



British Register of Accredited Memorial Masons

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# THE BLUE BOOK

Complying with BS 8415:2005+A2:2012

The reference guide for

Memorial Masons & Cemetery Personnel

Updated February 2016

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## Introduction

The best tradesmen are always looking for ways of improving their skills and knowledge. BRAMM can assist.

The information provided offers an account of best practice for the installation of a lawn memorial, and is a good reference point for anyone developing their knowledge or preparing to take an associated industry qualification. It is also intended to help Burial Ground managers and staff understand processes and procedures used by memorial masons when fixing and re-fixing lawn memorials in cemeteries & burial grounds.

Using the correct materials is an essential part of this trade and it is the responsibility of a fixer mason to ensure their work meets the industry standards as laid out in BS8415. (The British Standard for the memorial masonry industry)

Compliance with the enclosed recommendations will ensure that the requirements of BS 8415 are achieved.

## Design Consideration

**All lawn memorials over 625mm in height should be designed and installed in compliance with BS8415. They are required to be constructed to withstand a force of 70kg applied at the apex of the memorial or at 1500mm from the ground, whichever is the lower.**

The British Standard is a performance specification that requires memorials over 625mm in height to be constructed to withstand a force of 70kg. Note that the pressure is over double the force that the memorial may be subjected to when testing for stability in the Cemetery, any subsequent test pressure should not exceed 25kg.

**Memorials over 625mm in height:** The foundation must be larger than the footprint of the memorial base and that the base must be fixed to the foundation using dowels or a recognised lock-down system.

The requirements are achieved by ensuring that all parts of the memorial are able to withstand the forces required.

The following items should always be taken into consideration when constructing the memorial to ensure it achieves the performance requirements of BS 8415.

- 1) Ground conditions
- 2) Foundation design
- 3) Joints
- 4) Assembly

### **1) Ground conditions.**

It is the responsibility of the fixer mason to ensure the ground conditions are suitable for the selected fixing method.

The minimum width of undisturbed ground to permit proper fixing for a lawn type memorial shall be 600mm at the head of the grave. The Burial Authority shall ensure that their grave digging practices meet this standard. See Diagram on Page 28.

If the Burial Authority has been unable to provide 600mm of undisturbed ground at the head of the grave then every effort should be made to use a foundation of sufficient length and width so as to be supported on undisturbed ground.

### **2) Foundation Design**

Shall be designed in accordance with sound engineering principles having regard to the size and load imposed by the monument.

Local soil conditions, foundation movement and any special performance requirements shall be considered in the design of the monument.

Foundations shall either be level or as the design/type of monument dictates and drainage shall be provided to resist water accumulation within the structure.

No actual size of pre-cast concrete foundation is stipulated in BS8415 but BRAMM strongly recommends that a minimum size should be 900mm x 375mm x 75mm for suitably reinforced concrete or 900mm x 375mm x 60mm for hard stone.

### **3) Joints**

Joints shall be constructed as tight as practicable. Any item that could otherwise act as a spacer, eg, nuts or washers shall be countersunk into one of the adjoining parts.

#### 4) Assembly

Stainless steel dowels, minimum grade 304L shall be used between all components, minimum sizes are shown in the Table on page 7.

It is recommended that small memorials, ie. Less than 625mm in height that are not covered by the structural requirements of the British Standard, should as a minimum be dowelled to their foundations in compliance with the specified dowel and hole sizes for the plate to base joint shown in Fig 1 on page 8. Where possible a mechanical means of securing the base to the foundation should be adopted.

Memorials 626mm and above: If the installation is to take place on undisturbed ground all currently accredited ground anchors should be suitable.

However, soft ground i.e. disturbed ground, sandy soil or similar soils lacking resistance will need an anchor/foundation system designed for these conditions.

Soft ground may require a longer and or wider pre-cast foundation to span onto undisturbed ground, a wider diameter ground anchor, a longer length ground anchor or probably a combination of all three.

All holes for the ground anchor in the foundation and memorial base/sub base must not exceed those directed by the ground anchor manufacturer.

If a sub base is used with a lawn memorial construction, it is important to ensure the length of the anchor is correct for this use.

The memorial installation process is often determined by seasons and weather conditions.

Cement has many known limitations and the fixer may chose to avoid the use of cement when there is greater possibility of frost, snow, heavy rain or stormy weather.

Alternatives such as adhesives and mechanical locking systems may be considered.

## **Ground anchors.**

There are numerous ground anchor systems available. Information regarding the installation of ground anchors is available from each manufacturer/supplier.

