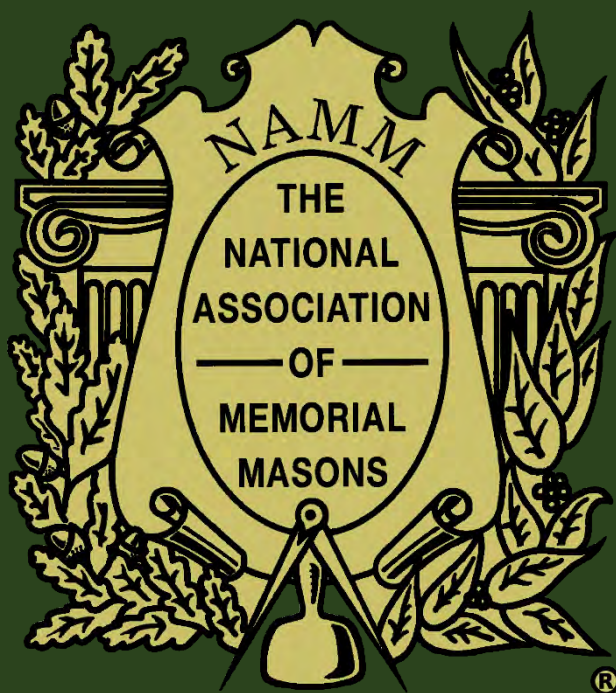


# N.A.M.M.

## CODE OF WORKING PRACTICE



Supporting the Memorial Mason  
in complying with British Standard 8415-2018

OCTOBER 2018

# **The Code of Working Practice for Memorials in Burial Grounds And Other Commemorative Sites**

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### **GENERAL STATEMENT**

The aim of the NAMM Code of Working Practice is to support the memorial mason in complying with current BS 8415 guidance and to ensure that the customer is provided with a memorial that is of good lasting quality and fit for purpose, requiring as little structural maintenance as possible.

Memorials must be constructed to comply with the Code of Working Practice and BS8415 guidance current at the time of fixing. If a memorial is dismantled for any reason, then it must be re-fixed to the latest specification.

The memorials supplied by members of the Association shall be of sound natural quarried materials and subject only to those variations in colour, natural characteristics and regional variations as are accepted by the trade and approved by NAMM General Council and the Technical Committee.

The suitability of a particular type of natural stone is determined by understanding the past performance of the materials used for monumental work in the United Kingdom.

The minimum thickness recommended for structural parts of a memorial over 625mm high is 50mm for slate and 75mm for all other stones. Thinner materials can be used but only in situations that carry little or no weight.

All components used in the construction of a memorial, including the dowels, must be of sufficient strength for the memorial to be self-supporting.

Workmanship must always be as good as possible with Members adhering to the principles and code of ethics of the Association at all times.

Masons must understand the Health and Safety implications of their work to themselves and others and appropriately manage risks such as dust, hazardous chemicals and the use of tools and machinery. Suitable Personal Protective Equipment must be used at all times.

Although not an exhaustive list the following links provide further useful guidance.

<http://www.hse.gov.uk/> The Health & Safety at Work Act (1974)

<http://www.hse.gov.uk/pubns/indg163.htm> Risk Assessment.

<http://www.hse.gov.uk/pubns/indg463.htm> Control of Silica Dust.

<http://www.hse.gov.uk/coshh/> COSHH (Control of Substances Hazardous to Health)

<http://www.hse.gov.uk/riddor/> RIDDOR (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations)

<http://www.hse.gov.uk/msd/manualhandling.htm> Manual Handling.

<http://www.hse.gov.uk/work-equipment-machinery/loler.htm> LOLER (Lifting Operations & Lifting Equipment Regulations)

<http://www.hse.gov.uk/work-equipment-machinery/puwer.htm> PUWER (Provision and Use of Work Equipment Regulations)

### **STANDARDS FOR FIXING MEMORIALS**

The Association, together with a consultant structural engineer, has tested, calculated and recorded the design strength of various sized memorials of various materials and methods of fixing. The construction and fixing methods shown in the Code including approved dowel sizes are nationally accepted standards and were first incorporated into BS8415.2005. The NAMM Code of Working Practice is continually updated to ensure full compliance with current BS 8415 guidance. Whilst the systems described in the Code are not the only way of fixing a memorial, alternative methods must achieve the minimum standards set out in the NAMM Code in order to meet BS8415.2018.

