National Federation of Demolition Contractors
Voice of the Global Demolition Industry

Temporary Works Hoardings
GUIDANCE NOTES

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DRG115:2019

INTRODUCTION

The National Federation of Demolition Contractors (NFDC) is represented on the British Standards subcommittee which prepares the code of practice for demolition (BS6187) and is, along with the Institute of Demolition Engineers (IDE), the voice of the UK demolition industry.

Founded in 1941 to help spearhead London's post-Blitz clean-up campaign, the NFDC's members are responsible for more than 90% of all demolition that takes place in the UK.

Today, the NFDC is committed to establishing safe working practices for its members and to represent their interests in areas such as training, safety, the environment, waste management, industry guidance, legislative changes and codes of practice.

However, in researching and preparing the information contained within this document the NFDC cannot be held responsible for its subsequent use, nor for any errors or omissions it may contain.

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CONTENTS

ABBREVIATIONS

1 BACKGROUND

2 RESPONSIBILITY & INFORMATION

3 DESIGN CONSIDERATIONS

4 DESIGN
4.1 Design Life
4.2 Design Loads
4.3 Design Guidance
4.4 Load Combination Factors
4.5 Post Design
4.6 Factors of Safety
4.7 Timber and Wood Based Panel Product Properties
4.8 Foundations

5 MATERIALS
5.1 Timber
5.2 Steel or Concrete Posts
5.3 Facing Material
5.4 Fixings
5.5 Scaffolding and Proprietary Equipment
5.6 Heras Type Fencing

6 VERIFICATION OF DESIGN

7 SITE SPECIFIC ISSUES
7.1 Workmanship
7.2 Inspection In Use
7.3 Access Points

NORMATIVE REFERENCES

The following referenced documents are indispensable for the application 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 EN 1991-1-4:2005 + A1:2010 Eurocode 1; General actions. Wind actions, BS 5975:2008 +A1 2011 Code of practice for temporary works procedures and the permissible stress design of false work, and BS6187:2011 Code of practice for full and partial demolition.

ABBREVIATIONS

The following abbreviations are used in this document or relate to content

DI	Designated Individual
TWC	Temporary Works Co-ordinator
TWR	Temporary Works Register
TWS	Temporary Works Supervisors
TWD	Temporary Works Designer
TWDC	Temporary Works Design Checker
PM	Project Manager
CDM	Construction Design & Management Regulations 2015
PD	Principal Designer

DEFINITIONS

The following abbreviations are used in this document or relate to content

Hoarding	A temporary structure of solid construction, erected to shield the works from others and to prevent any person gaining access.
Temporary Works Coordinator (TWC)	Competent person with responsibility for the co-ordination of all activities related to the temporary works.
Temporary Works Supervisor (TWS)	Competent person who assists the TWC in the supervision and checking of the temporary works.
Temporary Works Designer (TWD)	Competent person appointed to carry out the design of the temporary works.
Permanent Works Designer (PWD)	The organisation appointed to carry out the design of the permanent works.
Demarcation	The boundary, limit or dividing line of an area. In this document demarcation is used to describe both temporary fencing and hoardings.
Temporary Works	An ‘engineered solution’ 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, to provide temporary access or to provide security fencing.
Wind Loading	The force on a structure arising from the impact of wind on it.
Funnel Effect	Where winds push against obstacles such as buildings it is redirected either around (or over) them, causing the air pressure to drop thus accelerating the velocity. This is explained by Bernoulli’s principle of fluid dynamics. It should be remembered that air is a low viscosity Newtonian fluid that reduces in viscosity as its temperature increases.

1 BACKGROUND

Site hoardings are structures most commonly about 2.4m in height, using a plywood sheet (but increasingly constructed using proprietary steel or plastic panels), and are of solid construction. This guidance considers hoardings erected to construction sites.