It is essential before using a system to carefully read the manufacturer's instructions to ensure that the chosen anchor is the correct size for the memorial and is correctly fitted.

If fixing on sandy soil or on steep slopes where thicker memorial foundations are being used, the ground anchor manufacturer should be consulted for guidance on length and diameter of ground anchor to be used.

Ground anchors are designed to be used on single/multiple foundations, poured foundations and for using with a sub-base.

**Selecting a Ground Anchor** – Progressive ground anchors are tested to fail gradually after having resisted a force of 100kg. These are useful when installing a memorial of a softer or weaker stone.

See the National Association of Memorial Masons (NAMM) website for its Register of Accredited Ground Anchors and their specification.

**Soil Types** – Ground anchors have been tested historically in firm soil conditions. It follows that when installing a memorial in softer soil conditions fixer masons should consult ground anchor manufacturers to confirm that their ground anchors are suitable.

## Use of Dowels

All steel used in the construction of a memorial must be made of stainless steel grade 304.

Dowels are a traditional means of fixing and can be used for plate to base, base to sub-base and base to a suitable poured concrete foundation. In each case the dowel(s) must be secured by cement paste or a suitable resin.

The correct dowel(s) to use can be identified in the table below.

### Dowel Sizes:

Overall Height of Memorial	Minimum Thickness of Plate	Minimum Diameter of Dowel	Minimum Length of Dowel	Length into Plate	Length into Base	Plate Dowel Hole (Max)	Base Dowel Hole (Max)
Over 625mm and Up to 900mm (3 feet tall)	63mm (2.5 ins)	16mm	150mm (6 ins)	75mm (3 ins)	75mm (3 ins)	20mm	24mm
Over 900mm tall up to 1200mm (3 feet up to 4 feet)	75mm (3 ins)	16mm	200mm (8 ins)	100mm (4 ins)	100mm (4 ins)	20mm	24mm
Over 1200 mm tall up to 1500mm (4 feet up to 5 feet)	100mm (150mm for hard stone)	25mm	200mm (8 ins)	100mm (4 ins)	100mm (4 ins)	30mm	35mm

See Figures 1 to 4 on pages 8 to 10.



## Dowel & Hole Examples

Memorial  
under  
625mm

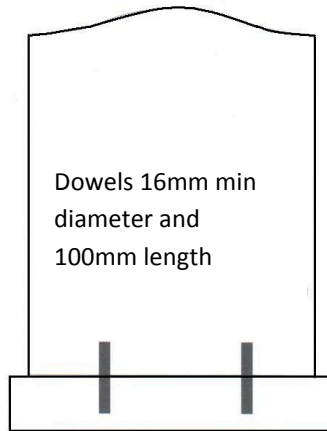


Fig 1

In all cases, a maximum clearance of 4mm in memorial plate dowel hole and 8mm in base must be maintained. Larger diameter dowels can be used to achieve this. This applies to both Fig 1 and Fig 2