Memorials in which the highest part of any component is greater than 625mm above ground level shall be designed to withstand a horizontal load of 70kg applied at its apex or 1.5m from the ground, whichever is the lower, with the load being applied in the most critical direction.

**See section 7 Ground Support systems.**

A memorial cannot be expected to withstand a determined vandal or catastrophic event.

The recommendations in this Code assume that the grave area has been suitably prepared by the Burial Authority for the safe erection of memorials as permitted in its regulations.

Masons may be required to vary fixing methods to comply with regulations outside the Code, or if so directed by a Structural Engineer employed by the Burial Ground management.

Some Burial Grounds install their own foundations or supply bases in which case the mason must comply with written instructions for that Cemetery. However, the Burial Authority must take responsibility for any part of the memorial construction it provides such as foundations and if requested issue appropriate dispensation to the mason.

Authorities are entitled to insist that a large monument be built to current Building Regulations and in any such case must provide a written specification.

Memorials and the surrounding areas must be left in a clean and tidy condition.

#### **Reinstated Memorials**

When reinstalling any memorial such as those previously removed for remedial work or adding an inscription etc or if re-fixing a failed memorial (when laid down or removed as safety measure ) all components such as foundations, dowels and method of fixing must comply with current standards. **See section 10**

This document will be regularly updated in the event of new materials and techniques being approved as appropriate in the construction of memorials.

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### **CEMENT AND CONCRETE**

3.1 **Cement** used in memorials within burial grounds and memorial sites shall be in accordance with BS EN 197-1 type CEM I, strength class 42.5.

3.2 Jointing and pointing materials used in memorials within burial grounds and memorial sites shall conform to BS EN 447.

3.3 Mating surfaces to be joined by cement should be roughened and free of surface dust and should be damp, but without any free water.

3.4 For lawn memorials, excluding any openings for vases, dowels, anchors etc, it should be aimed at achieving 100% coverage of the available contact area between the memorial base and foundation slab, so ensuring there are no voids or paths for water to penetrate the joint. The joint when put together should be 'worked' into place, to give sufficient adhesion or 'vacuum'. Isolated dabs are not acceptable as these could allow the penetration of water, which upon freezing would expand causing joint weakness and possible failure.

3.5 Cement quality is entirely dependent on the way that it is mixed. Cement should be date dry and correctly stored. It should be mixed with as little water as possible and thoroughly worked for 5 minutes to a consistency of smooth thick cream. If cement is not mixed thoroughly or mixed too quickly its strength and duration of workability will be reduced, the addition of more water once mixed will also weaken its adhesive properties. Cement paste shrinks and dries as it hardens. The more water used the more shrinkage and the less strength.

3.6 Neat cement paste may take 6 hours or more to harden and does not reach full strength until the 28th day. Early excessive pressure loading may cause the joint to fail.

3.7 Cement mixing should always be left until the last moment and only enough prepared for the immediate work in hand.

3.8 Work should not be carried out at temperatures below 5°C due to the risk of the mixing water freezing before it can react with cement.

#### **3.9 CEMENT APPENDIX**

This advice is based on information provided by the British Cement Association (BCA).

**Cement** when used correctly is perfectly suited to our use, cement should **NOT** be used beyond its declared shelf life or use-by-date.

Cement is manufactured in accordance with the British and European Standard BS EN 197-1 and is CE marked. Materials suitable for our applications are:

**CEM I** Portland cement, once known as Ordinary Portland cement (OPC). This provides the highest early strength but CEM II may be more readily available. CEM I is also available as **White Cement**.

**CEM II/A-L or CEM II/A-LL** Portland Limestone Cement. Contains up to 20% limestone fines.

**CEM II/B-V** Portland fly ash cement. Contains up to 35% fly ash.

**CEM II/A-S or CEM II/B-S** Portland slag cement. Contains up to 20% or 35% slag.

Due to the inclusion of a secondary main constituent CEM II cements are slightly less prone to early age shrinkage but do not provide as much early strength as CEM I cement. CEM I and CEM II cements both take 28 days to develop full strength. Some cement contains a plasticising additive, which provides improved frost resistance.

