mpa British Precast Architectural & Structural

British Precast Architectural and Structural Code of Practice for:

THE SAFE INSTALLATION OF ARCHITECTURAL AND STRUCTURAL PRECAST CONCRETE



2020

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PREFACE

The British Precast Architectural and Structural Code of Practice for the safe installation of architectural and structural precast concrete and associated components is designed to replace the now dated separate codes from the Architectural Cladding Association (ACA) and Structural Precast Association (SPA).

British Precast Architectural and Structural is the new identity of the old Architectural and Structural Precast Association (ASPA) which was in turn an amalgamation of the ACA and SPA.

The Code gives a guide to the current good practice for the installation of all types of architectural and structural precast concrete. Health and Safety is an ever-changing discipline, therefore this document is only up-to-date at the time of publication.

British Precast Architectural and Structural is committed to putting health & safety of the workforce at the forefront of production and installation activities. The health and safety of our employees and customers, as well as the general public, is our primary concern.

Installation of architectural and structural precast concrete components is acknowledged to be a potentially high-risk activity, as it involves the use of heavy plant, cranes and personnel working at height. This Code of Practice is, therefore, used as the basis for the training of installers and supervisors to ensure that all have the skills and competence to carry out their roles in a safe manner.

The council of British Precast Architectural and Structural gratefully acknowledges the help and guidance provided by the Health and Safety Executive in the preparation of this Code.

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Every effort has been made to ensure that the statements made, and advice given provide a safe and accurate guide; however, no liability or responsibility of any kind (including liability for negligence) can be accepted in this respect by the publishers or the authors.

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FOREWORD

Falls have historically been, and remain, the biggest cause of death and serious injury in construction. Incidents involving the movement and lifting of heavy items also form a significant proportion of annual construction incident statistics. If material movement, lifting and work at height is correctly planned - including selecting suitable plant and equipment and using it properly - then accidents involving falls of people, plant and materials can be prevented.

I am pleased to acknowledge the work of British Precast Architectural and Structural and those involved in revising this code of practice. It brings together good practice at a time where the use of offsite production is increasing the use of pre-cast components. It will guide those involved in the specification, design, installation and use of precast products. It is only by the industry showing leadership, working in partnership, and taking ownership of the management of risk that improvements will be made.

The HSE continues to work closely with the industry and endorses this guidance which follows a sensible and proportionate approach to managing health and safety. Please read this guidance and take the appropriate steps to turn the advice into action.

Sarah Jardine

Acting Chief Inspector of Construction

Message from BPAS Chairman Andrew Tyrrell

This code of practice brings together, as a single revised and updated document, two historic codes relating to the safe installation of both architectural precast cladding and structural precast elements. We advise you take a detailed look at the content whenever you are involved in an offsite precast concrete project. Each member of British Precast Architectural and Structural pledges to work to the Code both through their in-house construction teams and in partnership with all appointed subcontractors.

This code represents an important step in reducing the risks of accidents and injuries during the installation of architectural cladding and structural precast elements. The increasingly wide and exciting variety of applications for precast concrete in buildings, alongside the bespoke nature of our products means that the guidance provided in this code of practice is crucial to its installation. With construction trends continuing to move towards offsite manufacture in recognition of its associated benefits in terms of quality, speed of delivery and site safety, we see this code of practice as increasingly important.

Whether you are a client, a designer or a contractor, by working with British Precast Architectural and Structural members you can help to improve safety on your sites. In addition to adherence to this Code, British Precast members make a number of further commitments as signatories to the Health and Safety Charter which can be viewed on the British Precast website: www.britishprecast.org

Our members pledge to reduce accidents, both in terms of number and severity, to improve the overall health and safety of all those involved in our industry and to work towards the long-term aim of causing zero harm.

A copy of this Code of Practice is available to download at either www.architecturalprecast.org or www.structuralprecast.org.

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0.1 INTRODUCTION: The Procurement Process

This Code of Practice is designed to cover the safe installation of all architectural and structural precast concrete ranging from the installation of a few small elements up to the erection of a major structural frame and cladding. This wide range of scenarios could therefore involve an equally wide range of contractual arrangements. This means that some of the information in this guide may involve more complex arrangements than are legally necessary on a small, simple, short duration job. The principles of planning the work and selecting the right people, equipment and systems of work still apply to simple jobs but the level of paperwork will often be less. An apparently easy job in a busy area that involves awkward delivery, unloading, lifting, work at height, etc, can be as problematic as more complex work and much of this guide will need to be applied. This Code of Practice does not cover post-stressing of precast elements as this is a specialist area. Typically the principal parties involved in a precast installation project will be:

Client
Principal Designer
Principal Contractor
Contractor
Precast Designer
Precast Manufacturer
Precast Installer

Some of these parties may, on occasions, be one and the same. Frequently, the Precast Manufacturer may also be the Precast Designer (often employing a sub-contract structural engineer and/or detailer) and the Precast Installer (often employing a sub-contract installer) but this procurement model can sometimes vary. In some instances, the Precast Manufacturer may not have responsibility for installation and the Principal Contractor may act as the Precast Installer or employ its own subcontract Precast Installer. In other instances, the Precast Installer may also be the Precast Designer, procuring the precast units from an independent Precast Manufacturer.

This Code of Practice seeks to define the roles and responsibilities for the principal parties whilst recognising that there may be overlap in the contractual relationships and arrangements. Definitions of these parties are provided in the subsequent section.

In addition to the principal parties to the installation process, there may also be involvement from other parties and individuals, often employed by the principal parties, such as:

Temporary Works Coordinator
Temporary Works Designer
Temporary Works Supervisor
Installation Supervisor
Crane Supervisor
Appointed Person

Definitions of these titles are provided in the following section and the Code seeks to further define their roles and responsibilities as they relate to the safe installation of architectural and structural precast concrete.

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0.2 DEFINITIONS

Most of the terms used in this document are in common use. However, the following definitions are intended to remove any ambiguity:

Appointed Person: The person employed by the Precast Installer to have overall control of the lifting operation and to act on behalf of the Precast Installer. The Appointed Person must have adequate training and experience and be Certificated to ensure the implementation of a safe system of work.

As Installed Drawing: The layout drawings confirming actually 'as installed' positions of precast component positions, issued for the client's safety file.

Attendances: The Health, Safety and Welfare Attendances, the provision of which should be agreed between the Contractor and the Precast Installer at pre-subcontract stage.

Banksman: A person who has been suitably trained in giving signals to control plant movement and operations on a construction site.

Certificated: Having been trained and qualified to fulfil a particular role. Generally, holding a valid licence/certificate of training gained by attending a recognised course of instruction for the task in question.

Company Representative: A Supervisor/Contracts Manager (usually travelling) in the Precast Installer's employ with a responsibility for a number of contracts. A 'Competent Person' trained to assess all health, safety and welfare arrangements in relation to company operations.

Competent Person: The person is regarded as competent if they have 'sufficient skills, knowledge, experience, training and other qualities to properly assist the employer to meet his safety obligations'.

Components: Any member, article, or item comprised of precast concrete or ancillary metalwork.

Contractor: "The 'Contractor', as defined in this code of practice, shall mean the Precast Manufacturer's or Precast Installer's client, who is responsible for coordinating all Principal Contractor requirements and attendances for the contract. Where the Contractor has overall responsibility for the Construction Phase of the project the 'Contractor' shall also mean the 'Principal Contractor'."

It should be noted that in the CDM Regulations 2015 a Contractor is defined as: "Anyone who directly employs or engages construction workers or manages construction is a contractor. Contractors include sub-contractors, any individual, sole trader, self-employed worker, or business that carries out, manages or controls construction work as part of their business. This also includes companies that use their own workforce to do construction work on their own premises. The duties on contractors apply whether the workers under their control are employees, self employed or agency workers."