625mm to  
900mm  
high

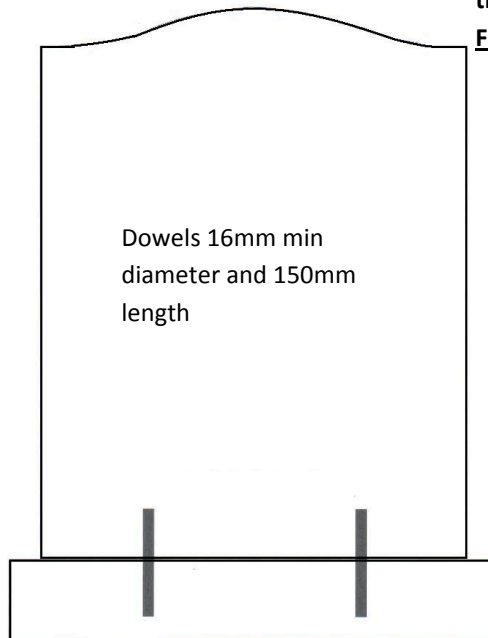


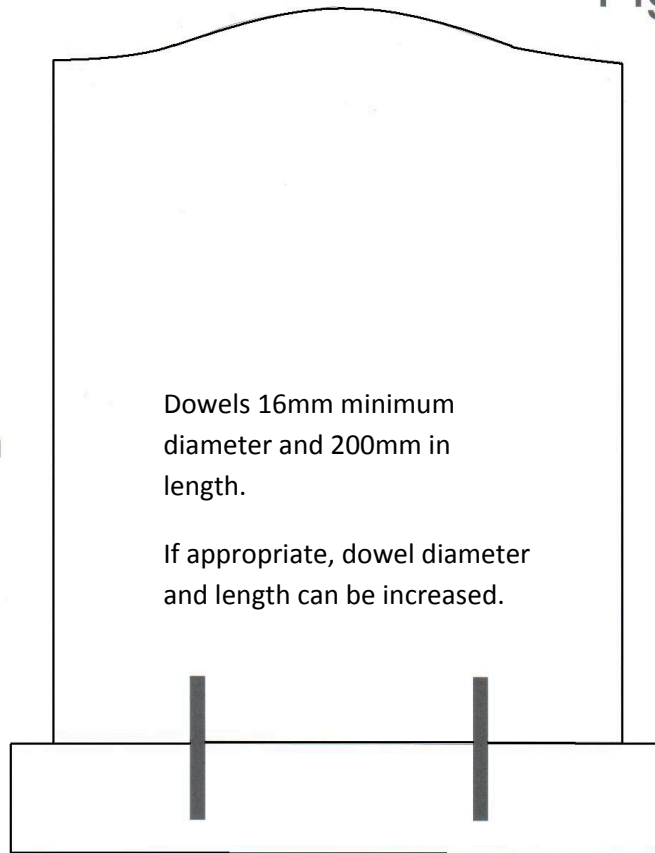
Fig 2

Fixer masons may find it easier to use a 175mm x 16mm dowel to ensure a 75mm engagement in the headstone plate where a 100mm thick base is used.

## Dowel & Hole Examples

Fig 3

901mm  
to  
1200mm  
high



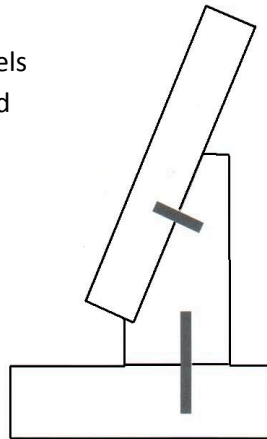
Dowels 16mm minimum  
diameter and 200mm in  
length.

If appropriate, dowel diameter  
and length can be increased.

Max dowel hole clearance in headstone  
plate 4mm and 8mm in base.

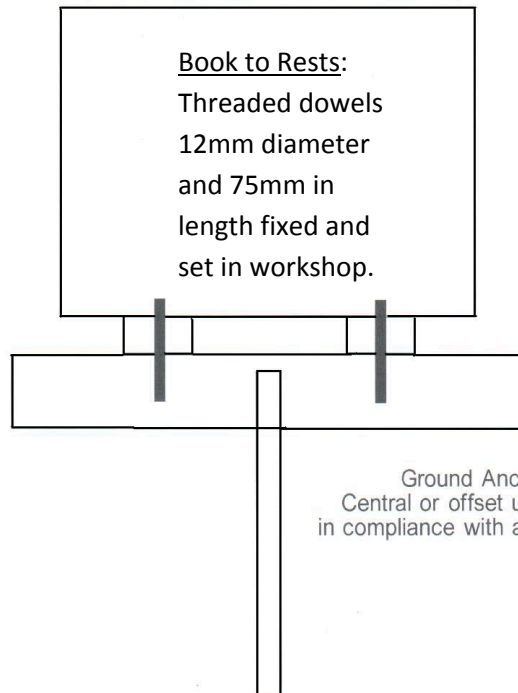
## Dowel & Hole Examples Book Memorial

Tick Rest to bases: Dowels  
16mm min diameter and  
150mm in length.