3.10 **White Cement** can be used for pointing marble, for this usage the addition of fine marble dust can improve workability and help reduce shrinkage, white cement can also be coloured for other applications using approved additives in accordance with manufacturer's instructions. .

3.11 **Lime Mortar** Lime mortars are generally used on stone buildings and the material is not usually appropriate for memorials other than those constructed from Limestone. Lime mortar can be acquired readymade at various strengths and formulations from specialist suppliers who are able to match existing mortar and supply data sheets which is beneficial when undertaking work such as the renovation of listed monuments. Special care and appropriate PPE must be worn when using Lime Mortars as they can cause serious burns and other skin problems.

**Concrete** for foundations should ideally be mixed by machine.

3.12 Concrete used in the foundations of memorials within burial grounds and memorial sites shall conform to BS EN 206-1. The characteristic compressive strength of the concrete at 28 days shall be not less than 30 N/mm<sup>2</sup>.

3.13 Concrete that is to be used for memorial bases, foundations or cast on site, should always be to the highest specification possible. In situ foundations should be allowed to cure for at least 14 days before fixing takes place (28 days preferable)

3.14 Concrete consists of cement, washed sand, aggregate and clean water (fit for drinking). Where there are sulphates in the ground, sulphate resistant cement must be used.

3.15 Reinforcing steel used in the concrete foundations of memorials within burial grounds and memorial sites shall conform to BS 4449.

3.16 If additives are used i.e. concrete antifreeze or plasticiser, then the manufacturer's guidance must be followed.

3.17 The sand and aggregate should be mixed first. This is often purchased ready mixed and called ballast. Concrete should be mixed before placing and the cement should be added last as any dampness in the ballast starts the cement setting process.

3.18 After mixing the cement into the dry mix, add minimum amounts of water allowing for any dampness in the ballast, so that when tamped just a very fine film of water rises to the surface.

3.19 Cement sets twice as quickly in the summer at temperatures above 20°C than in winter at 5°C. The laying of concrete should not take place when the temperature is below 5°C. When frost is forecast it should be covered to protect it.

3.20 Concrete is normally mixed in proportion: 1-part cement, 2 parts sand and 4 parts aggregate and can mixed by weight or volume, provided allowance is made for water content. Concrete used near the sea or other saline environments should be stronger: 1-part cement, 1.5 parts sand and 3 parts aggregate. If concrete is mixed by volume the same container should be used to measure each portion.

3.21 Placing of concrete should be within 30 minutes of mixing. Once placed it should be tamped to remove air bubbles. After trowelling any surface water should be taken off. Excessive water reduces the strength of the concrete and causes shrinking when setting.

3.22 Any mixed concrete, once the setting has started, **must not** be remixed with more water but should be discarded.

**WEIGHT** Dry concrete 300 x 300 x 300mm = 68kg - Approx. 2400kg/m<sup>3</sup>

## **ADHESIVES**

4.1 **Flexible Bonding and Sealing Agents** selected shall meet a performance class specified in BS EN ISO 11600 and be appropriate to the expected joint movements. The product must be supplied with a manufacturer's guarantee stating that the product is fit for purpose when used with natural stone, granite or marble and that the product's curing temperature is suitable to the UK climate.

4.2 **Styrene Free Polyester Resin** is a hard setting material, which can be used for fixing the rods in the 'Bolting Method', for lawn memorials and fixing rest(s) to a plaque. When using a polyester resin, all surfaces need to be dust free and dry and the work should be carried out in a workshop with a dry atmosphere.

4.3 **CAUTIONARY NOTE:** Polyester Resins have been used successfully. However deterioration has occurred over a period of time and failures have caused problems with memorials. Please confirm from the supplier that the resin is fit for purpose.

4.4 **PVA** waterproof adhesive can be added in small quantities to cement to improve its strength when making repairs. PVA adhesives can be used for repairing Lime and Sandstone, dowels should be added to provide additional support to larger repairs.

4.5 **Polymer or Silicone** based adhesives are generally unsuitable for fixing the structural parts of the memorial. These adhesives are suitable for secondary fixings such as photo plaques and small figures.

