



## Safety on site

Many construction activities are potentially dangerous so care is needed at all times. Current legislation requires all persons to consider the effects of their actions, or lack of action, on the health and safety of themselves and others. Advice on safety legislation can be obtained from any of the area offices of the Health & Safety Executive.

The downloadable booklets in the Concrete on site series are a continuation of a series originally issued in 1951 and have become standard guides to site personnel.

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Concrete on site 12 - Health and safety

OS012

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# 12 Concrete on site

## Health and safety



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# Health and safety

## HEALTH AWARENESS

Dry cement powders in normal use have no harmful effect on dry skin. As with any dusty material there may be ill effects from the inhalation or ingestion of cement dust and suitable precautions should be taken.

When cement is mixed with water, alkali is released. Precautions should therefore be taken to prevent dry cement entering the eyes, mouth or nose, and to avoid skin contact with wet concrete and mortar.

Repeated skin contact with wet cement over a period of time may cause irritant contact dermatitis. The abrasiveness of the concrete or mortar constituents can aggravate the effect.

Some skins are sensitive to the small amount of chromate that may be present in cements and can develop allergic contact dermatitis, but this is rare.

Continued contact with the skin can result in cement burns with ulceration.

Note that with alkali burns, pain is not immediate.

### Handling precautions

Protection for the eyes, mouth and nose should be worn in circumstances when dry cement may become airborne.

When working with wet concrete or mortar, suitable protective clothing should be worn, such as long-sleeved shirts, full-length trousers, waterproof gloves with cotton liners and site safety compliant wellington boots. Clothing contaminated with wet cement, mortar or concrete should be removed and washed before further use. Should concrete or mortar get into boots, remove them **IMMEDIATELY** and thoroughly wash the skin and the inside of the boots before proceeding with the job.

If cement enters the eye it should be washed immediately and thoroughly with clean water and medical advice sought.

Concrete or mortar elsewhere on the skin should also be washed off immediately.

Whenever there is persistent or severe irritation or pain a doctor should be consulted.

## INTRODUCTION

Building and civil engineering construction sites contain many hazards, some of which are related to concrete and the plant associated with delivery and placement.

Over 120 million tonnes of concrete are used every year in the UK, with very few health and safety problems arising. However, anybody who uses concrete, or is responsible for managing its use, should be aware that it presents a potential hazard to health both as a material and in its handling.

This document is for the site operative involved with concreting works on construction sites where they may encounter construction plant and vehicles.

It is not directed at plant/vehicle operators and drivers who receive their own specialist training. Neither

## Risk assessment

For general advice see <http://www.hse.gov.uk/risk/control-ling-risks.htm>

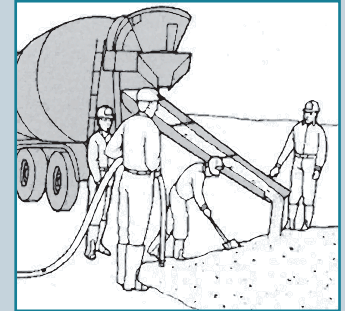


Fig 1. Direct discharge of ready-mixed concrete.

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is it a general guide to Health and Safety on construction sites.

## LEGAL PROVISIONS

The Control of Substances Hazardous to Health Regulations 1999 and the Management of Health and Safety at Work Regulations 1999 require the employer to assess health risks and prevent or control exposure.

The Construction (Health, Safety and Welfare) Regulations 1996 require those in control of construction sites to ensure that suitable and sufficient welfare facilities are provided. This includes providing adequate washing facilities with hot and cold (or warm) running water and facilities for changing and drying clothing.

The Personal Protective Equipment at Work Regulations 1992 require employers to provide suitable personal protective equipment for their employees, to make sure it is maintained (and replaced, where necessary) and to inform, instruct and train employees required to use it.

The Manual Handling Operations Regulations 1992 require employers to avoid manual handling where reasonably practicable and undertake risk assessment of the remaining manual handling tasks.

## RISK ASSESSMENT

The principle of risk assessment is fundamental in the management of health and safety. Any activity must be assessed for Hazard, Risk (likelihood and severity), and Competence of the operative.