This carries its own set of duties under the CDM Regulations 2015.

Crane Coordinator: The person who plans and directs the sequence of operations of cranes to ensure that they do not collide with other cranes, loads and other equipment.

Crane Driver: A competent and trained person responsible for the correct operation of the crane in accordance with the Manufacturer's Operating Instructions, the Safe Working Method Statement and directions from the nominated Slinger/Signaller. The Crane Driver is also known as the Crane Operator.

Crane Supervisor: Also known as 'Crane Lift Supervisor'. The person designated by the Appointed Person to supervise the lifting operations, where the Appointed Person has deemed the operations as basic or standard, as defined by BS 7121–3: 2000 Section 4.8.

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Duty Holder: Someone who has duties under CDM Regulations 2015.

Employing Organisation: The person or organisation requiring a lifting operation to be carried out and who has responsibility for safe use of the crane.

Flooring: The precast concrete components that form the structural element of a floor and may include associated precast components.

Installation Supervisor: The Precast Installer's senior representative on site in charge of all precast installation operations. A Competent Person trained in precast concrete installation and responsible for ensuring installation in accordance with the Working Drawings, Safe Working Method Statement and specifications.

Installer: A person who, after suitable training, is competent to carry out all functions of Slinger and Signaller, as well as to hoist, place and secure precast concrete components, including all plumbing/levelling and lining up, and who has the ability and training to work safely, and has a general understanding of structural stability issues. An Installer may be employed by the Precast Installer, a specialist installation company or be self-employed.

Operatives: All other site personnel involved with the precast works, not including Installers.

Precast Designer: The person or persons who produces specifications, drawings, details, designs or calculations for the Components, usually working for or on behalf of the Precast Manufacturer.

Precast Installer: The organisation employed by either the Principal Contractor, Contractor or Precast Manufacturer to install the precast concrete components

Precast Manufacturer: The manufacturer and supplier of the precast components, usually engaged by the Contractor usually also with responsibility for design of the Components. The Precast Manufacturer may also have responsibility for installation in which case they would act as Precast Installer or employ a sub-contract Precast Installer.

Principal Contractor: The contractor with control over the construction phase of a project involving more than one contractor. The role of Principal Contractor is defined within the CDM regulations - refer to the regulations for a full definition of duties.

Principal Contractor's Site Representative: The person in charge of the day-to-day running of a particular site or project, i.e. Site Manager, Site Agent, General Foreman, Project/ Contracts Manager.

Principal Designer: The designer of the building or structure incorporating the precast components. Usually, the organisation or individual (on smaller projects) appointed by the client to take control of the pre-construction phase of a project. A Principal Designer is only required when there is more than one contractor. The role of Principal Designer is defined within the CDM regulations - refer to the regulations for a full definition of duties.

Site Representative: See Company Representative.

Slinger/Signaller: A person who has been suitably trained in the proper selection of lifting tackle, the slinging of loads to the crane attachment, while taking into account the capabilities of the crane employed and has the responsibilities, after suitable certificated training, for directing the safe movement of a load attached to a crane, and for the movement of the crane on site.

Temporary Works Coordinator: On larger projects, the individual, usually employed by the Principal Contractor or Contractor, to plan and coordinate all temporary works on the site. This will include responsibility for ensuring that they are correctly installed, used, checked and maintained. On smaller projects these duties are usually taken on by the site manager.

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Temporary Works Designer: The organisation or individual with responsibility for design of any temporary works. In the context of precast installation, this may include any access scaffolds, props, falsework, crane platforms etc.

Temporary Works Supervisor: The competent person responsible for ensuring the correct installation, maintenance and use of any temporary works.

Vehicle Marshal: A person who has been suitably trained to control traffic on a construction site.

Work Area: The area on a site or building where precast components are being erected. This generally but not exclusively includes the areas where mobile cranes, tower cranes or other lifting equipment is being used to lift precast components from lorries (or stacks) to the final position.

Work at Height: Work where there is a significant risk of injury due to falling.

Working Drawings: The layout drawings, section and details, produced by the Precast Designer and issued for client approval, production and installation purposes.

Please note that where the term 'he' or 'his' is used this should also be taken to include 'she' or 'her' as appropriate.

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0.3 BIBLIOGRAPHY

This list is not exhaustive, but provides a helpful pointer to useful publications.
Note: Please ensure that you refer to the latest edition of these references.

Her Majesty's Government

Health and Safety at Work etc. Act 1974
The Management of Health and Safety at Work Regulations 1999
The Work at Height Regulations 2005
The Health and Safety (First Aid) Regulations 1981
The Control of Noise at Work Regulations 2005
The Electricity at Work Regulations 1989
The Personal Protective Equipment at Work Regulations 1992
The Provision and Use of Work Equipment Regulations 1998
The Lifting Operations and Lifting Equipment Regulations 1998
The Manual Handling Operations Regulations 1992
The Control of Substances Hazardous to Health Regulations 2002
The Construction (Design and Management) Regulations 2015
The Construction (Design and Management) Regulations (Northern Ireland) 2016
The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
The Control of Vibration at Work Regulations 2005
The Road and Streetworks Act 1991
The Control of Asbestos Regulations 2012

Health and Safety Executive

GS 6 Avoidance of danger from overhead electrical lines 2013
HSG 141 Electrical safety on construction sites (no longer available)
HSG 144 The safe use of vehicles on construction sites
HSG 149 Backs for the future – safe manual handling in construction
HSG 150 Health and safety in construction
CIS 10 Tower scaffolds (Rev. 4, 2006)
CIS 37 Handling heavy blocks
CIS 36 Construction dust. (Rev.2 June. 2013)
CIS 54 Dust control on cut-off saws used for stone or concrete cutting (Rev. 1. Feb. 2010)
General Information Sheet No. 6 (GEIS6) The selection, management and use of mobile elevating work platforms
Information Sheet MISC 614 Preventing falls from boom type mobile elevating work platforms
Managing health and safety in construction
Health surveillance for those exposed to respirable crystalline silica (RCS) – Supplementary guidance for occupational health professionals (amended January 2016)
HSE CDM 2015 guidance – http://www.hse.gov.uk/pubns/books/l153.htm

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British Standards Institution

British Standards and other guidance notes are issued on a continuing basis and users of this Code of Practice should acquaint themselves with the latest updates and revisions.

BS 5975	Code of Practice for falsework
BS 7121	Code of Practice for safe use of cranes – Parts 1, 2, 3 and 5. BS 5628
	Code of Practice for use of masonry
BS EN 818-4	Guidance for the purchaser and user of mechanically assembled slings
BS EN 1990	Eurocode – Basis of structural design
BS EN 1991–1–1	Eurocode 1: Actions on structures – Part 1-1: General actions – Densities, self-weight, imposed loads for buildings
BS EN 1992–1–1	Eurocode 2: Design of concrete structures – Part 1-1: General rules and rules for buildings
PAS 59 2004	Filled collective fall arrest systems

Construction Industry Research and Information Association

CIRIA publication C669 Site Safety Handbook
CIRIA publication C703 Crane stability on site
CIRIA publication C654 Tower crane stability

The National Access & Scaffold Confederation

TG20:13 Guide to good practice for scaffolding with tubes and fittings.
TG20:13 Toolbox talk training videos.

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1 MANAGEMENT OF HEALTH AND SAFETY

The Health and Safety at Work etc Act 1974 places general duties on employers, employees and others. Regulations are made under Section 15 of the Act. The Regulations referred to in the introductory notes below are a legal requirement and must be adhered to at all times. For more information, refer to the documents themselves, listed in the bibliography, and where necessary obtain competent, professional advice and approval on safety matters.