4.6 **MS POLYMER** comes under BSEN ISO 11600; 2003+A1:2100 *Building construction*.

*Jointing products. Classification and requirements for sealants*

Can be used to

- Seal joints
- Attach ceramic plaques
- Attach small vases to bases

MS Polymer **should not** be used to replace cement to "bed/join" structural components of natural stone together.

Not all MS Polymers are suitable for natural stone – and may require a relatively high curing temperature in comparison to normal UK conditions. **Always check data Sheets for correct usage.**

Some MS Polymers can have a curing time of 72 hours or even longer, usually requiring a temperature of 5 degrees and upwards.

If the temperature is not constant for instance it severely drops overnight, it can take much longer to "set" and may seriously reduce its bonding ability.

### **4.7 RESIN**

Is hard setting usually comprising of "two" compounds to be mixed together

It should not be used to replace cement to "bed/join" two pieces of natural stone together

SOME Resins can be used for small repairs, it comes in colours and is easy to work to blend in to stone, curing time will be affected by temperature, hot weather will decrease curing time and very cold weather will retard setting. **Always check data sheets for correct usage.**

Resin is not suitable for repairs on soft stone.

### DOWELS, AND FIXINGS

Stainless steel dowels were first introduced by NAMM in 1996, the NAMM dowel table is an Industry recognised standard derived from rigorous component testing financed and undertaken by NAMM and has been reproduced with NAMM consent in BS8415-2018 and all previous BS8415 publications.



*Above some examples of testing from NAMM component testing archives.*

#### **Dowel sizes for hard Limestones Marble Slate and Granite**

Memorial Size		Nominal Dowel Size			Maximum Hole Diameter	
Height of Apex	Thickness of Vertical Component	Diameter	Minimum Length into		Into Upper Section	Into Lower Section
			Plate	Base		
Up to and including 625 mm (24" 5/8 )	50mm minimum	12mm x 2	75mm	50mm	16mm	16mm
	50mm to 63mm	12mm x 2	75mm	50mm	16mm	20mm
	Over 63mm	16mm x 2	75mm	75mm	20mm	24mm
625mm to 915mm (3ft)	Over 63mm	16mm x 2	75mm	75mm	20mm	24mm
915mm to 1220mm (4ft)	Over 75mm	16mm x 2	100mm	75mm	20mm	24mm
1220mm (4ft)	Over 100mm	25mm x 2	100mm	100mm	30mm	35mm

For memorials over 1200mm increase length of dowel into headstone 25mm every 300mm



### Dowel sizes for soft Limestones and Sandstone

Memorial Size		Nominal Dowel Size			Maximum Hole Diameter	
Height of Apex	Thickness of Vertical Component	Diameter	Minimum Length into Plate                      Base		Into Upper Section	Into Lower Section
Up to 625mm (24" 5/8)	75mm	12mm x 3	75mm	50mm	16mm	20mm
625mm to 915mm (3ft)	75mm	12mm x 3	100mm	75mm	16mm	20mm
915mm to 1220mm (4ft)	100mm	16mm x 3	150mm	75mm	20mm	24mm

5.1 Materials other than Stainless Steel may become available in the future but the Association cannot recommend them until they have been satisfactorily tested for the use on memorials.

5.2 A dowel is a length of solid stainless-steel rod that fits into two corresponding holes to align and join pieces of stone together. The dowel is a structural part of the memorial. Dowels, cramps and other fixings must be Solid Stainless-Steel Grade 304 or higher. The diameters of dowels shown in the Code are nominal sizes.

5.3 Dowel holes must be drilled with great care to ensure the sides of the holes are not fractured in any way. Ensure the hole is accurately positioned and to the required diameter and depth.

5.4 It is recommended to use wet core drill for this procedure. (percussion drills may damage or weaken the stone)

5.5 Where cement is being used to secure the dowel, all dust must be removed from the drill hole before filling and inserting the dowel, the dowel hole should be damp but with no free water.

5.6 When setting the dowel into the hole, ensure the cement goes all the way to the bottom of the hole and is worked into the sides ensuring there is no trapped air between the dowel and the wall of the hole.