2 RESPONSIBILITY & INFORMATION

Site hoardings will usually be the responsibility of the Principal Contractor. On more rare occasions the hoarding, or its dimensions, may be specified by the Client, but generally the height and detail is left to the Principal Contractor and will be influenced by security needs.

Hoardings are considered to be temporary works and therefore consideration must be given to BS 5975:2005+A1:2011 and NFDC Guidance DRG 106:2019 for procedures for their managementand control. This includes requirements for the appointment of a TWC and for the preparation of a register of the temporary works on the site and preparation of design briefs. Hoardings are likely to be one of the first entries in the register of temporary works. Management procedures would include regular inspections and required maintenance during the life of the hoarding.

The importance of the preparation of a suitable design brief in controlling the procurement and design for a safe, durable hoarding that is fit for purpose, cannot be stressed too strongly. For any particular design brief, relevant hazards to its location and use need to be identified. Hazards to be considered would include; proximity of traffic, services, loadings from wind and/or crowds. The level and design checking should be appropriate to the hazards identified. See BS 5975 procedures.

Usually site hoarding will be erected for the duration of the construction work. This may involve several stages and can involve different contractors, e.g. demolition, excavation, construction, fit out. Although each contractor will only expect to be on site for the duration of their own contract, the site hoarding will often remain unaltered for the overall construction period. However, part of the hoarding may need to be modified at some point. The Client therefore has duty at the start of construction to give a realistic assessment of the critical sequences, modifications and likely overall duration. This expected design life should be communicated to the designer of the hoarding in the design brief.

It is important that the parties responsible for the design brief, the design of the hoarding and the relevant design check are made clear and explicit. Whoever designs the hoarding must know the layout, the location, the service life, dimensions, below ground obstacles and hazards, geotechnical ground conditions and any restrictions on space. If penetrations are made into the ground, the engaging party should consider the hazards which may affect progress and health and safety. Utilities are the most common hazard in this regard. Information should also be made available by the Client as part of the ‘pre-construction data’ requirements for the procedures to be put in place for all temporary works.

TEMPORARY WORK CLASSIFICATIONS

All items of temporary works are classified in BS5975 as Class 0, 1, 2 or 3.
All temporary works including Class 0, shall be designed
All temporary works must be managed in accordance with the temporary works procedures, and must be recorded on the project TWR with their classification.
Note: It may at times be necessary to increase the class due to site conditions causing a greater risk.

3 CLASSIFICATION

The like information to be included in the design brief for hoarding would be:

- Site Location
- Expected life span
- Dimensions
- Signage details
- Any specified details for hoarding lighting
- Ground Conditions
- Position of relevant utilities
- Access ways required in or through the hoarding
- Details of any permits and/or licences required
- Details of any fire ratings required
- Space restrictions
- Any restrictions on types of fixings to be used
- Design risks from future operations
- Any crowd loading that may be relevant
- Whether vehicle impact loading may be relevant
- Whether in proximity to a railway is a factor
- The category of design check required (See BS 5975:2008+A1:2011)
- Wind factor
- Any restrictions related to inspection and maintenance
- Any favoured materials specified
- What category of design check is required

4 DESIGN

4.1 DESIGN LIFE

The anticipate design life of the hoarding will affect the loadings to be used in the design and the range/type of suitable materials. Durability of the hoarding is a design consideration.

The service life of a hoarding shall be:

As specified by the Client of engaging party (usually the Principal Contractor); *or*

As agreed with, or specified by the manufacturer (for proprietary hoardings); *or*

If not specified or agreed elsewhere, 10 years.4.2 DESIGN LIFE

For most hoardings the key design matter is lateral / horizontal loading arising from either the wind and / or impact. Depending on location there could be a crowd loading or vehicle impact. The lateral loads will require either a positive connection to the foundations to prevent sliding, or be restrained by sufficient kentledge to resist sliding by friction alone.