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

Many substances used in concrete work are potentially harmful if inhaled or come in contact with skin. The importance of the correct PPE cannot be over emphasised.

Apart from hard hat and safety footwear, PPE for concrete operatives must also be available against:

- substances that have potential to

- create hazardous dust or fumes
- substances that could irritate the skin or burn e.g. cement, some admixtures
- airborne dust and grit e.g. grinding and breaking-out activities
- processes that may cause eye injuries e.g. many concrete handling activities
- falling e.g. working at height.

The Health and Safety at Work Act requires that all employers provide PPE relevant to the job free of charge.

## CEMENT AND FRESH CONCRETE IN CONTACT WITH SKIN

The British Standard for concrete specification and production is BS 8500: *Concrete*, and contains the following Hazard Warning;

*“Where skin is in contact with fresh concrete, skin irritations are likely to occur owing to the alkaline nature of cement. The abrasive effects of sand and aggregate in the concrete can aggravate the condition.”*

## PPE

On site always wear:

- Safety helmet
- Hi-visibility clothing
- Safety footwear appropriate for activity
- Suitable gloves
- Suitable eye protection
- Any other PPE determined by a risk assessment\*

PPE is not a choice; it's the law!

See video;

<https://vimeo.com/77597955>

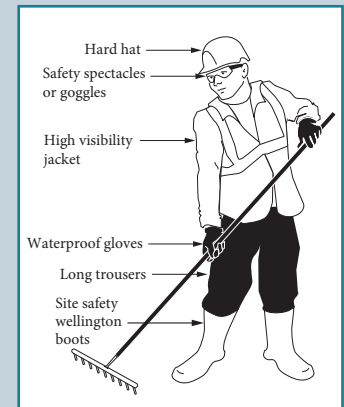


Fig 2. PPE.

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*Potential effects range from dry skin, irritant contact dermatitis, to in cases of prolonged exposure – severe burns.....”*

## Dermatitis

Skin affected by dermatitis feels itchy and sore, and looks red, scaly and cracked. The cement in concrete is capable of causing dermatitis by two mechanisms – irritancy and allergy.

### *Irritant dermatitis*

This is caused by the physical properties of cement that irritate the skin mechanically. The fine particles of cement, (mixed with sand or other aggregates to make concrete), can abrade the skin and cause irritation resulting in dermatitis. With treatment, irritant dermatitis will usually clear up. But if exposure continues over a longer period the condition will get worse and the individual is then more susceptible to allergic dermatitis.

### *Allergic dermatitis*

This is caused by sensitisation to the hexavalent chromium (chromate) present in cement. The way this works is quite distinct from that of irritancy. Sensitisers penetrate the

barrier layer of the skin and cause an allergic reaction. Hexavalent chromium is known to be the most common cause of allergic dermatitis in men. Research has shown that between 5% and 10% of construction workers may be sensitised to cement and that concreters, plasterers and bricklayers are particularly at risk. Once someone has become sensitised to hexavalent chromium, any future exposure may trigger dermatitis. Some skilled tradesmen have been forced to change their trade because of this.

The longer the duration of skin contact with a sensitiser, the more it will penetrate the skin, and the greater the risk of sensitisation will become. Therefore, if cement is left on the skin throughout the working day, rather than being washed off at intervals, the risk of contact sensitisation to hexavalent chromium will be increased.

In order to reduce the amount of chromate present in cement, a reducing agent is added to the cement. This reducing agent is only active for a limited period of time, hence the low level of chromate is only maintained during the shelf life for the cement.

Both irritant and allergic dermatitis can affect a person at the same time.

## Dermatitis prevention

### *Skin contact*

You should first consider using elimination or substitution to prevent the possibility of contact with cement. Otherwise, you should apply control measures which minimise contact with the skin either directly or indirectly from contaminated surfaces in the working environment.

### *Control measures*

An important way of controlling cement dermatitis is by washing the skin with warm water and soap, or other skin cleanser, and drying the skin afterwards. Sinks should be large enough to wash the forearms and have both hot and cold (or warm) running water. Soap and towels should be provided. Facilities for drying clothes and changing clothes should also be available.

Gloves may help to protect skin from cement, but they may not be suitable for all aspects of construction site work. Caution is advised when using gloves as cement trapped against the skin inside the glove can cause a cement burn.