5.7 When cement is mixed to the right consistency it will not come out of the dowel holes during fixing.

5.8 Fixing the dowels into the upper unit in the workshop and allowing the cement to set will simplify final assembly on site and provide a more stable initial fix.

5.9 All surfaces to be fixed with cement should be roughened to form a key for good adhesion. This applies to all parts of the memorial except where the design of the fixing system being used dictates otherwise. All joints must be fully bedded, and properly pointed or sealed.

5.10 To avoid hydraulic shock when bedding or jointing porous stones such as Limestone and Sandstones, the jointing surfaces should be pre-wetted to the point where they no longer readily absorb water

5.11 The joint between a headstone and base must have **two solid stainless-steel dowels**, of appropriate grade and size, which can be **smooth or threaded**.

5.12 If dowels are used that differ from the sizes shown in the **DOWEL TABLE**, the holes should not be more than 4mm larger diameter than the dowel in the top section or 8mm larger diameter than the dowel in the lower section.

5.13 **Dry Dowels** are where the dowel is secured into only one of the adjoining holes. They prevent slippage and are often used to locate heavy pieces of stonework such as the bases of a built-up structure. For ledger slabs resting on kerbs or directly on a foundation, use the same size dowels as for fixing kerbs. For all other memorials, use the height of the memorial as a guide.

5.14 **Dowel sizes for structural components of a memorial.** The table shows minimum dowel sizes for standard memorials which are derived from comprehensive testing by NAMM. Any variations must be fully calculated and the structure must be designed to the NAMM criteria shown in the Glossary. Stainless steel manufacturers and/or structural engineers can assist in these calculations.

5.15 Slate 50mm or thicker is strong enough to be used for headstones up to a maximum height of 625mm and the dowel sizes in the first row of the Dowel Table should be followed.

5.16 Slate Memorials over 625mm in height fixed with dowels on a foundation or base should not be less than 75mm in thickness.

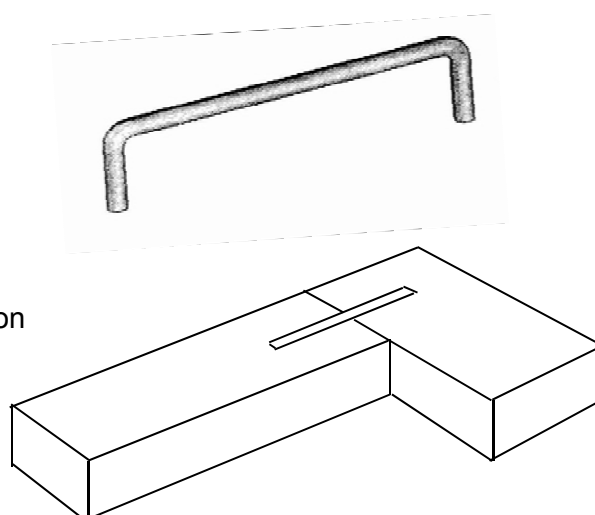
5.17. Where headstones do not require a ground anchor, the memorial base should be secured to the foundation using an approved lock down device, bolting method or dowels.

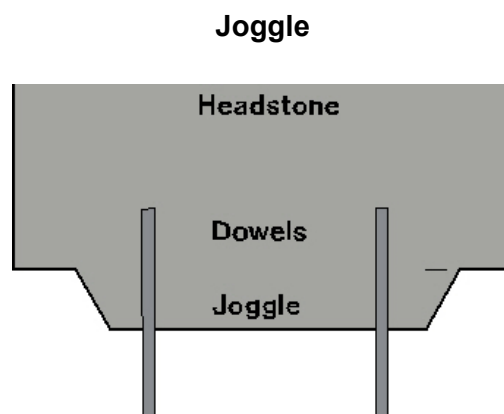
**Cramp** (also known as a 'Dog Cramp')

5.18 **Cramps** are shaped lengths of stainless steel suitably bedded into a sinking (a groove), cut into adjoining components to tie them together.

Must always be used at 90 degrees to the joint.