Management of health and safety issues needs to be planned, supervised, monitored, reviewed and improved where possible. This needs to be an ongoing process within all organisations and by all employers and the self employed. HSE publication HSG65 Managing for Health and Safety sets out examples and arrangements to make this an effective and efficient process.

See http://www.hse.gov.uk/pubns/priced/hsg65.pdf

1.1 Management of Health and Safety at Work Regulations

The Management of Health and Safety at Work Regulations requires all employers and self-employed Operatives to apply sound risk management principles. This includes assessing the risk to the health and safety of workers and any others who may be affected by the work carried out. Where five or more employees are involved, the conclusions of the risk assessment must be recorded in writing.

Assessments will help to identify all the protective and preventative control measures and arrangements that need to be taken to reduce the risk of incident to an acceptably low level. This document contains information to help with understanding the issues, assessing the site and the task to be achieved and selecting and using appropriate control measures. Further guidance on the procedures for risk management and risk assessment can be found on the HSE website.

Before an assessment of risk can be made it is important to understand the terms used, the two most important being:

Hazard – is something with the potential to cause harm,

Risk – expresses the likelihood that the harm from a particular hazard is realised.

Most employers will be capable of undertaking the risk assessment themselves using expertise within their own organisations. Where there are complex hazards or equipment, it may be necessary to employ the help of external health and safety professionals.

The key actions to be taken can be summarised as below:

- These Regulations require an employer to make a suitable and sufficient assessment of the risks to the health and safety of employees and others who may be exposed to those risks. This includes contractors or temporary staff engaged for specific work. Risk assessments must be signed and dated.
- Risk assessments must be regularly reviewed and altered if they are no longer valid or circumstances/conditions have changed significantly.
- This may be a suitable employee or, for new or unfamiliar types of work or equipment, you may need external support.
- Emergency procedures must be established, and Competent Persons nominated to implement them.
- Information must be provided to the employees on the risks identified, the control measures to be taken, the names of the Competent Persons and information on the risks identified, including risks created by sharing work areas with other trades or employers.
- Training must be given to employees in respect of the duties placed upon them by the Regulations, at induction when first employed, when transferred, or if the job changes. This training must be updated and repeated periodically to take account of any changes.

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In addition employees have certain duties under the Regulations:

- To make full and proper use of anything provided by the employer in accordance with the training given. This includes safety equipment, machinery, substances, means of transport, etc.
- Employees must also inform the Employer (or Nominated Persons) of any dangerous work situation or any matter relating to the employer's health and safety arrangements.

1.2 Risk Assessments and Method Statements (RAMS)

1.2.1 General procedure for risk assessment

1. Identify the hazards and activities.
2. Where possible the hazards identified should be removed/minimised by design.
3. Consider who will be affected by the hazard and the likely extent of injuries or damage that could result.
4. Assess existing control measures or precautions for adequacy, and decide if any further measures needed.
5. Consider whether the additional control measures now make the task or activity safe – ie low level of risk. Repeat this thinking process until the risk is low enough.
6. Check for compliance with other legal requirements.
7. Record the findings and arrangements.
8. Issue risk assessment.

NB. Risk assessment is largely a process of thinking through the task that needs to be done and ensuring that suitable control measures are in place and correctly used. Some companies prefer to use a numerical approach - such as the example below. However this is not essential and not a legal requirement. All the legislation calls for is a clearly thought out approach so that no one is doing work that hasn't been assessed and judged safe, have been recorded and implemented and are updated.

Table 1.1
Risk assessment

	Severity of harm to personnel				
Likelihood of harm	Bump/scrape No injury (1)	First aid needed (2)	Reportable injury (3)	Major injury (4)	Fatality/ disability (5)
Unlikely (1)	**1**	**2**	**3**	**4**	**5**
Remotely possible (2)	**2**	**4**	**6**	**8**	**10**
Possible (3)	**3**	**6**	**9**	**12**	**15**
Probable (4)	**4**	**8**	**12**	**16**	**20**
Certain (5)	**5**	**10**	**15**	**20**	**25**

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Probability rating

1. There is little or no risk of injury or ill health. Only under rare and unforeseen conditions is there the likelihood of injury or ill health. This should be the aim of all workplace activities.
2. Remote possibility; if other factors were present, that injury or ill health might occur, but the probability is low.
3. Possible; the incident may happen if additional factors precipitate it, but it is unlikely without the other factors.
4. The event is probable; the effects of humans or other factors could cause the event (injury or ill health), but it is unlikely without additional factors
5. If the task continues, then it is certain that an injury or ill health will occur.

Severity rating

1. Minor injury such as a slight laceration or bruising requiring limited medical treatment
2. Injury requiring medical treatment, but unlikely to result in absence from work
3. More serious injury, possibly requiring hospital attendance, which could result in absence from work
4. Fracture, dislocation and attendance or possible attendance at hospital for treatment
5. Serious or fatal injury

Risk Score

9-25 Put controls in place before commencing to reduce risk score
6-8 Prioritise and control as far as reasonably practicable
1-5 No further action required. Review periodically

1.2.2 Complexity of task

For simple tasks that workers carry out regularly in similar locations, risk management can be a simple check that the job will be straightforward using familiar techniques and equipment. If generic procedures are used there must still be a check to ensure the location of the work does not pose additional or unusual problems. This location check should form one of the conclusions of the recorded risk assessment.

Where new systems of work. new equipment, or an unfamiliar work area will be involved the risk assessment must be thought through to ensure all significant hazards have been identified and acted on.

Some clients or major contractors have their own risk assessment style and they may insist that you use their approach. Some of these can involve scoring the hazards in relation to likelihood of occurrence and severity of outcome. Then scoring again with control measures in place. For completeness an example of this type of approach is set out in Table 1.1. In most cases this approach adds little and to the unwary can cause more problems than it solves. Remember that the thinking process to identify hazards and work out which control measure or combination of control measures is best for the task and will make the risk of incident acceptable is the main part of the risk assessment process. Recording the conclusions creates a record to show that the legislation has been followed. It is not a legal requirement to carry out a numerical risk assessment although the approach can be justified in high hazard process industries and environments.

1.2.3 Method Statements

A method statement is used to inform workers about how they are expected to carry out the task. The method statement should be discussed during task planning and at all stages any concerns or additional information that would help should be incorporated. Sometimes this means making quite large changes as the planning work proceeds. The process works most smoothly if supervisors or the workers themselves are involved in early discussion. This ensures they agree with proposals and means they are more likely to follow them.

Safe Working Method Statements form part of the overall Safety Management System, covering hazardous activities such as the installation of precast units and associated

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components. They provide the information on the arrangements and, where required, the actual sequence of work necessary to manage health and safety. Basic information must be provided and communicated to all concerned parties at the planning stage, thus allowing time for approval or modification of the Safe Working Method Statements prior to site installation.

Precast units installation is similar in nature on many sites and therefore a Safe Working Method Statement will contain common elements and activities. However, the Safe Working Method Statements must take account of specific site conditions/ requirements, information from the Health and Safety Plan/Design Risk Assessment, and/or contractors requirements in the CDM Construction Phase Plan.

1.2.4 Content of Safe Working Method Statements

Safe Working Method Statements must be concise but informative and should contain the following information as a minimum.