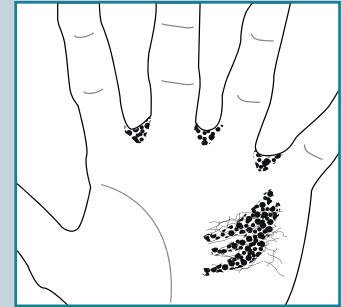


Fig 3. *Dermatitis; itchy skin between fingers and on the palm.*

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Employers should provide protective clothing, including overalls with long sleeves and long trousers.

## Cement burns

Wet cement, as found in concrete, can cause burns. The principal cause is thought to be the alkalinity of the wet cement. If wet cement becomes trapped against the skin, for example by kneeling in it or if cement falls into a boot or glove, a serious burn or ulcer can rapidly develop. These often take months to heal, and in extreme cases will need skin grafts or can even lead to amputation. Serious chemical burns to the eyes can also be caused following a splash of cement.

The Hazard warning in BS 8500 states:

*“Take care to prevent fresh concrete from entering boots and use working methods that do not require personnel to kneel in fresh concrete.*

*Unlike heat burns, cement burns might not be felt until some after contact with fresh concrete, so there might be no warning of damage occurring.*

*If cement or concrete enters the eye, immediately wash it out thoroughly with clean water and seek medical treatment without delay. Wash wet concrete off the skin immediately. Barrier creams may be used to supplement protective clothing but not an alternative means of protection.”*

In addition to the above, clothing or boots contaminated by wet concrete or cementitious products should be removed immediately and washed before re-use.

## Health surveillance

Employers are required to arrange for employees to receive suitable health surveillance where there is exposure to a substance known to be associated with skin disease and where there is a reasonable likelihood that the disease may occur. This means employers should provide health surveillance for workers who will be working with wet cement on a regular basis.

Health surveillance is needed to:

- protect individuals
- identify as early as possible any

indicators of skin changes related to exposure, so that steps can be taken to treat their condition and to advise them about the future

- give early warning of lapses in control.

Health surveillance must never be regarded as reducing the need to control exposure or to wash cement off the skin. Simple health surveillance will usually be sufficient. Skin inspections should be done at regular intervals by a competent person, and the results recorded. Employers will probably need the help of an occupational health nurse or doctor to devise a suitable health surveillance regime and they will need to train a ‘responsible person’, for instance a supervisor, to carry out the skin inspections.

A responsible person is someone appointed by the employer who, following instruction from an occupational health physician or nurse, is competent to recognise the signs and symptoms of cement-related dermatitis. The responsible person should report any findings to the



Fig 4. Cement burn.

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employer and will need refer cases to a suitably qualified person (e.g. an occupational health nurse).

The employer must keep health records containing the particulars set out in the Appendix to the General COSHH Approved Code of Practice. Employers are also required to provide employees with information, instruction and training on the nature of the risk to health, and the precautions to be taken. This should include characteristic signs and symptoms of dermatitis.

Employees should be encouraged to examine their own skin for any such signs and report them. Reports should be made to the 'responsible person' or to the occupational health nurse.

## MANUAL HANDLING

Working with cement and concrete also poses risks such as sprains and strains, particularly to the back, arms and shoulders from lifting and carrying cement bags, mixing mortar etc. Concrete is heavy, with a standard

barrow weighing over 100kg, so lifting/carrying just a small volume may cause physical injury. More serious damage to the back can be caused in the long term if workers are continually lifting heavy weights.

Manual handling of heavy loads should be avoided. In particular, cement should be supplied in 25kg bags or ordered in bulk supply. Where manual handling does take place, you should assess the risks and adopt appropriate risk control measures.

## WORKING AT HEIGHT

Placing and compacting concrete can mean working on temporary structures and access platforms.

When working at height, you, your tools and materials must be prevented from falling.

- Ensure that physical barriers protect any edge that you could fall from.
- Working platforms above 2m height must be fitted with double

guard rails and toe-boards.

- Safe access must be provided.
- A harness must be worn if full edge protection cannot be provided.