5.19 Position cramp drilled and recessed into foundation  
Length at least 150mm with 75mm over each section  
Minimum depth of leg 50mm  
Diameter of cramp rod 8mm  
Ideally drill so that joint is drawn together  
Must be cemented





5.20 A **Joggle** is the name for a mason's mortise and Tenon, where one piece of material is let into another. This type of joint in memorials can create weakness and stress and is not recommended unless there is also adequate dowelling. To calculate the length of the dowels, the depth of the joggle must be added to the length of the dowel shown in the dowel table. A joggle joint is acceptable when the whole thickness and at least 75% of the width of the material is set into a mating groove in the foundation or base. The depth into the base or foundation of the joggle must be more than 75mm.

#### **Bolting Method** for fixing plate (headstone) to base.

5.21 Threaded dowels (rods) and nuts must be of different grades of stainless steel (e.g. dowels could be A4 grade, nuts A2) to prevent the possibility of their binding together.

#### 5.22 Threaded Dowels sizes

Height of Memorial	Diameter of Dowel	Minimum Length of Dowel into Memorial Plate
Up to 915mm ( 3 ft )	12mm	75mm
Up to 1220mm ( 4 ft )	16mm	100mm
Up to 1830mm ( 6 ft )	16mm	150mm

5.23 Two threaded dowels are required in hard limestone, marble, slate and granite. Three threaded dowels are required in soft limestones and other stones.

5.24 All hole diameter sizes should be as per the Dowel Table. The dowel holes should be sealed with a suitable sealant to prevent the ingress of water.

5.25 Recommended torque applied to the nut:  
 Up to 12mm - 40Nm  
 Up to 16mm - 90Nm  
 Note: Care must be taken not to over-tighten the nuts.

5.26 A polyester resin adhesive should be used to fix threaded dowels.  
**See Adhesives Section 4.**

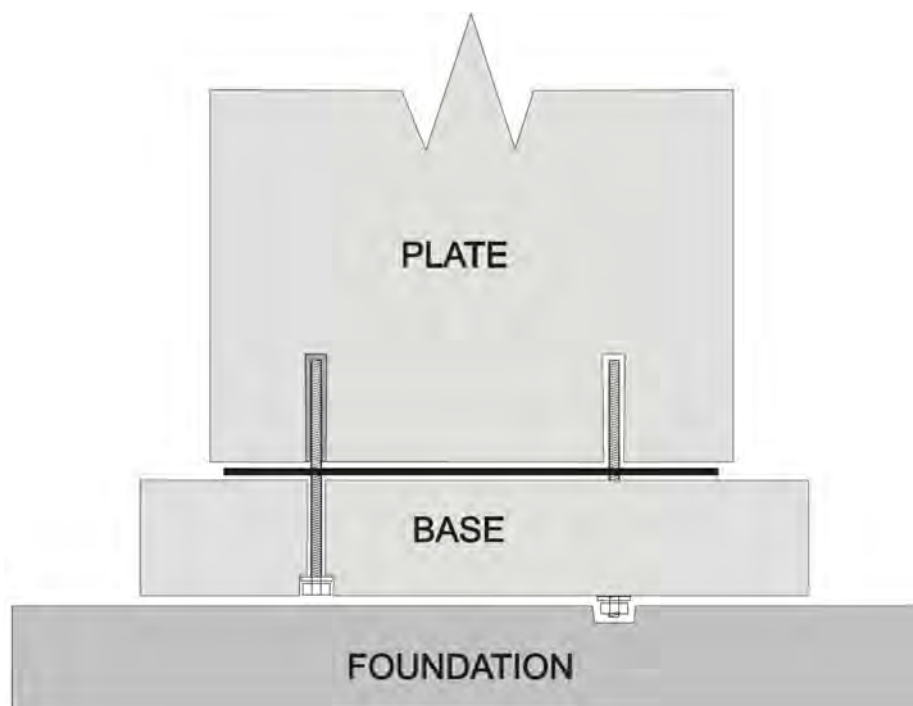
5.27 The dowel holes shall be dust free and dry when fixing takes place and the work must be carried out in a workshop with a dry atmosphere. Diamond core drilled holes should be suitably roughened to provide a key for the resin.

5.28 A waterproof membrane must be placed between plate (headstone) and base to prevent damage. A suitable membrane would be a damp-proof course made of a plastic material, which will not cause staining.

5.29 The washers must be at least 3mm thick and be over 50% larger than the lower dowel hole diameter. Using more than one washer to make 3mm is **not** permissible. Either the base or foundation needs to be counter-sunk to accept the nut and washer.