Max dowel hole clearance  
in rest 4mm  
Max dowel hole clearance  
in base 8mm

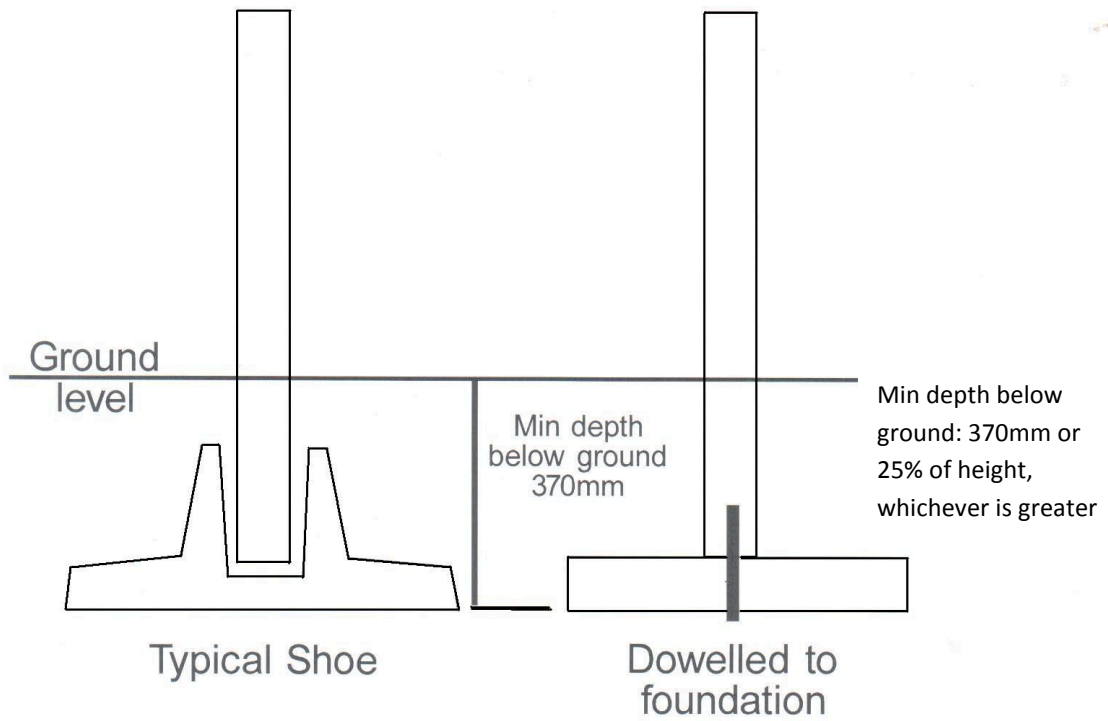
Fig 4



Book to Rests:  
Threaded dowels  
12mm diameter  
and 75mm in  
length fixed and  
set in workshop.

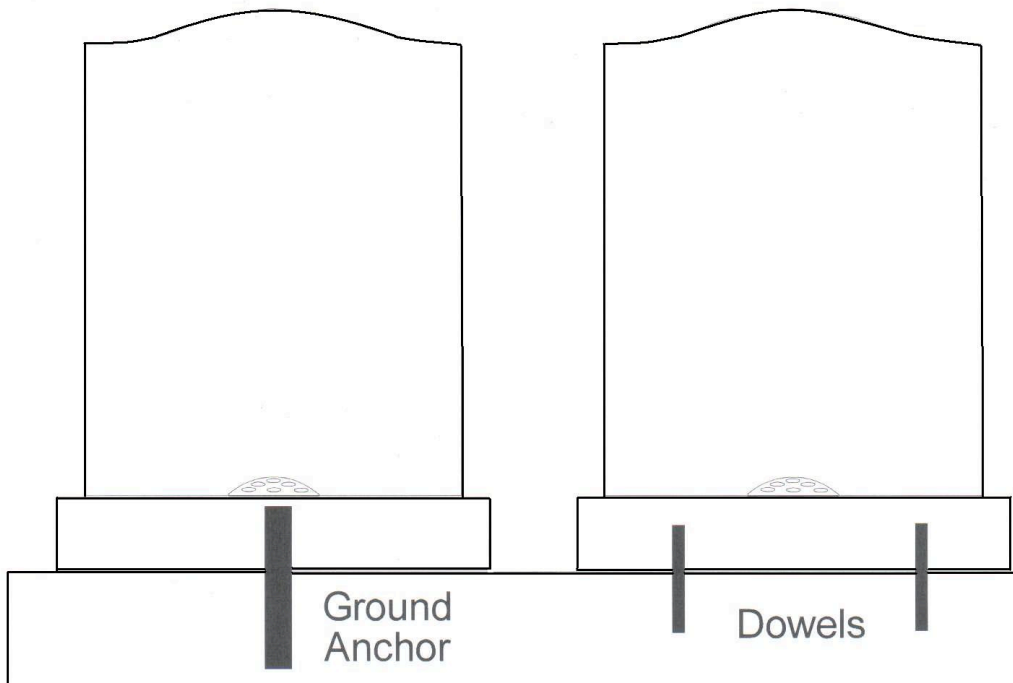
Ground Anchor  
Central or offset under rest  
in compliance with accreditation

## Examples Monolith Memorial



Examples  
Memorials in situ

Fig 6



Continuous Reinforced Concrete Raft

Memorials secured by

- A) Ground Anchor
- B) Dowels as plate to base specification
- C) Mechanical locking system (not shown)

Note: A mechanical locking system will make subsequent removal easier.