## INHALATION OF DUST

High levels of dust can be produced when cement is handled, for example when emptying or disposing of bags. In the short term, exposure to high levels of cement dust irritates the nose and throat. Long term exposure to dust can have fatal or debilitating consequences. Use ready-mixed concrete rather than handling cement in bags.

Cutting, drilling and breaking-out concrete can also lead to exposure to high levels of dust. Use wet cutting techniques when breaking out concrete.

Exposure to dust should be eliminated where possible. Where this is not possible, the risk should be assessed and appropriate control measures implemented.

## Manual handling

Injuries can be caused by lifting cement sacks, particularly if the overall load exceeds 25kg.

- Try to avoid manual handling, consider using a mechanical aid.
- Plan where you will be able to put down the load.
- Stand close to the load and spread your feet.
- Partly bend your knees but keep your back straight.
- Hold the load firmly.
- Keep the load close to your body.
- Raise your head as you begin to lift.

## Falls from height

Falls from height cause nearly half of all construction fatalities.

See video;  
<https://vimeo.com/77599266>

## Exposure to silica dust

More than 500 deaths a year are attributed to silica dust exposure. Diseases affecting construction workers are: lung cancer, silicosis, asthma and chronic obstructive pulmonary disease (COPD).

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## COMPACTION, BREAKING-OUT & SURFACE PREPARATION

### Placing and finishing equipment

Whether hand tools, poker vibrators, screeding equipment, power floats and trowels, or any other accessory, they will get coated in concrete during use. All tools and equipment should be kept clean of concrete so as to avoid contact between skin and concrete. The cleaning process is just as hazardous in terms of skin contact with alkaline from the cement. Wear the correct PPE.

### Hand Arm Vibration Syndrome (HAVS)

Compacting fresh concrete typically requires poker vibrators and vibrating screeder and beams for finishing.

Preparing a hardened concrete surface to provide a key for the next pour, or just breaking out concrete, sometimes entails the use of scabbling and other percussion equipment.

Hand Arm Vibration Syndrome (HAVS) is a disorder which affects

the blood vessels, nerves, muscles and joints of the hands, wrists and arms. You are at risk from HAVS when using any percussive or vibrating equipment. HAVS can be a severely disabling condition.

If you experience any symptoms of HAVS you must report them to your supervisor.

To reduce the risk of HAVS; keep your hands warm, wear gloves, avoid gripping the poker vibrator more than you have to, use the correct poker vibrator and reduce the amount of time that you use the poker vibrator in one go.

There are two basic types of poker vibrator. In the most common, the head containing the vibratory mechanism is separate from the motor, to which it is connected by a flexible drive shaft. On the second type, motor and vibratory mechanisms are in the same head.

The first type of vibrator is easily portable, but produces more tool vibration that can lead to HAVS. A flexible drive shaft poker vibrator can be limited to a maximum usage

period of 60 minutes in 8 hours as compared to a motor in the head poker vibrator which can be used for 480 minutes in 8 hours (guidance for 50mm diameter pokers based on HSE guidelines). The HSE publication *Hand-arm Vibration – The Control of Vibration at Work Regulations 2005* describes a comprehensive approach to control of exposure and risk.

Employers should ensure that a risk assessment is undertaken in accordance with *The Control of Vibration at Work Regulations 2005*.

## SPECIAL CONCRETES

There are some hazards associated with special concretes such as sprayed concrete and foamed concrete which should be addressed through a risk assessment of the materials (COSHH) concreting process.

### Foamed concrete

Foamed concrete is very fluid and typically pumped over a large area up to 1m deep. In addition to the risks associated with cement and concrete, this constitutes a drowning hazard.

## Symptoms of HAVS include:

- Tingling and numbness in the fingers.
- White coloration of the fingers.
- Loss of feeling.
- Pain, tingling or numbness in hands, wrists or arms.
- Loss of strength in the hands.

See video:  
<https://vimeo.com/77597956>

## Risk of drowning

Self-compacting concrete and foamed concrete are very fluid. This constitutes a drowning hazard.

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## Sprayed concrete

For sprayed concrete, the material components of sprayed concrete contain cementitious products and possibly other additives and chemicals. Due to the serious hazard to exposed skin and eyes, whether the concrete is sprayed by hand held equipment or via a robotic mounted arm, the nozzleman, mixing gang and those in the vicinity of the spraying work must be issued with appropriate PPE. This will include overalls, gloves and safety helmet with full face visor or specialised helmet with breathing apparatus and safety boots.