Part 1: Management and control	
Principal Contractor	The name of the main contractor in charge of the site.
Contractor	The contractor or sub-contractor who employs the Precast Manufacturer and/or the Precast Installer
Precast Installer	The name of the company or sub-contractor. (If different from above) responsible for installation of the units
Precast Manufacturer	Concrete precaster and supplier
Precast Designer	The designer of the precast elements if different from the Precast Manufacturer
Site address	The address at which the proposed work is to be carried out.
Site manager or representative	The point of contact at the site.
Part 2: Description and information (contract, site and plant)	
Scope of works	Brief description of the work to be carried out – should include the number of visits that will be necessary to complete the contract and approximate duration of work
Lifting equipment and lift plan	The crane type/other lifting equipment (rating and style, tonnage, mobile, tower, outrigger loadings etc). General location of the crane, the location of any obstructions or nearby hazards including overhead and underground services, voids, tanks etc. This section should also include details of the crane supply arrangements ie. whether it is provided by the Principal Contractor, or on 'contract lift' under the control of the crane supplier or on 'crane hire' to the Precast Installer. This section may also include a schedule of lifts (ie the unit weights and method of attaching and lifting the units) as supplied by the Precast manufacturer.
Method of installation and sequence of work	How the units will be lifted and positioned and other relevant requirements. e.g. where will work commence and how the programme is sequenced in respect of other trades.
Temporary Works	Is there a requirement for temporary propping to any units or areas and who will provide this? Are there any other structural stability issues which need to be taken into account? What are the site handover procedures to ensure that temporary works are signed –off by a competent person and ready for use.
Maximum component weights and crane working radius	The maximum weight/radius' for each component type must be stated and any recommendations from the crane suppliers must be considered.
Deliveries and site access	The method of transport by which the components are to be delivered, offloaded and the access and egress requirements, e.g. hardstanding and lay-down areas and their preparation and maintenance. Marshalling of vehicles onto and off site.

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Loading, unloading and storage requirements	Design information to ensure that precast units are correctly supported on bearers and properly lifted using the correct equipment to ensure that each unit is not over-stressed and can be positioned safely without damage.
Part 3: Adequacy of supporting structure and ground conditions	
Adequacy of supporting structure and/or ground conditions	The Principal Contractor, at handover, will usually be responsible for ensuring the adequacy of the supporting structure or ground to accept both the precast units in the temporary and permanent conditions and to support any lifting equipment, delivery vehicles and other installation plant. If not, responsibility should be clearly defined in the sub-contract.
Part 4: Personnel	
Installation Supervisor	Manager/ supervisor is the nominated person to liaise with principle contractor and third parties.
Personnel	Statement to confirm the competence and training of all personnel who will be involved in the installation. These may include the Appointed Person, Crane Supervisor, Crane Operator, Slinger/Signaler (banksman) and other Installers.
Other site operations/ third parties	Where cooperation and coordination with other site operations/ third parties is required, this must be stated and managed by the Principal Contractor.
Part 5: Health and safety management and control measures	
Personal protective equipment	List of PPE requirements at the site and a general statement stating that all Installers and other personnel must comply with site and task-specific requirements
Access to work area	It would usually be the Contractor's responsibility to provide safe access and egress to the work area. The provision and use of scaffolding, temporary access etc.
Positioning of components	Standard and non-standard/unusual methods of positioning and installing components.
Access to and Working at height	Statement regarding the means of access to the work area, provision of handrails and other means of protection and risk reduction measures.
Leading edge protection	The use of fall prevention/arrest equipment, e.g. birdcage scaffolding, decking systems, harnesses, safety nets, airbags and barriers to close off any open edges Means of rescue from the fallen position.
Exclusion zones	Method of creating and maintaining exclusion zones.
Welfare facilities	Provision of facilities, e.g. first aid, restroom and toilets.
Part 6: Amendments and additional information	
Amendments to the Method Statement	Should any part of this Method Statement require amendment or alteration, this must be notified for agreement by all relevant parties prior to it being enforced.

1.2.5 Communication of the Safe Working Method Statement

The Safe Working Method Statement must be submitted to the Contractor for review and approval. Where changes are made these must be recorded and the appropriate amended copy sent to the Contractor. Once approved and signed, the Contractor's copy must be added to the Construction Phase Plan. The current Safe Working Method Statement must be supplied with the Working Drawings for the installation crew to use during the installation phase. The Installation Supervisor must ensure that the Installers understand the Safe Working Method Statement and must monitor its adequacy during the installation phase. Any variations are to be reviewed/approved and recorded following liaison between the Precast Installer and the Principal Contractor. Any variations must be communicated to the personnel undertaking the work.

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1.2.6 Additions to the Safe Working Method Statement

The Safe Working Method Statement may be supplemented by attaching and/or referring to other documents, for example:

- Company site safety booklets.
- Company procedures, for example, those regarding handling and storage.
- Crane Planning Schedule and Lift Plan.
- Ground Investigation reports
- Risk assessments.
- Addendums to the Safe Working Method Statement.
- Specifications and certification of plant and equipment, etc.
- The British Precast Architectural and Structural Code of Practice and Information Sheets
- Attendances
- The Health and Safety Plan.
- Construction issue drawings and specifications
- COSHH assessments and safety data sheets

This list is not exhaustive and the level of information/inclusion will vary and depends on the nature of the contract.

1.3 Checks and Briefings

1.3.1 Pre-Start Check by Precast Installer

The Precast Installer must ensure that prior to any work commencing a pre-start check has been completed and signed off by a Competent Person. This covers the following areas:

- Crane and lifting requirements.
- Work at height.
- Structural stability.
- Ground conditions.
- Proximity hazards.
- Welfare facilities.

The Precast Installer should ensure that the Competent Person and the Principal Contractor's Site Representative are made fully aware of the need to check and sign off the above on the day of the visit to site. Any problems found should be reported to the Precast Installer and the Contractor.

1.3.2 Daily Briefing by the Contractor

On a daily basis, the Principal Contractor's Site Representative must ensure, as a minimum requirement, the following daily checks and briefings must be conducted:

A summary of activities include the following:

- Daily Significant H&S risks
- Lifting operations/ slewing zones
- Pedestrian and traffic management plan
- Access and egress
- Offloading areas
- Coordination with other subcontractors

1.3.3 Daily Briefing by the Precast Installer

On a daily basis, the Installation Supervisor must brief his team on the following minimum requirements:

- Daily activity to be completed in relation to the Principal Contractor coordination meeting

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- Any H&S issues including specific hazards in daily activities
- Any change in Method Statements
- Work activities to be completed.
- Crane operations
- Deliveries

1.3.4 Daily Checks by the Precast Installer

On a daily basis, a Competent Person or persons appointed by the Installation Contractor must carry out the following minimum checks:

- H&S checks to be completed including LOLER, PUWER, COSHH, PPE
- Work area inspection for any significant risks (slip falls, edge protection, access & egress, etc)

This list is not exhaustive and the level of information. Inclusion will vary and depends on the nature of the contract.

1.4 Supplier Coordination

Prior to and throughout the installation contract, the Precast Installer must maintain contact with the Precast Manufacturer and the Precast Designer to ensure that any safety related issues in respect of unit handling and delivery are properly communicated to all relevant parties.

For example:

- Precast Manufacturer to clarify lifting and handling requirements for all units
- Precast Installer to ensure that delivery drivers are aware of access and egress routes, PPE requirements and any restrictions on delivery times
- Precast Installer to ensure that delivery vehicles have provision for edge protection during off-loading or that fall arrest systems are in place where access to trailer beds is required
- Precast Installer and Precast Manufacturer to agree delivery programme and sequence
- Precast Installer to check with Precast Designer in respect of any remedial works, site cutting or drilling

1.5 Specific Health and Safety Considerations

1.5.1 Work at Height

The Work at Height Regulations 2005 apply to all work at height where there is a risk of a fall liable to cause personal injury.

They place duties on employers and any person that controls the work of others (for example facilities managers or building owners who may contract others to work at height).