4.2.1 MINIMUM NOTIONAL HORIZONTAL LOAD

As per BS 6180:2011 Table 2, the “minimum horizontal imposed load is defined as a load of 0.74 kN/m shall be considered to act on all hoardings. This load will be considered to act at a height of 1.2m and my be applied from either side of the hoarding.

4.2.2 WIND LOADING

Although the source of wind loading is BS EN 1991-1-4:2005+A1:2010 and the UK National Annex to that standard, the simplified method given in BS 5975:2008+A1:2011 is generally recommended for hoardings provided due consideration is given to the life of the hoarding.

Wind load varying factors:

- Length of hoarding
- Corners and free ends
- Location of hoarding
- Advertising signs

In built up areas such as city centers, funnelling effect should be considered and arrangements should be made where appropriate for liaison with, for example, the Meteorological Office to obtain forecasts of sudden and severeweather changes, such as strong winds, snow and heavy rain.

Consideration should also be given to the location of the works as it is simply not feasible to have an off the shelf, generic design covering the UK in its entirety. Reasons being that comparatively, a coastal northern-based locale such as an ocean-edge in Shetland has approximately 50% faster primary wind speeds than a built up urban environment such as London citycentre.

Somewhere close to the sea with high altitude has up to four times the wind load of a low position, remote from the sea plus any additional factors.

4.2.3 CROWD LOADING

Crowd loading is to be considered in populated areas, such as town centres and restricted railway platforms. Information may be specified in local bye-laws, or by the Client. These loads can be significant, particularly if there is a requirement to resist crowd of farm animal crushing loads. The location of the hoarding can be significant, for example in the approaches to a stadium.

Where hoardings are erected in areas adjacent to spectator accommodation, barrier and crush loads may also need to be considered and reference made to BS EN 13200-3:2005.

FACE MATERIAL LOADING

4.2.4 VEHICLE LOADING

A requirement to design a hoarding to withstand vehicle loading is not reasonable, however may be requirement dependant on the specific risks and location of the site.

Due to the nature of a lightweight temporary hoarding, a design to resist the dynamics of moving vehicles is not economic and steel frames and sheeting will be required with a more robust design in place.

It is recommended that if there is a risk of vehicle impact that separate vehicle barriers be used and a space left between the vehicle barriers and hoarding.

4.2.5 INDIRECT LOADS FROM PASSING TRAINS

Where demarcations are erected close to railway tracks indirect loading should be considered, as velocity pressures arising from passing trains can be significant. The magnitude of the forces from passing trains is affected by:

Velocity of the passing train (km/ hour),
The maximum line speed,
Aerodynamic shape of the train,
Shape and position of the hoarding,
and
The clearance and relative height to the track,
In this and all cases competent advice must be sought.

4.3 DESIGN GUIDANCE

Designers will be aware of the two methods of design in current use; either the earlier permissible stress code(s) or limit state (EuroCode) codes. The hoarding working group are aware that there will remain many in the industry familiar with permissible stress design, and have therefore included design information to suit both methods.

Factors cannot easily be compared between methods because the philosophy is different therefore designers will opt for one method or the other.

4.4 LOAD COMBINATION FACTORS

The principal load on a hoarding is usually the wind and the minimum notional horizontal line load. This is usually the critical design issue and the loads from either side are considered in the design. Where the design brief is susceptible to overcrowding, then the crowd loading is also to be taken into account.

There will be occasions when the location of the hoarding requires the effect of passing trains to be considered and advice should be sought if needed.

4.5 POST DESIGN

The post to a hoarding is designed to resist the world load combination identified in the design applied separately from either direction.

The wind and the minimum notional/crowd load generate a combined moment and shear force at the ground level of this post.

4.6 FACTORS OF SAFETY

4.6.1 GENERAL

As designers will either be using permissible stress or limit state codes in their design, the recommended factors of safety used in the design of hoarding for materials and for overall stability are given in spate sections.

An adequate factor of safety should be used when considering the overall stability of the hoarding when subjected to wind and/or crowd loading.