## CONCRETE DELIVERY AND DISCHARGE

### Concrete Delivery Vehicles

Every year pedestrians and cyclists are killed on the UK's roads by construction industry vehicles making left turns.

It is important that owners and drivers ensure they have a good

view all around, with Fresnel lenses and measures like proximity sensors, mirrors, and cameras.

At the construction site, safe access for the concrete delivery vehicle should be provided, taking into consideration the size and weight of the vehicle when loaded with concrete, the ground conditions and access.

### Delivery to skip or dumper

The delivery vehicle must be stationary and on stable ground with the driver in a safe position. The ground to the rear of the truck should be flat, stable and free of any obstruction. All movements should be controlled and in the case of crane skips, the driver must not act as banksman or be involved with skip landing.

### Delivery to pump

The pump should be in a fixed position and on stable ground. The truck discharge position should be clear of all obstructions and of hard standing. The driver must have adequate work space to operate the

mixer discharge and to communicate with the pump operator.

## Direct into a foundation or trench

This requires unobstructed access on stable ground, with the discharge distance from the trench dependent on ground conditions and trench support method. The minimum distance is one metre from the trench. There should always be safe and unobstructed access to the side and rear of vehicle. The sides of the excavation should be battered or propped so that the ground will support the weight of the delivery vehicle.

Site operatives should not climb on to the concrete delivery vehicle and should remain well clear of the rotating drum mixer and chute. If vehicle engines are run indoors, then adequate ventilation must be provided.

Where visibility is restricted at the exit of a site, a banksman should be made available to guide vehicles out of the site.

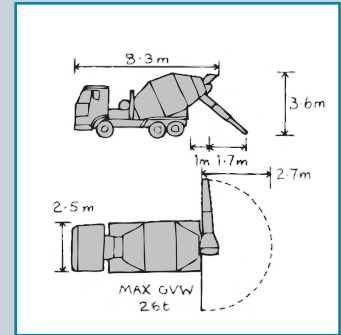


Fig 5. Typical radius of a 6m<sup>3</sup> truck mixer chute



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## CONCRETE PLANT

### Pumps

The British Concrete Pumping Group (BCPG) has produced a Code of practice for the Safe Use of Concrete Pumps which should be adhered to when concrete pumps are in use.

During the pumping operation:

- A code of signals must be agreed between the concrete pump operator and a representative of the concrete placing gang before pumping starts.
- If the concrete pump operator is required to position himself where he cannot see the concrete placing gang, the site must supply a signaller to give appropriate signals to the concrete pump operator.
- Until concrete is flowing smoothly out of the end of the delivery hose, or when a blockage occurs in the boom pipeline, all personnel should remain clear of the delivery hose and the placing boom.
- The danger zone is the area around the delivery hose in which

the delivery hose can strike out. The diameter of the zone is twice the length of the delivery hose.

- Site personnel should not, under any, circumstance, open or attempt to open the pipeline under pressure.
- For moving a flexible delivery hose lying on the ground, a rope should be tied around it near to the delivery end.
- Concrete must be prevented from falling out of the delivery hose when the boom is being manoeuvred over personnel or property.

### Mobile Plant

The movement and operation of vehicles and site plant may cause accidents involving not only the driver or operator but also people on foot who may be working nearby or passing by.

Plant operators must always:

- hold an up to date, relevant, certificate of competence.
- be authorised to operate the item of plant.
- carry out a visual inspection prior

to use and report any defects.

- wear a seat belt where fitted.
- be aware of overhead power lines and overhead obstructions.
- park on level ground.
- comply with the Traffic Management Plan.
- use a banksman to reverse.
- leave the vehicle whilst it is being loaded (unless there is a purpose built cab to protect the operator).
- refrain from overloading plant or vehicle.

All plant must be fitted with:

- ROPS (Roll Over Protection System).
- a flashing beacon.
- a reversing alarm.
- adequate mirrors (or CCTV) to provide all round vision.