## Examples Memorials in situ

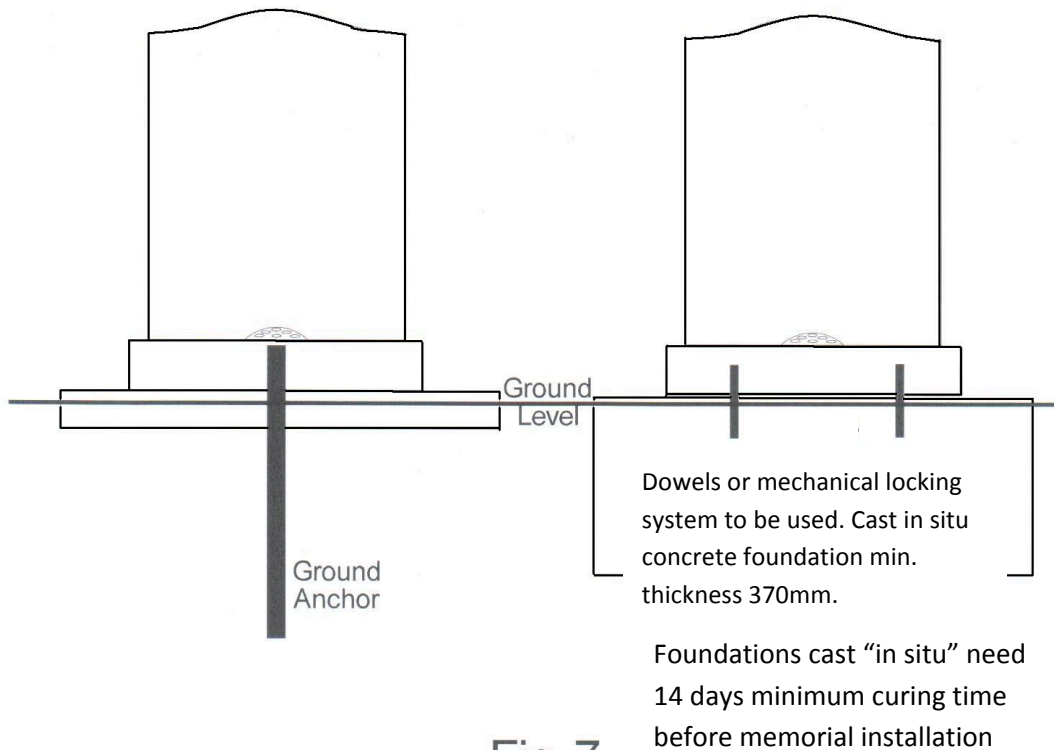


Fig 7

Dowels or mechanical locking system can be used to secure headstone base to foundation.

Note: A mechanical locking system will make subsequent removal easier.

## **CEMENT**

### **Health and Safety information when using cement.**

Cement is commonly used in the memorial industry but all too often users are not fully aware of the current health and safety issues

### **Personal protective equipment.**

This should be worn when using and mixing cement as it can cause dermatitis and damage to nerve endings. Wet cement when in contact with the skin can cause an alkaline burn. Cement naturally has chromium within it which can cause damage to nerve endings. When mixing cement avoid breathing in the dust. Some masons protect themselves with a dust mask when mixing cement.

### **General guidance**

It is important to remove as much air as possible from the joint achieved by working the surfaces together. This will maximise the grip between the surfaces of the joint. This also prevents voids where water may collect and freeze.

All surfaces where cement paste is used should be “keyed” to give better adhesion .

Ensure there are no entry points for rain water to access the joints.

The use of cement to secure the base to the foundations with troughs for flower containers should be avoided. A trough reduces the contact area for the cement and as a consequence the joint will naturally be weaker.

All flower container holes should have sufficient drainage to the sub soil.

If cement has been used to construct the memorial the structure should not be tested for stability for at least 28 days.

### **Tried and tested methods of using cement.**

Prepare the memorial for installation.

The mixing of cement should be done immediately prior to use.

Mix enough cement for immediate work.

In the memorial industry masons generally use neat cement, which is mixed with water into what memorial masons refer to as a cement paste.

The cement should be mixed to a thick creamy consistency to achieve best results.

Once mixed to the right consistency a chemical reaction begins.

If the cement dries before use do not add additional water. By adding more water the chemical reaction will be changed and the strength of the cement will be reduced.

All surfaces to be joined should be well damped with clean water before the cement is applied in order to prevent cement drying too quickly (hydraulic shock).

If the temperature is likely to fall below 5 degrees centigrade during the initial 28 day curing period a suitable frost proofing additive should be used.

### **Storing cement.**

Cement has a defined shelf life because of the trace elements it contains.

When buying Cement always check the “use by” date.