For demarcation constructed using mixed materials such as steel and timber, material elasticity may require to be factored. Where loadings are fluctuating, repetitive or cyclical it is important to consider the possibility of material fatigue when choosing a factor of safety, as a cyclic load below a material's yield strength may still cause failure if the material is exposed through sufficient cycles.

FACE MATERIAL LOADING

4.6.2 FACTORS OF SAFETY – PERMISSIBLE STRESS DESIGN

A) MATERIALS

Where the strength of a component cannot be ascertained from the relevant permissible stress code outlined in BS 5975.

B) OVERALL STABILITY

No part of the hoarding should overturn at any stay during construction or use.

4.6.3 PARTIAL SAFETY FACTORS – LIMIT STATE DESIGN – EURO CODES

A) MATERIALS

The partial safety factor for the material properties and resistance for the ultimate limit state must comply with BS EN 1997-1:2004 Eurocode 7 Geotechnical Design General Rules at Section 2.1

B) OVERALL STABILITY

The design moment resisting overturning shall be great than or equal to the design moment causing overturning.

4.6.4 FACTORS OF SAFETY – SLIDING

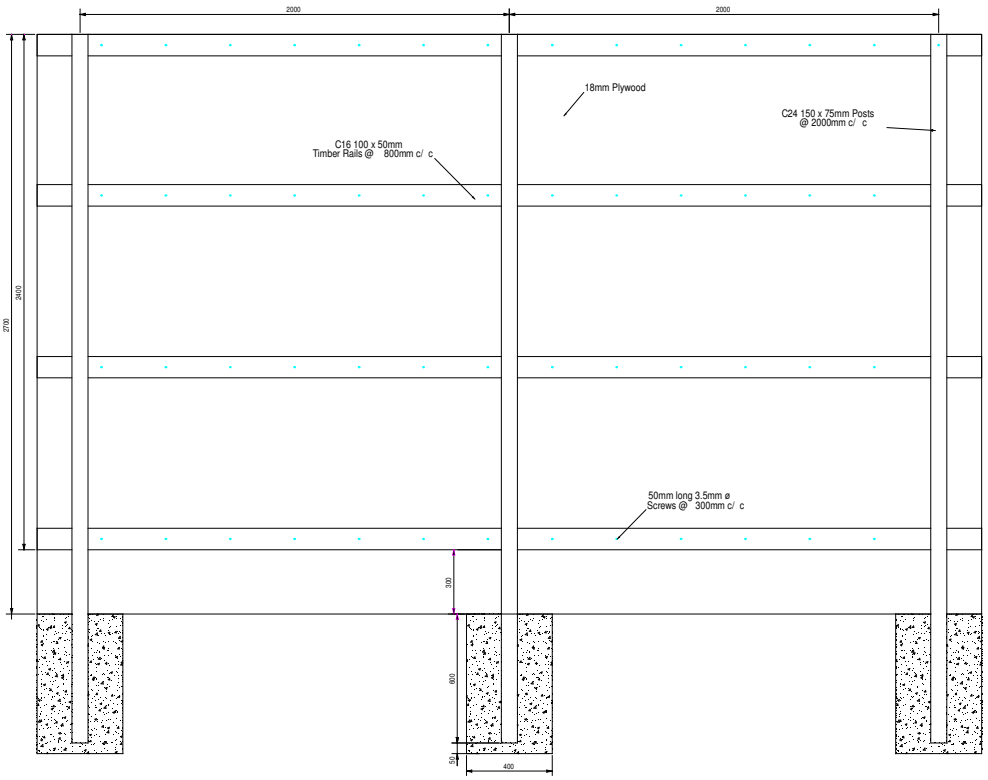
Where hoarding relies on its self weight and / or fixings to prevent global sliding under the applied lateral loads, the design force (including the relevant factors of safety) resisting sliding shall be greater than or equal to the applied design lateral load causing sliding.