Many accidents involving mobile plant occur because plant is large and the driver has a restricted view in at least one direction. Beware of reversing plant and stay out of the 'crush zone'.

If you are on foot near where plant is operating it is better to stay out of the way if possible.

## Concrete pumping

Pumping equipment can be very dangerous due to, amongst other potential hazards, pressurised pipelines and swinging booms.

See video:  
<https://vimeo.com/78264417>

The Construction Plant Association administer the BCPG.  
[www.cpa.uk.net](http://www.cpa.uk.net)

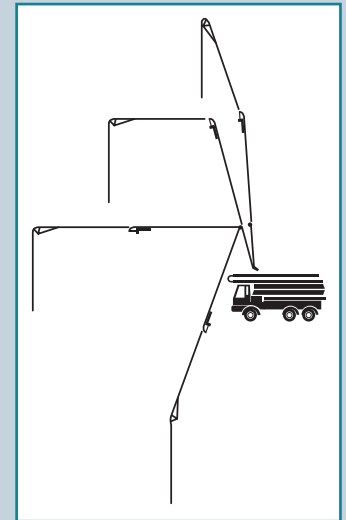


Fig 6. Typical range of a pump with boom-supported pipeline.

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People and vehicle access should be separated whenever possible.

After dark and at other times when the light is poor, remember that you will be more difficult to see.

## Cranes and lifting equipment

All lifting operations must be properly planned, appropriately supervised and conducted in a safe manner by trained personnel.

This includes:

- Driver.
- Slinger.
- Banksman.
- Supervisor.

## On-site concrete mixers (small)

Before starting work:

- Make sure that the work area is clear and safe (a mixer will ignite fumes from petrol or gas cylinders).
- Store diesel/petrol away from the mixer.
- Protect other people from noise and dust, warn others to keep

away and put barriers around your work area.

- PPE including goggles, dust mask, safety boots, gloves, ear defenders, long sleeves and full trousers should be worn by the operator and anybody working nearby.
- Ensure that the mixer is sited firmly and safely near to your work area.
- Check how the on/off switch operates – before you switch the mixer on, you must know how to stop it.

### *The drum*

- Always start the drum rotating before loading.
- Do not put your hand, shovel or anything other than the concrete constituents into the drum whilst it is rotating.
- Do not move the mixer while the drum is full or rotating.

### *Mixers powered by electricity*

- Before use, a brief visual inspection should be conducted of the casing, power supply (power lead and plug) .

- Keep all electrical equipment away from rain and water.
- Do not move the mixer while it is still connected to an electrical power supply or is working.

## ! USEFUL CONTACTS

British Precast Concrete Federation  
[www.britishprecast.org](http://www.britishprecast.org)

BSI Quality Assurance  
[www.bsi-global.com](http://www.bsi-global.com)

Cement Admixture Association  
[www.admixtures.org.uk](http://www.admixtures.org.uk)

Cementitious Slag Makers Association  
[www.ukcsma.co.uk](http://www.ukcsma.co.uk)

Construction Plant Association  
[www.cpa.uk.net](http://www.cpa.uk.net)

Meteorological office  
[www.metoffice.gov.uk](http://www.metoffice.gov.uk)

Mineral Products Association  
[www.mineralproducts.org](http://www.mineralproducts.org)

Quality Scheme for Ready Mixed Concrete  
[www.qsrmc.co.uk](http://www.qsrmc.co.uk)

Sprayed Concrete Association  
[www.sca.org.uk](http://www.sca.org.uk)

The Concrete Centre  
[www.concretecentre.com](http://www.concretecentre.com)

The Concrete Society  
[www.concrete.org.uk](http://www.concrete.org.uk)

UK CARES (reinforcement)  
[www.ukcares.co.uk](http://www.ukcares.co.uk)

UK Quality Ash Association  
[www.ukqaa.org.uk](http://www.ukqaa.org.uk)

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## FURTHER READING

For information on Concrete Society publications, refer to the Concrete Book Shop, [www.concretebookshop.com](http://www.concretebookshop.com)

## British Standards

BS 1881: *Testing Concrete.*

Part 113: *Method for making and curing no-fines test cubes.*

Part 130: *Method for temperature-matched curing of concrete specimens.*

BS 4449: *Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product. Specification.*