The cement bag should have a CE mark which will confirm the product is manufactured to European Standards BS EN 197-1

BS 8415 requires the mason to use Cem 1 or 2 which will be marked on the cement bag.

Cem 1. This is known as Portland Cement. This product achieves a higher strength in the early stages of setting. Cure time 28 days.

Cem 2. This is readily available from most builders’ merchants. Cure time 28 days



## Bolting

The resin used to secure bolts into plate must be as recommended by manufacturer as suitable for use in the memorial industry or that it has a proven suitability within the stone industry.

The bolting together of components must be done in the workshop and a suitable membrane, e.g. damp-proof course material **MUST** be used to cover the entire area between the headstone base and plate.

The drill holes must be dust free and, if holes are diamond core drilled, suitably keyed to give good adhesion to the resin.

Bolting memorial parts together has been proven to achieve the necessary standards. Use sizes as table below.

<b>Height of Memorial</b>	<b>Diameter of Bolt</b>	<b>Minimum Length of Bolt into Memorial Plate</b>
Up to 915mm	12mm	75mm
916mm – 1220mm	16mm	100mm
1221mm – 1830mm	16mm	150mm

It is recommended that holes are **NOT** larger than twice the diameter of the bolt.

A torque wrench **MUST** be used when tightening nuts. Settings are:

12mm diameter threaded bolt – 40Nm (30lbs/ft)

16mm diameter threaded bolt – 90Nm (65lbs/ft)

A single stainless steel washer must be used under nuts. The washer must be minimum 3mm thick and of a diameter of at least one and a half times the diameter of the base dowel hole, e.g. a 30mm washer for a 20mm hole.

## **Use of MS Polymers.**

MS Polymers are frequently used for joining stone to stone or stone to concrete.

When using this adhesive all surfaces must be clean, dry and dust free.

When using ms polymers to join granite or stone to a concrete surface the following is essential to give good adhesion:

The concrete surface should be cleaned well to ensure salts are removed and that any low strength surface layer is removed.

A wire brush is a useful for this work.

**All surfaces must be free of dust.**

## Other Important Considerations When Fixing

### **Preparation prior to transportation of a memorial**

All materials and tools should be secured and protected against damage.

Ensure that others know where you are working. This is essential if working alone. See also HSE guidance on 'Working Alone'.

Permits and all authorisations should be completed before an installation takes place.

Fixer masons must comply at all times with cemetery regulations.

### **Risk Assessment in the Cemetery**

It is essential to carry out a site specific risk assessment before unloading a memorial. This does not necessarily need to be documented and is a specific risk assessment of the area and those that might be affected.

### **Preparing the site for the memorial installation**

Decide where tools and waste materials will be placed and how the memorial will be moved and positioned for installation.

### **Installation objective**

To install the memorial in line, level and plumb.

### **During the Installation**

Should a funeral commence close to the work location all work should cease until all mourners have left the cemetery.

### **Leaving the installation**

Ensure that the installation is left in a clean, tidy and safe state.

### **Report to the cemetery office on departure if required**

It is important to check cemetery regulations and follow them.

Report any dangerous structures to the cemetery office.

## Re-installing Lawn Memorials

If a lawn memorial has to be re-fixed, e.g. after being deemed to be dangerous or following the addition of an inscription, it must be re-installed in compliance with BS 8415 and this Blue Book.

In some instances the memorial base is not removed from the plate. In these circumstances the fixer mason has no knowledge of whether or not the joint complies with BS 8415. There are two options the fixer mason can take to ensure compliance in these circumstances:

1. Core through the base into the plate and secure using dowel and cement or an approved resin. It is advised that a 20mm core drill is used with 16mm dowels. Holes must be of sufficient depth to allow dowels go at least 75mm into the plate.
2. A proprietary approved long anchor peg, tested to comply with BS 8415, which goes through the headstone and into the headstone plate can be used, secured with cement paste or a suitable resin, in which case additional dowels are not required. If there is any doubt about future stability the base should be removed from the headstone plate and compliant stainless steel dowels used.

Ground anchor fixing will be achieved by drilling the appropriate size hole in the memorial base and using the correct size foundation with correct size anchor hole. A mechanical method can be used to secure the base to the foundation but an approved ground anchor must still be used.