4.7 TIMBER AND WOOD BASED PANEL PRODUCT PROPERTIES

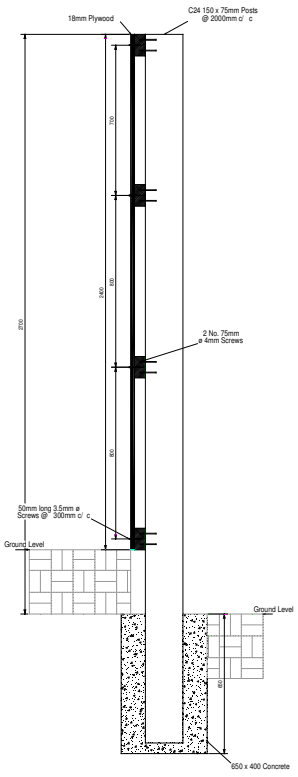
4.7.1 GENERAL

Timber is a material whose load capacity depends on the duration of the load and its durability on its state / quality. A long term load will cause movement in its fibres, whereas under a short term load, the wood fibre will recover.

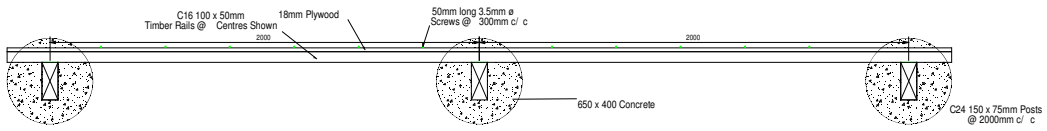
4.7.2 TIMBER



ELEVATION



TYPICAL SECTION



SUGGESTED PLAN OF SOFT GROUND EMBEDDED POST HOARDING DESIGN TO FORM PART OF A TEMPORARY WORKS REVIEW AND DESIGN PROCESS

4.7.3 WOOD BASED PANEL PRODUCTS

The design properties of wood based panel products should e given by the supplier / importer of the products for the grade and thickness to be used.

Many wood based panels have different properties in the two directions, so orientation of the sheet material should be carefully considered by the designer and communicated to the site.

4.8 FOUNDATIONS

4.8.1 GENERAL

The adequate founding of hoardings will always require care and on-site experience given the variability and nature of the ground. Although the design brief will have identified the ground conditions, the designer should take account of expected variations.

There are generally three types of foundation used, conventional post-in-hole, bolted sleeve fabrication or above ground foundations blocks / kentledge.

4.8.2 CONVENTIONAL 'POST-IN-HOLE'

This is very similar to domestic style fencing. The normal construction being that a post is placed in a pre-excavated hole at suitable centres, and while the post is held in position, concrete is placed around the hoarding post.

4.8.3 BOLTED (OR SIMILAR FOUNDATIONS

The fixing posts can be secured to foundations already prepared. Posts can be bolted to the base. Care is necessary in the selection of corrosion resistant bolt assemblies to ensure the design service is achieved.

Proprietary corrosion resistant post sleeves and end plates are available so that the post is kept out of contact with the ground. These items are suitable for a short design life of normal hoardings up to two years, provided there are regular inspections.

4.8.4 PROPRIETARY, ABOVE GROUND, FOUNDATION BLOCK

These should be verified for sliding and overturning against prevailing site conditions.

4.8.5 FOUNDATION BLOCK / KENTLEDGE FOUNDATION

Resistance to overturning may be provided by either a foundation block or kentledge. Where this type of foundation is used, the stability in both directions should be carefully considered.

The kentledge may be precast concrete, a purpose made block, or a number of scaffold tubes, or a container acting as ballast and filled with sand or a liquid. Ballast in the form of liquids should be securely contained to prevent inadvertent or malicious removal.

5 WOOD BASED PANEL PRODUCTS

5.1 TIMBER

The minimum quality of timber used in hoardings should be grade C16 (BS EN 338). Where subject to moisture and possibilities of decay, all hoarding timber should be treated with a wood preservative, preferably supplied pre-treated with a pressure applied wood preservative.