BS 4482: *Steel wire for the reinforcement of concrete products. Specification.*

BS 4483: *Steel fabric for the reinforcement of concrete. Specification.*

BS 5975: *Code of practice for temporary works procedures and the permissible stress design of falsework.*

BS 7542: *Method of test for curing compounds for concrete.*

BS 7973: *Spacers and chairs for steel reinforcement and their specification.*

BS 8443: *Specification for establishing the suitability of special purpose concrete admixtures.*

BS 8500: *Concrete – complementary British Standard to BS EN 206,*

Part 1: *Method of specifying and guidance for the specifier.*

Part 2: *Specification for constituent materials and concrete.*

BS 8666: *Scheduling, dimensioning, bending and cutting of steel reinforcement for concrete. Specification.*

BS EN 206: *Concrete - Specification, performance, production and conformity.*

BS EN 12350: *Testing fresh concrete.*

Part 1: *Sampling.*

Part 2: *Slump test.*

Part 4: *Degree of compactability.*

Part 5: *Flow table test.*

Part 7: *Air content. Pressure methods.*

Part 8: *Slump-flow test.*

Part 9: *V-funnel test.*

Part 10: *L-box test.*

Part 11: *Seive segregation test.*

Part 12: *J-ring test.*

BS EN 12390: *Testing hardened concrete.*

Part 2: *Making and curing specimens for strength tests.*

Part 3: *Compressive strength of test specimens.*

BS EN 13670: *Execution of concrete structures.*

BS EN 13286-41 *Unbound and hydraulically bound mixtures: Part 41: Test method for determination of the compressive strength of hydraulically bound mixtures.*

BS EN 14227-1 *Unbound and hydraulically bound mixtures – Specifications – Part 1 Cement bound granular mixtures.*

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## FURTHER READING CONTINUED.

### **Building Research Establishment**

*Design of normal concrete mixes*, 2nd ed, 1997

*Formwork for modern, efficient concrete construction*, BR495, 2007

### **The Concrete Society**

Technical Report 52, *Plain formed concrete finishes*, 2015

Technical Report 62, *Self-compacting concrete*, 2005

*Formwork – a guide to good practice*, 3rd edition, 2012

Good Concrete Guide 2: *Pumping concrete*, 2005

Good Concrete Guide 6: *Slipforming of vertical structures*, 2008

Good Concrete Guide 7: *Foamed concrete, application and specification*, 2009

Good Concrete Guide 8: *Concrete practice, Guidance on the practical aspects of concreting*, 2008

*Checklist for erecting and dismantling falsework*, 2014

*Checklist for assembly, use and striking of formwork*, 2014

Concrete Advice no 16, *Assessing as struck in situ concrete surfaces*

Concrete Advice no 20, *Curing concrete*

Concrete Advice no 30, *Identity testing for strength in accordance with BS EN 206 and BS 8500-1*

Concrete Advice no 31, *Identity testing of fresh concrete for properties other than strength*

Concrete Advice no 37, *Mould release agents*

### **Construction Industry Research and Information Association (CIRIA)**

*Concrete pressure on formwork*, Report 108, 1985

*Formwork striking times – criteria, prediction and methods of assessment*, Report 136, 1995

*Action in the case of non-conformity of concrete structures*, Report C519, 1999

### **Construct**

*Guide to flat slab formwork and falsework*, 2003

*A guide to the safe transportation of formwork and falsework equipment*, 2005

*A guide to the safe use of formwork and falsework*, 2008

### **Health and Safety Executive (HSE)**

*Hand-vibration – The control of vibration at work regulations*, 2005

*The work at height regulations*, 2005

*The Control of Substances Hazardous to Health Regulations*, 2002

*Management of Health and Safety at Work Regulations*, 1999

*Managing Health and Safety in Construction*, 2007

*The Personal Protective Equipment at Work Regulations*, 1992

*The Manual Handling Operations Regulations*, 1992

### **Highways England, Her Majesty's Stationary Office (HMSO)**

*Manual of contract documents for highway works, vol 1, Specification for Highway Works*

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7. Construction joints
8. Making-good and finishing
9. Sampling & testing fresh concrete
10. Making test cubes
11. Winter working
12. Health and safety