As part of the Regulations, Duty Holders must ensure:

- All work at height is properly planned and organised.
- Those involved in work at height are competent.
- The risks from work at height are assessed and appropriate work equipment is selected and used.
- The risks from falling through fragile surfaces are properly controlled.
- Equipment for work at height is properly inspected and maintained.

Work at height is covered further in Section 8 of this publication and further guidance can be found on the HSE website (www.hse.gov.uk/work-at-height) including the publication *"Working at Height"* INDG401(rev2)

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1.5.2 Lifting Operations

Lifting operations are governed by the Lifting Operations and Lifting Equipment Regulations (LOLER). The Regulations aim to reduce risks to people's health and safety from lifting equipment provided for use at work. In addition to the requirements of LOLER, lifting equipment is also subject to the requirements of the Provision and Use of Work Equipment Regulations (PUWER).

Generally, the Regulations require that lifting equipment provided for use at work is:

- Strong and stable enough for the particular use and marked to indicate safe working loads.
- Positioned and installed to minimise any risks.
- Used safely, i.e. the work is planned, organised and performed by competent people.
- Subject to ongoing thorough examination and, where appropriate, inspection by competent people.

Further information on lifting operations can be found in Section 6 of this publication and further guidance can be found on the HSE website including the publication *"Lifting Equipment at Work"* INDG290(rev1)

1.5.3 Manual Handling

1.5.3.1 Introduction

The Manual Handling Operations Regulations 1992 must not be considered in isolation, but should be used in conjunction with Regulation 3 (1) of the Management of Health and Safety at Work Regulations and other legislation that applies on site. The construction industry has a history of poor health of which excessive manual handling continues to be a problem. By undertaking suitable and sufficient assessment of the risks to the health and safety of their employees while at work a suitable mix of lifting aids and procedures can be used to minimse manual handling and ensure that remaining tasks involving manual handling are safe to carry out.

1.5.3.2 The working environment

The roads and routes around the site should be prepared in advance of the delivery of the precast units. If they are not to be off-loaded into their laying position, suitable stacking areas should be prepared.

Areas where units are moved or handled should be kept clear of obstacles and tripping hazards. Uneven, slippery or unstable ground conditions increase the risk of injury.

1.5.3.3 Training

Installers and Operatives must be given information and training on manual handling risks, their prevention and the systems of work to be used on that site to ensure safe manual handling. Suitable training will also be necessary for designers, specifiers and those managing contracts.

1.5.3.4 Individual capability

Particular consideration must be given to employees who are known to have a history of back trouble, hernia or other health problems that could affect their manual handling capability.

1.5.3.5 Health surveillance

Employers should conduct appropriate health surveillance in order to identify at an early stage any indications that the employee is suffering injury due to the manual handling, thereby enabling further harm to be prevented.

Note: Further guidance and a manual handling assessment chart (MAC) can be found at www.hse.gov.uk/msd (search for toolkits).

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1.5.4 Noise at work

The Noise at Work Regulations 2005 place certain duties on employers, employees and manufacturers. The noise created by any operation may be excessive and could cause a health hazard that requires assessment and control. Wherever there is noise at work, you should be looking for alternative processes, equipment and/or working methods which would make the work quieter or mean that people are exposed for shorter times. You should also keep up with what is good practice or the standard for noise control within your industry eg. through your trade association or machinery or equipment suppliers.

Action levels (based on daily or weekly average exposure)

Lower exposure action value	80 dB (A)
Upper exposure action value	85 dB (A)
Exposure limit value	87 dB (A)

Employers must:

- Provide employees with suitable hearing protectors if they ask for them, and their noise exposure is between the lower and upper exposure action values;
- Provide employees with suitable hearing protectors and make sure they use them fully and properly when their noise exposure exceeds the upper exposure action values

To make sure protectors are worn fully (all of the time they are needed) and properly (fitted or inserted correctly) will require you to have systems of supervision and training. Also consider the use of spot checks and audits.

Further guidance on noise at work, including a toolkit for estimating noise exposure can be found at www.hse.gov.uk/noise

1.5.5 Vibration at work

Hand-arm vibration is vibration transmitted from work processes into workers' hands and arms. It can typically be caused by operating hand-held power tools such as portable disc cutters and drills.

Regular or frequent exposure to high levels of vibration can lead to permanent injury. This is most likely to occur when contact with a vibrating tool or process is a regular part of a person's job. Occasional exposure is unlikely to cause injury, although it should be avoided by people with medical conditions such as Raynaud's Disease.

Health and safety law requires the company to assess the risk to the health of employees, plan for its control and manage the risk. This will include provision of suitable equipment, correct maintenance of equipment and providing employees with information and training on health risks and safe use of the equipment.

The documentation supplied by the equipment manufacturer should provide data on typical vibration levels for the equipment when set up and used in a defined manner. Regular use of hand-held power tools may give rise to potential risk.

The risks identified following assessment can be controlled in many ways. Advice and approval should be sought from a competent safety professional and the equipment manufacturers.

It is therefore recommended that the Precast Installer should assess the level of vibration generated by hand-held power tools and minimise exposure to this equipment in line with guidance.

Further guidance on vibration at work can be found on the HSE website (www.hse.gov.uk/vibration).

1.5.6 Provision and Use of Work Equipment Regulations

The Provision and Use of Work Equipment Regulations 1998 (PUWER) lay down important health and safety requirements regarding work equipment. The primary

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objective of PUWER is to ensure the provision of safe work equipment and its safe use. The PUWER Regulations make more explicit the general duties on employers, the self-employed and persons in control to provide safe plant and equipment. The PUWER Regulations must not be considered in isolation; in particular, they need to be read in conjunction with the Management of Health and Safety at Work Regulations.

Although the prime duty for ensuring health and safety rests with employers, employees also have legal duties, particularly under Sections 7 and 8 of the Health and Safety at Work etc Act. These duties have been supplemented by Regulation 14 of the Management of Health and Safety at Work Regulations, which require that employees must correctly use all work items provided by their employer in accordance with the training and instructions they received to enable them to use the items safely.

Further guidance on PUWER can be found on the HSE website:
www.hse.gov.uk/work-equipment-machinery
www.hse.gov.uk/pubns/books/l22.htm

1.5.7 Welfare facilities

On the majority of sites, the provision of welfare facilities will be on a shared welfare basis, where the Contractor provides the necessary facilities that can be used by Operatives and Installers engaged in the installation of precast concrete units.

When no formal welfare arrangements exist, the Precast Installer should ensure that the necessary facilities are provided by way of an Attendance, agreed pre- sub-contract, or alternatively, the Precast Installer may provide facilities for use by Operatives and Installers.

The ultimate responsibility for ensuring that the facilities are provided, and that they are of a standard equal to that required by the CDM Regulations, remains with the employer, and therefore, the Installation Supervisor must satisfy himself that the facilities provided, from whatever source, are adequate.

1.5.8 Control of Substances Hazardous to Health (COSHH)

1.5.8.1 Introduction

In order to comply with the Control of Substances Hazardous to Health Regulations 2002, the Precast Installer must ensure the collection and issue of up-to-date information on the potential hazards and toxicity of all materials and substances used by the company in carrying out its site activities, and the control measures to be adopted.

Materials and substances including anything workers could encounter, use or generate e.g. contaminated ground, ready-mixed concrete, silica dust from cutting, drilling and grinding operations, etc.

1.5.8.2 General procedure

Assessment sheets for all products used on site are to be issued to the Installation Supervisor.

All Operatives involved in the use of these materials, e.g. cement, ready-mixed concrete, etc. should be instructed on the hazards from the particular material about to be used and be instructed in all necessary precautions including any PPE required to be provided and used. This equipment will be put into use before any substance is used on site.

All substances received on site should be stored in accordance with the instructions contained in the Assessment Sheets, and in the event of any spillage, appropriate action must be taken to retrieve the material, in accordance with instructions contained in the Assessment Sheet. The Installation Supervisor should monitor these procedures.