## **BRAMM Supplementary Information.**

### **Health and safety requirements**

*The Health and Safety at Work Act places a legal duty on all people at work.*

*Under this act it is the responsibility of the employee to ensure their own safety and that of others.*

*It is important to see your employer's health and safety policy. It will explain how health and safety is managed.*

*PPE to be supplied by employer and used/ worn as advised.*

*Rubbish or other materials left over after fixing it should be gathered up and either removed or placed in designated areas.*

*Accidents in the work place, which includes working in cemeteries, must be recorded in the Company accident book.*

*Care should be taken when using adhesives and substances. Always read the labels and information.*

*A first aid kit should be available in the workshop and in the fixer's vehicle.*

### **Risk assessments**

*A risk assessment tells how a task should be carried out to ensure safe working. Each business should have relevant risk assessments but fixers need to carry out risk assessments prior to memorial installation.*

### **Memorial design requirements**

*Refer to page 3 of the for the main criteria.*

*All metal used in the construction of a memorial must be stainless steel. The British Standard BS8415 states the minimum standard of stainless steel must be BS6744/ grade 304.*

*Installation of Monolith memorials requires a minimum of 25% of the memorial to be installed below ground. Monolith memorials are frequently installed into a concrete or hard stone shoe to increase stability.*

## **Pre-cast Concrete Foundations**

*Manufactured memorial foundations must be reinforced.*

*BS 8415 references indicate that metal reinforcement should be used in the manufacture of pre-cast concrete memorial foundations*

*When purchasing pre-cast concrete foundations, please consult the foundation manufacturer to confirm that their foundations comply with BS 8415 recommendations for steel reinforcement of pre-cast foundations.*

*Poured foundations require a mix of concrete in a ratio of 1 cement, 2 sand and 4 aggregate and appropriate re-enforcement used. The foundation should be allowed to cure for at least 14 days before proceeding with the installation.*

*Minimum thickness, **pre-cast concrete foundation**: 75mm*

*Minimum thickness, **natural stone foundation**: 60mm*

*All foundations must have a **minimum depth, front to back**, of 380mm*

**BRAMM recommended size of pre-cast foundations: 900mm x 450mm x 75mm**

Soil should be tamped (firmed, consolidated) before a pre-cast foundation is positioned.

### **Soil types**

*Ground anchors have been tested historically in firm soil conditions. It follows that when installing a memorial in softer soil conditions fixers should consult ground anchor manufacturers to ensure the correct size anchor is used.*

## **Useful information and acronyms**

BRAMM. British Register of Accredited Memorial Masons.

NAMM National Association of Memorial Masons

CoWP Code of Working Practice

COSHH Control of Substances Hazardous to Health

HSE Health and Safety Executive

PPE. Personal Protective Equipment. eg. Steel capped boots, goggles, ear defenders, mask and gloves.

## Glossary

Burial Authority	<i>Organisation responsible for managing a burial ground.</i>
Memorial Mason	<i>A tradesperson responsible for installing memorials.</i>
Dowel	<i>A pin to align, prevent movement and make a secure joint between adjacent elements of a memorial.</i>
Lawn Memorial	<i>A jointed memorial with an upright stone fitted to the back of a base stone. This type of memorial is often between 600mm (2') and 1200mm (4') in height and is a more modern design often found in abundance on lawn sections of British cemeteries.</i>
Ground Anchor	<i>A long bar that is driven through the foundation in order to pin it to the ground thus providing stability. A number of approved ground anchors are currently being used by memorial masons.</i>
Lock Down System	<i>A mechanical system used to 'bolt' a memorial base to the foundation. A number of approved lock-down systems are currently in use by Memorial masons.</i>
Foundation	<i>A part of a structure in direct contact with and transmitting load to the supporting ground. Foundations can be single reinforced concrete slabs 900mm x 375mm x 75mm or 900mm x 375mm x 60mm for hard stone.</i>
Universal Landing with Trough	<i>A type of foundation with pre-formed holes/apertures designed to allow flower vases to be incorporated into the headstone base. Note that these landings/foundations are not suitable when cement is used as a fixative as the contact area between the base and foundation is unacceptably reduced.</i>
Monolith memorial	<i>One-piece memorial buried between 25% and 35% into the ground. Under some ground conditions it may be advisable to fit the memorial into a "shoe" foundation piece.</i>



Cement	<i>The fixative used to secure dowels into the drilled holes in the memorial and/or foundation.</i>
Resin	<i>An alternative to cement that is used for the same purpose.</i>
Arris.	<i>A sharp edge, created when two surfaces meet .</i>
Chamfer	<i>Where two surfaces meet the corner is removed to create a flat surface joining the two existing surfaces.</i>
Joggle joints.	<i>This method of construction is no longer recommended. This is a joint where one piece of stone is let into another. Similar to a carpentry mortise and tenon joint.</i>
Hydraulic Shock.	<i>This is a term used when cement is applied to a dry surface. Water will quickly be drawn from the cement altering the chemical reaction. Cement suffering hydraulic shock will cure to a much weaker strength.</i>

