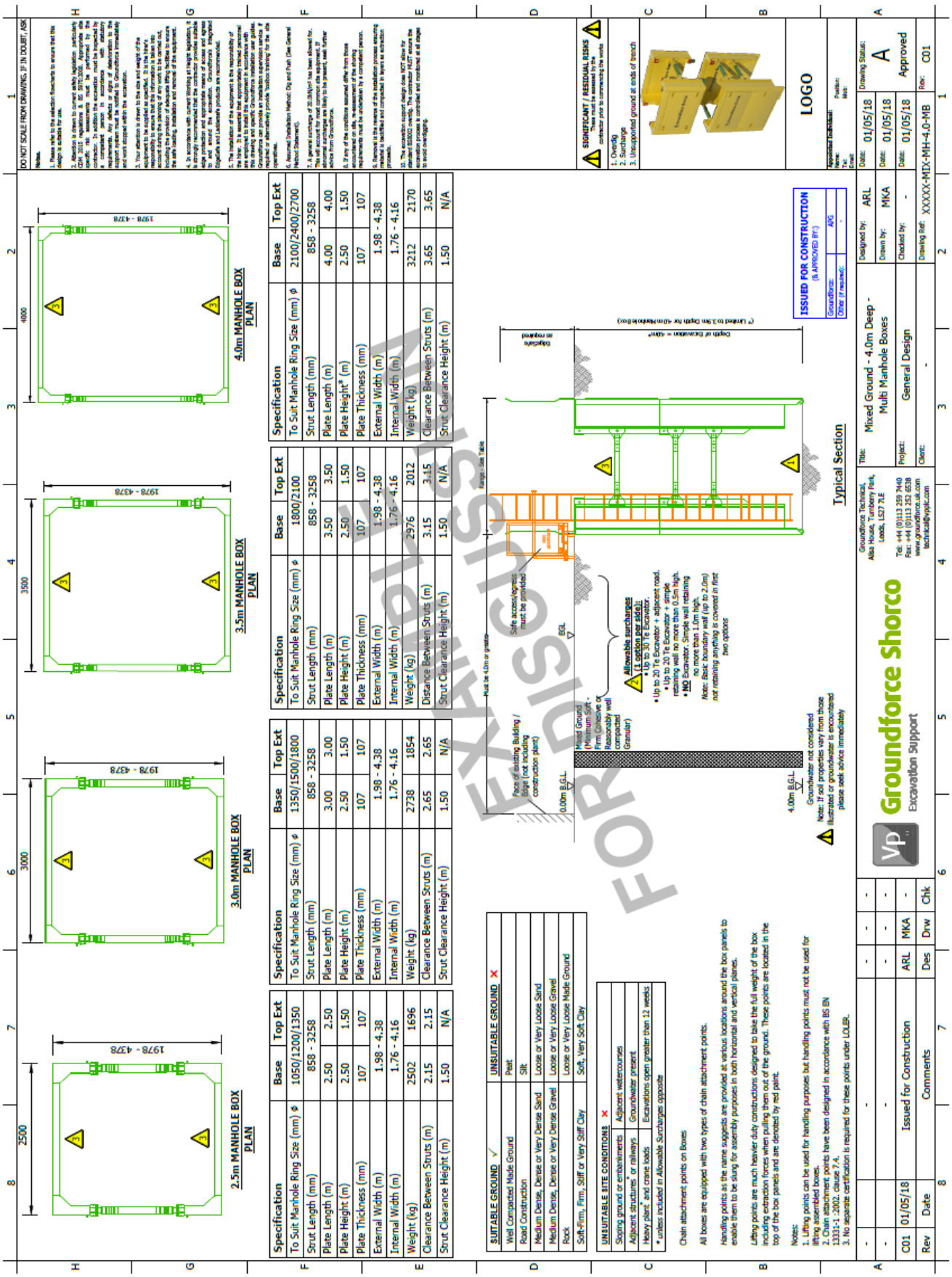


Figure C.7 – Standard Solution for Manhole Box

Annex D – Working Group Membership

Chairman:	
Andrew Lowe	Groundforce Shorco
Members:	
Ahmad Laly	GAP
Peter Bavister	Actavo
Brent Bolton	HSE
Tim Chapman	Leada Acrow
Stuart Clazey	GAP
David Coley	The Plastic Piling Company
John Cooper	Promech
Matt England	Promech
Matthew Green	NTS
John Grubb	CITB
Vicky Hesson	GAP
Steve Hesketh	MGF
Steven Lloyd	Mabey Hire
Paul Millea	Mabey Hire
Michael Nicholson	Mabey Hire
Mike Paffett	Promech
Chris Parkin	ProShore
Ian Shearring	HSE
Rob Squires	CPA
Andrew Ward	NTS
Matthew Westhead	Mabey Hire
Simon Wilkinson	RMD Kwikform
Steve Young	Actavo

Reference No. STIG 1801

First Published: November 2018
Revised: February 2021
Published by:
Shoring Technology Interest Group (STIG)
Construction Plant-hire Association
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