Wood does not deteriorate just because it gets wet. When wood breaks down, it is because an organism is eating it as food. Preservatives work by making the food source inedible to these organisms. Properly preservative-treated wood can have 5 to 10 times the service life of untreated wood. Preserved timber is used for railway sleepers, telegraph poles, marine piles, fences and other outdoor applications.

The durability of wood and wood based products is defined by use classes. (BS EN 335-2:2006)

Class 3.1 - Exterior use above ground and protected
Class 3.2 - Exterior use above ground but unprotected
Class 4.1 - Exterior in ground contact and / or fresh water

Where the ground water is “severe” or in salt water other classes would apply

Although circumstances will vary, it is foreseeable that a treated wooden hoarding post will rot after about 9 or more years in the ground and surrounded by concrete, giving an expected design life of about 5 years, subject to regular inspections at maximum six monthly intervals.

5.2 STEEL OR CONCRETE POSTS

Steel posts should have corrosion protection and be regularly inspected.

The use of concrete posts for hoarding is rarely justified. They will give long service with little maintenance.

5.3 FACING MATERIAL

The facing material for hoarding is often a wood based material, such as plywood, wood particleboard (commonly known as chipboard) or Oriented Strand Board (OSB). The face material is normally fitted to span vertically between horizontal rails.

Generally all external hoardings will require a water resistant wood based panel product. Procurers should be aware of the variations in face materials and the various glues and resins used to make the panel. They may not be suitable for long term exposure to the elements. Reference should be made to the manufacturers’ specifications and advice on the specific product.

When using wood particlewood, the minimum grade recommended grade is P7. (EN 12369-1) None of the grades of particleboard are designed for use in wet conditions where the moisture is likely to exceed 18%.

When using oriented strand board (OSB) the minimum grade recommended is OSB/3 (BS EN 310). OSB has significantly different properties in two directions and user should be particularly aware of the orientation of the board.

For robustness it is suggested that the minimum thickness of a panel of wood or wood based material for an external hoarding should not be less than 16mm and when used correctly, under normal conditions of use, a life expectancy of the resulting facing panel shall be 15 years.

5.4 FIXINGS

All fixings shall be considered for durability of the hoarding, and when a long duration is expected, be designed for ease of regular inspections. Nailed connections are to be avoided where joints may become loose under cyclic loading or deteriorate with age.

The frequency of fixings should be increased near to the end of hoardings due to increased wind loading.

Typically a hoarding has interface areas of fixings, the face material to the rails, and the rails to the posts. In both cases, the principal load on the fixings will be the tension caused by the wind blowing from the opposite side to that which the rails are fitted.

As the face and rails are normally fitted to the public side of the hoarding post, the effects of crowd loading can be ignored in the fixings design. The fixings should be designed for either the full wind force or the working wind plus the minimum notional horizontal load.

It is recommended that coach screws, bolts, nuts and washers shall have a protective coating. This could be hot dip galvanised in accordance with BS EN ISO 1461 as recommended for fencing (BS 1722-5 Cl;8) or other suitable protection. The use of stainless steel fixings will rarely be justified on a temporary hoarding construction.

Information on the safe loads of nails, screw and bolts are giving in Section 6 of BS 5268-2:2002. This includes shear strengths and spacing of nails, use of differing face materials, effects of pre-drilling holes for screws etc.

5.5 SCAFFOLD AND PROPRIETARY EQUIPMENT

Scaffold and proprietary equipment should be clearly and readily identifiable by shape or size. Where this is not possible they should be marked.

Scaffolding equipment should conform to current recommendations. Useful guidance is given by the National Access and Scaffolding Confederation (NASC) in publications such as TG20:13 and SG4:10. The safe working loads stated for steel scaffold tube and fittings given in TG20:13 may be sued for design of hoardings without modification.