Empty containers and waste material must be disposed of in accordance with the approved procedures, as noted on the Assessment Sheet for the product or products concerned.

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The materials used in the installation of precast concrete units are generally of low toxicity but all Operatives must be made aware of the hazards at all times by the Company. Checks that control measures are being adhered to should be made at periodic intervals by the Installation Supervisor.

Copies of COSHH Assessment sheets may form part of the Precast Installer's Work Method Statement.

The Installation Supervisor should request the Contractor to supply details of any other substances on site that could affect the Precast Installer's employees or their sub-contractors.

1.5.8.3 Silica Dust

Silica dust can be generated during all drilling, cutting and grinding activities on precast concrete units. Breathing in the very fine dust produced during drilling and grinding is known to cause silicosis which permanently impairs breathing function and can lead to lung cancer. The hierarchy of control in the COSHH Regulations must be followed to prevent silica dust affecting all persons in the vicinity.

More information on dust in the workplace can be found at www.hse.gov.uk/dust and specifically, information on controls and protection against the inhalation of silica dust are available in HSE publications CIS36 (Silica dust) and CIS54 (Dust control on cut-off saws used for stone or concrete cutting).

1.5.9 Occupational Health

1.5.9.1 Introduction

The management of health is an important aspect of site practice. The health of those installing precast concrete can be affected if the work is not properly controlled. To assist in monitoring the effectiveness of the controls described in this Code of Practice, the following recommendations are made regarding pre-employment health screening and health surveillance. Please be aware that some contractors are implementing a system of identifying those on-site workers who in receipt of a Fit to Work Certificate for safety critical workers.

1.5.9.2 Pre-employment health screening

Pre-employment health screening is an essential requirement in establishing the fitness of a potential new employee for the tasks that he will perform. It is also necessary to record the health status of the new employee so that any changes can be measured during the course of their employment.

A person applying for a site-based position should be provided with a brief questionnaire to assist the Precast Installer in assessing any potential health problems that could affect their suitability to do the job that they are applying for. The questionnaire should include questions on the following, but is not limited to those listed below:

- Noise and noisy environments.
- Dust and dusty environments.
- Skin complaints such as dermatitis.
- Vibration and work with vibrating tools.

In addition, where a potential employee is to work in an area where they may come into contact with, or be exposed to substances or situations that could affect their health, they should be provided with a pre-employment medical examination.

In any case, it is recommended that all new employees are assessed for the following:

- Audiometry (assessment of hearing where an employee is likely to work with noisy equipment).
- Lung function.
- Hand-arm vibration assessment (where the person has reported suffering from the problem and will use vibrating tools during the course of employment).
- Vision testing

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1.5.9.3 Health surveillance

It is recommended that employees undergo general health surveillance, undertaken by a suitably trained, Competent Person, at a frequency to be determined by the employer's risk assessment policy. This will allow the company to identify where a person's health has been affected. The health surveillance should cover the following:

Audiometry

Where noise levels exceed 80 dB(A), those persons exposed should be screened for hearing loss.

Vibration

Where persons are exposed to vibration to their hands and arms, e.g. in the use of drills, cutting equipment etc. then they should be screened for disease related to hand-arm vibration syndrome (HAVS). The initial screening can be carried out using a self-assessment questionnaire, followed up by specialist consultation where the questionnaire results indicate that this is necessary.

Skin conditions

It is recommended that any person who is likely to be exposed to chemicals or substances that are known to be capable of causing occupational dermatitis are subject to regular skin inspections as part of the health screening arrangements and, in addition, are trained to recognise the symptoms related to occupational dermatitis.

Lung function

Where a person is likely to be exposed to dust it is recommended that lung function tests are carried out in accordance with the advice given by an occupational health professional.

Vision

Where a person is operating or controlling mobile plant it is recommended that vision screening is carried out.

The records of the surveillance must be kept strictly confidential in accordance with all current legislation on Data Protection. Access to these records is limited, and the person to whom the records relate must be asked for their permission in writing before any medical report can be requested from Doctors and other medical personnel. The results of the surveillance should be passed to one nominated individual within the company so that they can arrange any changes to work pattern or arrange referral to an occupational health physician or other specialist as required.

More details on health surveillance can be found at www.hse.gov.uk/health-surveillance.

1.5.10 Occupational Health

1.5.10.1 Introduction

The Personal Protective Equipment at Work Regulations place requirements on the use of personal protective equipment (PPE) in the work place.

The Health and Safety Executive (HSE) has prepared specific guidance on the Regulations after widespread consultation with industry. Readers should refer to the guidance on the Regulations produced by the HSE.

The HSE document contains advice on the selection of PPE, considers the different types of PPE available, and identifies some of the processes and activities which may require PPE to be worn.

1.5.10.2 Working clothes and personal protective equipment

The Personal Protective Equipment at Work Regulations (PPE Regs.) require the Employer to provide suitable PPE necessary for the protection of Operatives and Installers engaged in the installation of precast concrete units. The requirements for PPE must be identified on the General Risk Assessment.

All Operatives and Installers, irrespective of the nature of particular site conditions,

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must be provided with, and must wear, PPE to meet general needs, in particular safety footwear, high-visibility clothing, abrasion-resistant gloves, weatherproof clothing and suitable head protection. All PPE must be properly stored and maintained in accordance with manufacturers' recommendations.

The distribution and quality of such equipment are matters of individual company policy. However, all protective equipment or clothing must carry the CE Mark, identifying the product as having passed certain European Standards, or be of a standard at least equal to that set by the appropriate British Standard.

Wherever possible, the Precast Installer should consider the views and comments received from their Operatives and Installers when deciding upon particular types of equipment. The physical stature of Operatives and Installers should be matched as closely as is practicable by any equipment. PPE must also be compatible with other PPE worn, e.g. hearing protection worn with head protection.

The company must ensure that all protective clothing and equipment is fit for use and should apply all necessary measures to ensure that their employees are using such items in proper manner. Operatives and Installers issued with such equipment have a duty under the Health and Safety at Work Act to use and look after it. The company must ensure that Operatives and Installers receive adequate instruction and training regarding the proper use, storage, maintenance and replacement of protective equipment and clothing. Employers must not charge employees for the cost of necessary PPE.

On certain sites, the conditions, site rules or method of working will necessitate the use of special protective clothing and equipment. Certain items such as eye protection, respiratory protection, ear protection and safety harnesses should be carried by the installation team at all times and used as the need arises or should be made available to the installation team prior to the commencement of work. The use of specific protective equipment, e.g. safety harnesses, must be identified in Risk Assessment and Method Statement.

The user should conduct daily inspections prior to use of all equipment and clothing and any items found to be missing or defective should be notified to the company for immediate replacement or repair.

1.5.11 Site Safety Audits

It is recommended that a system of regular site safety audits be implemented on any sites where the installation of a significant duration.

These audits should be carried out by a competent, independent, visiting person.

1.6 Training and Certification

1.6.1 Introduction

British Precast Architectural and Structural is committed to ensuring that all Installers involved in installation activities carried out by or on behalf of its member companies are competent. This includes ensuring a good understanding of the objectives of this Code of Practice for the safe installation of Architectural and Structural Precast Concrete. The Precast Installer should determine the level of training an individual has achieved and should provide training, instruction and refresher training as required.

1.6.2 Scope

The training and certification that applies to all personnel involved in the safe installation of architectural and structural precast concrete.

1.6.3 Responsibility

Employers have a responsibility under many regulations to provide appropriate training for their employees and ensure that their sub-contractors have received the appropriate training.

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Section 2 of the Health and Safety at Work Act imposes a general duty on every employer to provide as much information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of their employees and sub-contractors.