5.30 A stainless steel sprung washer can be used between the nut and main washer to prevent fixing becoming loose over time

5.31 Sealing the void around the bolt where it exits the top of the base will prevent water ingress.



**Nut and washer countersunk in either base or foundation.**

## **FOUNDATIONS**

### **General**

6.1 A Foundation is a platform on which to build a memorial. All memorials must have a foundation strong enough to take the weight of the structure and be large enough to keep it stable.

6.2 The stability of the memorial is the mason's responsibility, memorials fixed in compliance to the current CoWP in turn ensures compliance with BS8415 and confirms the mason has done all possible to meet their responsibility. This applies to new memorials, reinstated or re levelled memorials where all fixing components and materials including foundations must comply with current CoWP and BS8415 requirements.

6.3 Where possible a memorial should be erected on undisturbed ground, BS8415:2018 states that Burial Authorities should provide an area of undisturbed ground (600mm) at the head of the grave plot.

6.4 If the memorial must be erected on disturbed ground, the ground must be allowed to settle for an appropriate period before the work commences and be well consolidated, the mason must be satisfied that the ground can support the structure and not settle within a reasonable warranty period.

6.5 The grave area must be suitable for the safe erection of the memorial. The mason must take into account the type of ground and consider its ability to support the intended construction where the memorial is to be placed.

6.6 Bricks or Concrete Blocks used as part of the construction of a memorial foundation must conform to the relevant British Standard and be of appropriate durability for their intended use.

6.7 The use of Weed Killers is **not** acceptable in or around memorials or foundations. Root systems hold the ground together and help prevent soil erosion.

6.8 Drainage must be provided as appropriate to prevent the accumulation of water on or within foundations, vases and bases.

6.9 Masons may be required to provide a foundation as specified by a particular Cemetery Authority. Some Authorities install or provide their own foundations and the mason must comply with the instructions for that Cemetery. In any of these cases the Cemetery must accept responsibility for any structural parts of the foundation which they supply or for their own foundation specifications that they require masons to comply with on which they fix memorials.

6.10 Foundations for memorials which are greater than 625mm shall be designed in accordance with sound engineering principles having regard to the size and load imposed by the memorial. Local soil conditions, foundation movement and any special performance requirements shall be considered in the design of the foundation.

6.11 All foundations must be larger on plan than the base of the memorial. Where possible the foundation should be wider than the grave. This is to make the memorial more stable, especially when it is to be fixed on disturbed ground.

6.12 Foundations should be level with due allowance made for sloping ground, with the foundation set into the ground with the top of the foundation slab level with the soil at the lowest point.

6.13 The ground must be well consolidated under the foundation. Where possible the foundation should be wider than the grave excavation with a recommended minimum width of 900mm

6.14 **Pre-cast foundations** for Lawn Memorials constructed from reinforced concrete should have a smooth finish and not less than 75mm thick. (unless design characteristics and product manufacture as per BS8500 apply)

6.15 Concrete used in the foundations of memorials shall conform to BS EN 206-1 and the characteristic compressive strength of the concrete at 28 days not less than 30 N/mm<sup>2</sup>.

6.16 Steel used for the reinforcing of concrete **must** conform to BS4449. If other materials are used as reinforcing, they must have similar or better performance than stainless steel which can be confirmed by design and calculation or testing.

6.17 **Hard stone foundations** with a density of at least 2400 kg/m<sup>3</sup> can be used for lawn memorial foundations. Dense granites should be a minimum of 60mm thick.

6.18 Horizontally bedded Silica stones (such as Yorkstone) are acceptable for foundations provided they are of good quality and at least 75mm thick.

6.19 Memorials fixed to a cast in situ foundation must be securely anchored or doweled to the foundation. The foundation (cast-in-situ) must be of sufficient weight and dimensions to stabilize the design of the memorial.

6.20 All independent foundations should be a minimum 385mm deep front to back with a recommended depth of 455mm front to back and must be larger on plan than the base of the memorial.