Information necessary for the design, erection, use, maintenance and dismantling of the proprietary equipment used in the construction of hoardings should be available. The supplier / manufacturer has a duty at Law to provide data about the product, together with any limitations and requirements affecting the safety of the product.

5.6 HERAS TYPE FENCING

All temporary fencing, regardless of brand or manufacture should be able to withstand wind speeds of approximately 90mph (40mps / 145kph / 78knots) if erected to the manufacturers specifications.

Spec sheets should be made available from either the manufacturer directly, the hire centre or supplier of the temporary fencing.

All demarcation should be on the TWR and installed as per the design and checked by the TWC or TWS depending on the classification or other site-specific factors.

Where temporary fencing has signage, acoustic barrier or debris netting affixed the classification may need to be reconsidered due to the potential increase of wind loading and additional fixings such as ballast blocks, stabilisation support or rake back bars may be required.

+ NOTES

1. In areas of security issues, anti-lift brackets and anti-tamper clips may be required.

Solid panel temporary fencing will carry a higher wind load than temporary fencing and should be erected to the manufacturers specifications.

Spec sheets should be made available from either the manufacturer directly, the hire centre or supplier of the panels. Wind loading and other calculations need to be carried out to determine the amount of ballast required.

6 VERIFICATION OF DESIGN

The design of a site hoarding and it's foundations should be designed to a recognised code, in accordance with fundamental design principles.

The design of all hoardings should be checked and a relevant design check certificate be issued. The categories of design check are outlined in BS 5975:2008+A1:2011 at Section 9.2. The design check should not be regarded as an onerous task; it is a verification that an independent person (not the actual designer) has carried out a check.

On a simple hoarding, built to a standard solution, the design would involve ensuring the standard solution was suitable for the site, location and height envisaged, and that the correct data table and/or solution has been used. More complex hoardings would require a greater degree of independence check.

7 SITE SPECIFIC ISSUES

7.1 WORKMANSHIP

The quality of workmanship should be to recognise work standards. Operatives assembling and erecting hoardings should be competent and be aware of correct good practice.

7.2 INSPECTION IN USE

All hoardings should be regularly inspected during their working life. At the time of erection of the hoarding the requirement for regular inspection and timings of such inspections should be specified, and is usually a requirement in the initial risk assessment. The maximum period between formal inspections of hoarding should be six months, although in many applications, with fast changing construction processes inspections may require to be more frequent. Additional inspections should be carried out after any exceptional event such as high winds or impact. It is likely that a daily visual check will be required to be made by the TWS.

The inspection requirements for the classes mentioned in section 2.0 are as follows:

CLASS 0:
May be checked by another member of the site or design team. Standard solutions often come with manufacturer calculated working or ultimate capacities but still need to be checked for compliance with the design criteria to ensure they will be fit for purpose.

CLASS 1:
May be design checked by another member of the design team.

CLASS 2:
Must be design checked by a party independent from the design team. i.e. not involved in or consulted by the original design team.

CLASS 3:
Must be checked by a third party organisation independent from the design team organisation.

The risk rating for demarcations are as follows:

CLASS 0: LOWER RISK
Site hoarding and fencing up to 2m high.

CLASS 1: LOW TO MEDIUM RISK
Site hoarding and fencing greater than 2m high.
Site hoarding and fencing up to 2m high with additional debris netting or acoustic barriers in exposed temporal environments.

CLASS 2: MEDIUM TO HIGH RISK
Site hoarding and fencing greater than 3m high.
In the case where any class 1 method is used in an unusual or high-risk situation. This is unlikely.

CLASS 3: HIGH RISK
Temporary works combining multiple designs or unusual concepts. Site demarcation will not fall into this classification.

7.3 Access Points

Hoardings will require openings for access, either personnel and/or vehicular. Site gates with solid panels pick up large wind loads and consideration should be given to use of open mesh panels to reduce the loads. The gates should be securely fixed when closed and should incorporate a restraint chain or similar to prevent the gate from swinging out beyond the site boundary when not in use.

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