It is the responsibility of the Company employing the individual(s) to ensure that they have, or are in the process of obtaining the appropriate skills, knowledge, experience and training in the installation of precast concrete products, for them to carry out the tasks allocated to them and for ensuring that full records of any training provided are kept securely. The company should (a) assess the existing health and safety skills, knowledge, training and experience of their personnel, (b) compare these existing attributes with the skills, knowledge, training and experience they will need for the job. Identify any shortfall between (a) and (b); the difference between the two will be the training required.

1.6.4 Responsibility

All personnel must be trained in accordance with a recognized precast concrete training scheme such as L2 NVQ qualifications in erection of architectural and structural precast (Code Ref 600/3654/0 and 600/3745/3).The training of personnel at all levels is to be carried out by Competent Persons or approved training organisations (e.g. CPCS/CITB/ Proskills).

Courses may include those in the following list, which is not exclusive:

- Site safety awareness.
- Manual handling.
- Powered cut-off saw and abrasive wheel operation.
- Work at height/work at height equipment.
- This British Precast Architectural and Structural Code of Practice for the safe installation of Architectural and Structural Precast Concrete.
- Slinger, Signaller.
- Banksman
- Crane Supervisor (BS 7121).
- Appointed Person (BS 7121).
- MEWP (mobile elevated work platform) scissor and boom operation.
- Forklift/tele-handler operation.
- Passive fall installation.
- CDM Regulations 2015.
- Tower scaffold.
- Temporary Works Supervisor
- Site Supervisor Safety Training Scheme

In addition it is recommended that each team of Installers has either a suitably qualified person to administer emergency aid or a fully qualified First Aider. The employer's duty to provide first aid is set out in Regulation 3(1) of the Health and Safety (First-Aid) Regulations: "An employer shall provide, or ensure that there are provided, such equipment and facilities as are adequate and appropriate in the circumstances for enabling first aid to be rendered to his employees if they are injured or become ill at work".

Note: The need for refresher and update training must be regularly monitored; no employee can remember everything, especially if it is not an everyday part of the individual's work. The need for re-training is an essential requirement to satisfactorily meet the requirements of the current Regulations. Re-training requirements can be monitored by expiry dates on certificates of achievement or by periodic assessment of individuals followed by refresher training.

Training is the responsibility of the company employing the Installer and other Operatives.

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1.6.5 Certification/competency

Trained and competent Operatives should hold the following competency cards in accordance with the construction Skills Competency Scheme (CSCS) and the Construction Plant Competency Scheme (CPCS):

- CSCS Precast Concrete Installer (industry accreditation A) card.
- CPCS Slinger Signaller card.

Operatives who have not achieved these cards should receive appropriate training and carry out the following NVQs, which will enable them to achieve the appropriate competency card:

- NVQ in Precast Concrete Installation.
- NVQ in Slinger Signalling.

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2 SAFE WORKING METHOD STATEMENTS AND DAILY PRE-START CHECKS BY A COMPETENT PERSON

2.1 Introduction

Safe Working Method Statements form part of the overall Safety Management System, covering hazardous activities such as the installation of precast flooring and associated components. They provide the information on the arrangements and, where required, the actual sequence of work necessary to manage health and safety. Basic information must be provided and communicated to all concerned parties at the planning stage, thus allowing time for approval or modification of the Safe Working Method Statements prior to site installation.

Precast flooring installation is similar in nature on many sites and therefore a Safe Working Method Statement will contain common elements and activities. However, the Safe Working Method Statements must take account of specific site conditions/ requirements, information from the Health and Safety Plan/Design Risk Assessment, and/or contractor's requirements.

2.2 Content of Safe Working Method Statements

Safe Working Method Statements must be concise but informative and should contain the following information as a minimum.

Part 1 Management and control	
Principal Contractor	The name of the Contractor in charge of the site.
Precast company client	The name of the sub-contractor/client of precast company.
Site address	The address at which the proposed work is to be carried out.
Site manager/agent/ contact	The point of contact at the site.
Part 2 Description and information (contract, site and plant)	
Description of contract	Brief description of the work to be carried out - may include the number of visits that will be necessary to complete the contract.
Method of installation and sequence of work	How the units will be lifted and positioned and other relevant requirements. e.g. will propping be required and where will work commence?
Crane type/position	The crane type (rating and style, tonnage, mobile, tower, outrigger loadings etc). General location of the crane, etc.
Maximum component weights and crane working radius	The maximum weight/radius' for each component type must be stated and any recommendations from the crane suppliers must be considered.
Deliveries and site access	The form of transport by which the components are to be delivered, offloaded and the access and egress requirements, e.g. hardstanding.
Part 3 Stability and bearings	
Stability and bearings	The adequacy of bearings and the Principle Contractor's responsibility for checking them prior to work commencing. The Principle Contractor's responsibility for ensuring stability and the sequence of laying.

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2 DESIGN OF BUILDINGS INCORPORATING PRECAST CONCRETE AND THE ROLE OF THE PRECAST DESIGNER

Maximising the use of precast concrete elements within a building can radically change the construction methodology to improve programme quality and safety. However, designers will need to consider all hazards/risks associated with manufacture, transportation and installation of the individual precast concrete units. Site operations usually involve Operatives and Installers working at heights and the use of cranes or other lifting equipment. To assist Engineers, Designers and Contractors in meeting the requirements of the CDM Regulations 2015, the following detailed information is provided to assist in coordinating designs to achieve safe installation. Under CDM there is a strong duty on all designers involved to share information and cooperate with the other designers and those needing additional information. This should be via the Principal Designer who has a legal duty to organise the design work so that the construction drawings and instructions are an integrated package.

In this Code of Practice, the Precast Designer is not the Building Designer. This may not always be the case but the Principal Designer or Building Designer will have additional legal responsibilities which are not within the scope of this Code. The Precast Designer is often also the Precast Manufacturer who may employ a sub-contract engineer for this purpose.

2.1 Site specific constraints

There are a number of site specific constraints that need to be taken into account by the Building Designer.

The following aspects should be investigated as part of the planning procedure:

- The sizes and weights of the components will determine the method and overall strategy of off-loading and placing the units.
- The precast units are usually delivered to site on articulated lorries> Narrow roads or restricted access may necessitate the use of rigid vehicles.
- Pedestrian and traffic management measures need to be considered, especially if the delivery lorries are off-loaded from the public highway. In this case the Principal Contractor must ensure that any actions taken comply with the Highways Act and the New Roads and Streetworks Act. Partial or full road closure (including public footways/pavements) requires liaison with the Local Authority under their licensing scheme which can take several weeks to arrange. The Principal Contractor should plan this in advance.
- The Contractor should consider the Traffic Management Plan, other trades and deliveries, and plan adequate arrangements for offloading positions. Unless it has been possible to pre-sling components during loading to allow ground level hook up. or to design a slinging method that requires no access onto the flatbed or trailer; then fall protection equipment will be required around vehicles.
- Access to the work area must be provided and suitably maintained for cranes and lorries. An adequate design for hardstanding and crane working platforms must be provided. The crane platform will need a temporary works design to either ensure that ground conditions combined with any load spreading mats or grillage is adequate; or will need a design to allow the ground to be improved to safely support the loads imposed by the crane's outriggers. This also applies to lorry loader crane's used to offload and stack components into holding areas.
- Safe access to the work area for site operatives, plant and equipment must be provided and suitably maintained in order to minimise the interaction with site traffic, vehicle movements and to reduce the risk of slips, trips or falls occurring due to ground conditions.
- Excavations, underground services, drains, water attenuation tanks and basements

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are a hazard and strengthening may be required if their proven location cannot be avoided. A temporary works design may also be needed to establish the safe distance from the edge of an underground feature including weak ground, uncompacted backfill or made ground, edges, slopes and open excavations.