**Metric to imperial conversion**

Masons may find it useful to refer to this table to find imperial size measurements

625mm      equivalent to      24.6 inches

75mm                              3 inches

100mm                             4 inches

150mm                             6 inches

200mm                             8 inches

Recommended minimum size of pre-cast concrete foundation:

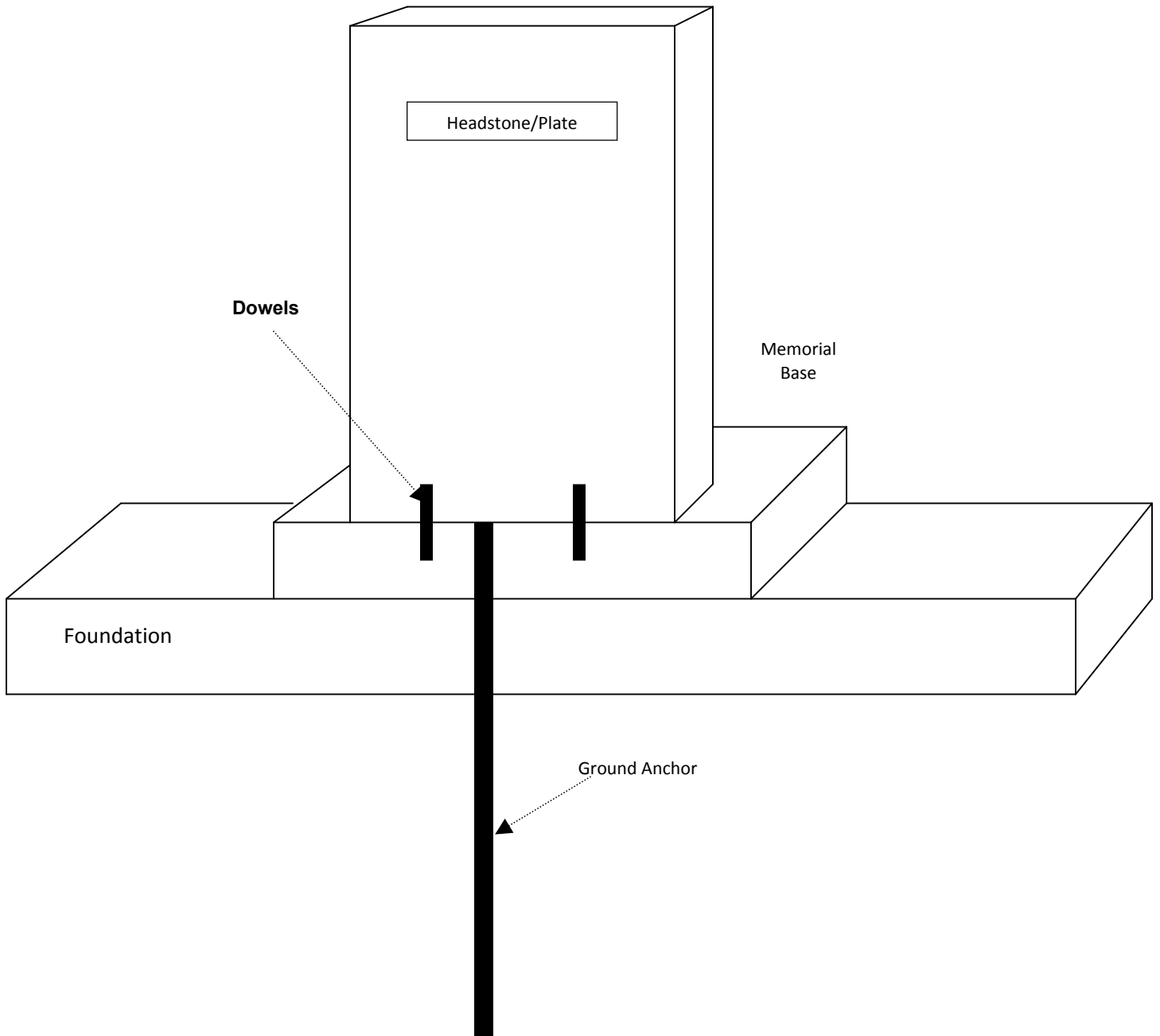
900mm x 450mm x 75mm equivalent to      36 inches x 18 inches x 3 inches

1200mm      equivalent to      4 feet

1500mm                             5 feet

1800mm                             6 feet

**Lawn Memorial Construction Diagram - EXAMPLE of COMPONENTS**  
**Memorial over 625mm in Height**



## Grave Space Layout