- The presence of power lines, railway tracks, trees or overhead structural obstructions may hinder the operation of cranes.
- On restricted sites it may be necessary for loads to be lifted over adjacent land and buildings. In these circumstances, permission must be gained to operate within the airspace of third parties in conjunction with a full risk assessment. All site restrictions and partial or full evacuations must be planned and agreed in advance.

2.2 Pre-Tender Design and Planning

The CDMRegulations: 2015 require a designer's competence to be considered to ensure they secure the health and safety of those affected by their design. Members of British Precast Architectural and Structural must conform to the requirements of this code.

To assist the Precast Designer and Precast Manufacturer for the purposes of producing a tender proposal for the Components, the following information should be provided by the Contractor:

- The design deliverables programme
- Pre-tender stage Health and Safety Plan.
- Design specifications, including permanent and variable actions (Dead and live loads). Design life, fire resistance and concrete exposure are also key parameters which must be identified in the specification.
- Applicable design standards being utilised by the design team
- Manufacturing and erection tolerances, e.g. BS8297, BS EN product standards, National Structural Concrete Specification
- Movement and tolerance report.
- Suitably developed Architects and Engineers drawings including M&E requirements and, where appropriate, aesthetic intent.
- Residual Risk register
- Phasing or sequencing of the works.
- Site and services plan.
- If the project is BIM Level 2 as per PAS 1192 – Part 2 the contractor should provide their Employers Information requirements, BIM Execution Plan, both documents form the basis of how the information and models are managed, shared and collaborated between the different design teams.
- Any other limitations on for example component size or weight.

This information should enable the Precast Designer to produce an outline design for the precast units to enable the Precast Manufacturer and Precast Installer to prepare a quotation for the Contractor. The outline design for tender purposes would normally include:-

- Section sizes and reinforcement contents
- Piece weights of units for installation purposes
- Joint details
- Details of any supporting bracketry etc. including material for fixings and supports, e.g. stainless steel, hot dip galvanized, bright zinc plated, primed
- Any special lifting requirements

If required for the tender, the Precast Designer should also be able to provide general arrangement drawings and sufficient information for the Contractor to assist him in preparing his tender to the Principal Contractor and to facilitate any design of the supporting structure. This may include:-

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- Loads and moments expected to be imposed by the precast units
- Minimum bearing area and load
- Any special requirements for the supporting structure (eg column pockets or holding down bolts, shelf angles, minimum bearing shelves etc.)

2.3 Post-Order Design and Detailing

2.3.1 Information Required by the Precast Designer

When an order is placed for the precast concrete units, the Contractor should provide the Precast Designer with the following information:

- Any relevant amendments to the Construction Phase Plan.
- Fully dimensioned 'Construction Issue' Architect's and Engineer's drawings and specifications, detailing the supporting structure, if applicable, and any other aspects that may affect the precast unit design and installation.
- Loadings, including type and location of partitions, types of finish, etc.
- The Engineer's "Movement and Tolerance Report"
- Position and sizes of all holes, notches or rebates required in the precast units.
- Site and services plan (if not provided at tender stage).
- Provisional sequencing and programme dates.
- Where working in the vicinity of rail tracks, underground railway lines, or energy supply structures such as power cables, all permissions that are required from the owners or controllers of the relevant infrastructure are to be given in advance along with any special instructions for the safe installation of the works.
- Information on the location of any nearby schools, or other establishments which could place restrictions on delivery times, working times, or could pose issues with access for certain types of delivery vehicles.
- Any pertinent ground conditions e.g. access roads, crane hard standings.

In addition to information provided by the Contractor, the Precast Designer will also need to take account of the following information provided by the Precast Manufacturer:

- Expected orientation and method of casting
- Preferred concrete mix and strength
- Minimum concrete strength at de-moulding
- Preferred supplier and type of lifting anchors
- Expected orientation of unit during factory handling and storage
- Expected orientation of unit during transportation to site and method of transportation (ie flat or on 'A' frames)
- Any storage or stacking requirements if units are not unloaded and installed immediately.

2.3.2 Design Considerations

Precast Designers may have responsibility for design of any aspect of a structure from complete structural frames or just specific elements to be fitted to new or existing frames. In any event, the sub-contract for supply and/or installation of the precast elements should make it clear which party (Building Designer or Precast Designer) is responsible for which elements of design of the structure. The following list should be considered by all parties and agreement reached over who is responsible. There should be close liaison between the Precast Designer and the Building Designer, either directly or through the Contractor, to ensure that all issues have been covered.

- Designers must take into account the stability of the structure during the installation of precast components and must be aware of or determine the sequence of installation to ensure that stability is maintained at every stage. Where progressive

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collapse may be an issue, Building Designers and Precast Designers must take account of this and design accordingly.

- When designing structural elements the designer will need to carefully consider details and connections to ensure progressive structural collapse will not occur. Designers should be familiar with the requirements of BS EN 1992-1-1 in this regard. When designing precast façade systems where precast elements are loaded through one another to a lower level (ie stacked), these should be risk assessed to determine whether design for failure of a lower element needs to be considered. Appropriate consideration should be given to the risk(s) of collapse of the façade in extreme circumstances. Undertaking a specific design risk assessment to determine the best mitigation strategy is recommended. In general, it is good practice that the engineer responsible for the overall stability of the structure should ensure the compatibility of the design and details of parts and components, even where some or all of the design and details of those parts and components are not made by this engineer. This is particularly important when it comes to the robustness of the structural frame. In any event, the party responsible for assessing overall stability should be clearly stated in the contract or sub-contract.
- The Building Designer (in cases where precast units are being fitted to an existing structure) or Precast Designer (where they are responsible for design of the complete structure) must ensure all load paths arising from the temporary precast installation process have been examined and suitable factors of safety incorporated into the design.
- The Building Designer and the Precast Designer must give consideration to the proposed sequence of construction and the effects of any temporary removal of parts of the structure to facilitate the safe installation of the precast units.
- Designers must also consider any temporary loading to be applied to the structure during construction such as construction plant and materials.
- Consideration should be given at the planning stage to allow for the removal, prior to the installation of the components, of overhead obstructions, such as purlins, bracings or main beams (where spans change at the level above) that are likely to foul or hinder the crane boom or suspended load.
- Precast components are heavy. Bearings must be adequate and be robust enough to withstand normal unit fixing operations including landing and barring.
- Lintels or steel beams must be securely fixed and have adequate safe bearing at each end to avoid overturning, excessive deflection, or collapse when precast units are placed onto them.
- Consideration must be given to the unequal loading of unrestrained walls, lintels or steel beams when precast units are being placed.
- Where the use of temporary supports are necessary, they must be designed and installed by a Competent Person. The location of temporary supports should be agreed with the Precast Designer.
- Designers must consider the unit exposure in order to determine the concrete mix requirements and cover to reinforcement. This will also determine the finish requirements (stainless, galvanized, BZP etc) and, if appropriate, depth of embedment, for any steel inserts or bracketry.

Precast units should be designed to take account of every load case from de-moulding (when the concrete strength will be at its lowest), through handling and stacking in the storage yard, transportation to site, off-loading and possibly pitching and tilting, site storage and placing of the unit in its final position.

- The type, size and position of lifting inserts should be established for each unit to take account of all expected lifting scenarios during the lifetime of the unit. Inserts should be designed to PD CEN/TR 15728:2016 Design and Use of Inserts for Lifting and Handling of Precast Concrete Elements and must take account of mould adhesion in de-moulding, chain angles and directions of lift and dynamic actions such as crane loading factors during handling and placing as well as just the self-weight of the unit.

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