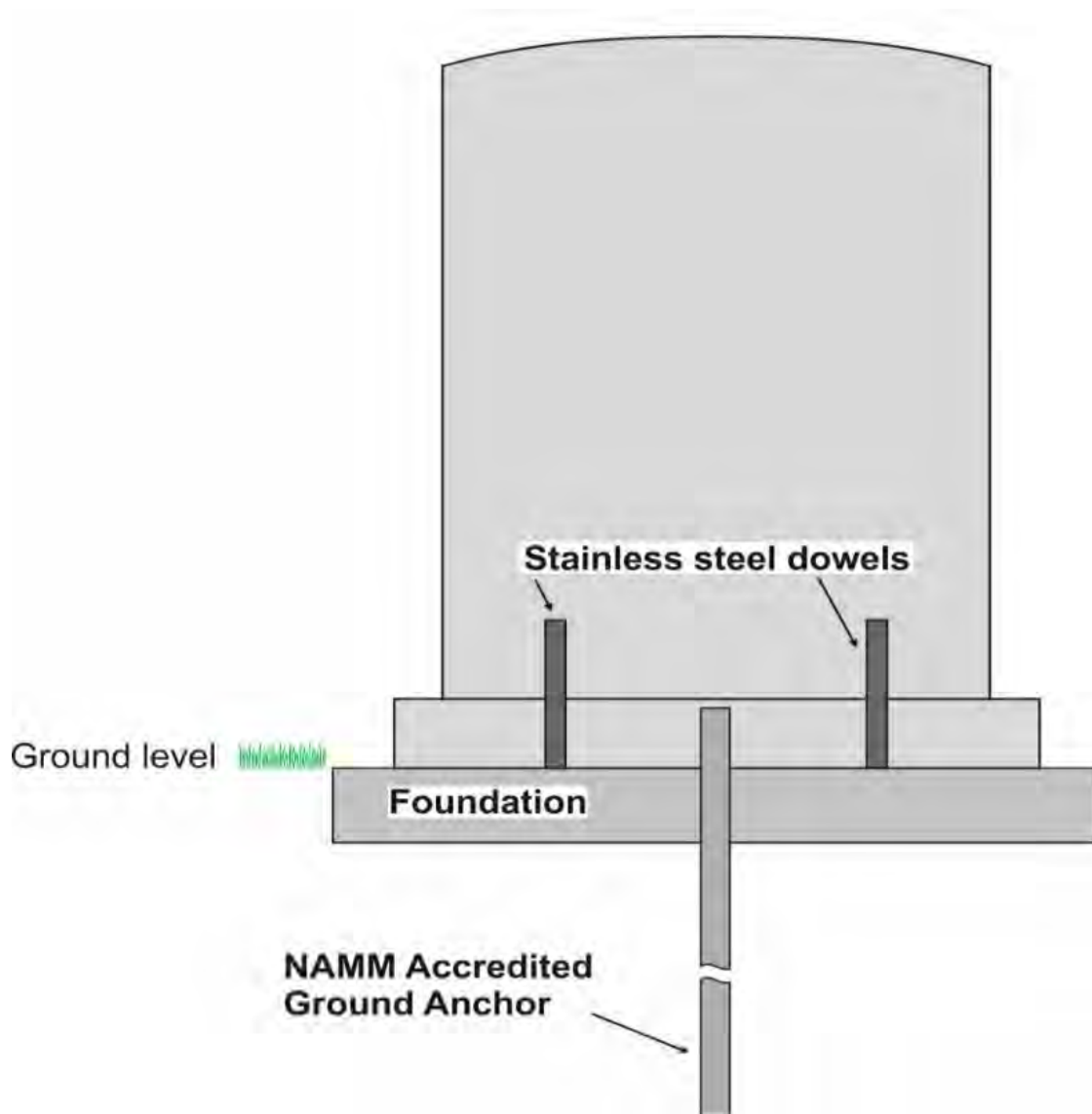
6.21 If the foundation is acting as an anchor it must be of sufficient size and weight in accordance with CoWP and BS8415.

6.22 Multiple or tiered foundations may be required where unusual ground conditions prevail or where the memorial is unusually large. They may also be a feature of the design.

6.23 Memorials on a Beam or Strip foundation do not need a Ground Anchor but must be secured by dowels or fitted using a suitable beam anchor. (See Drawings 6.E / 6.F)

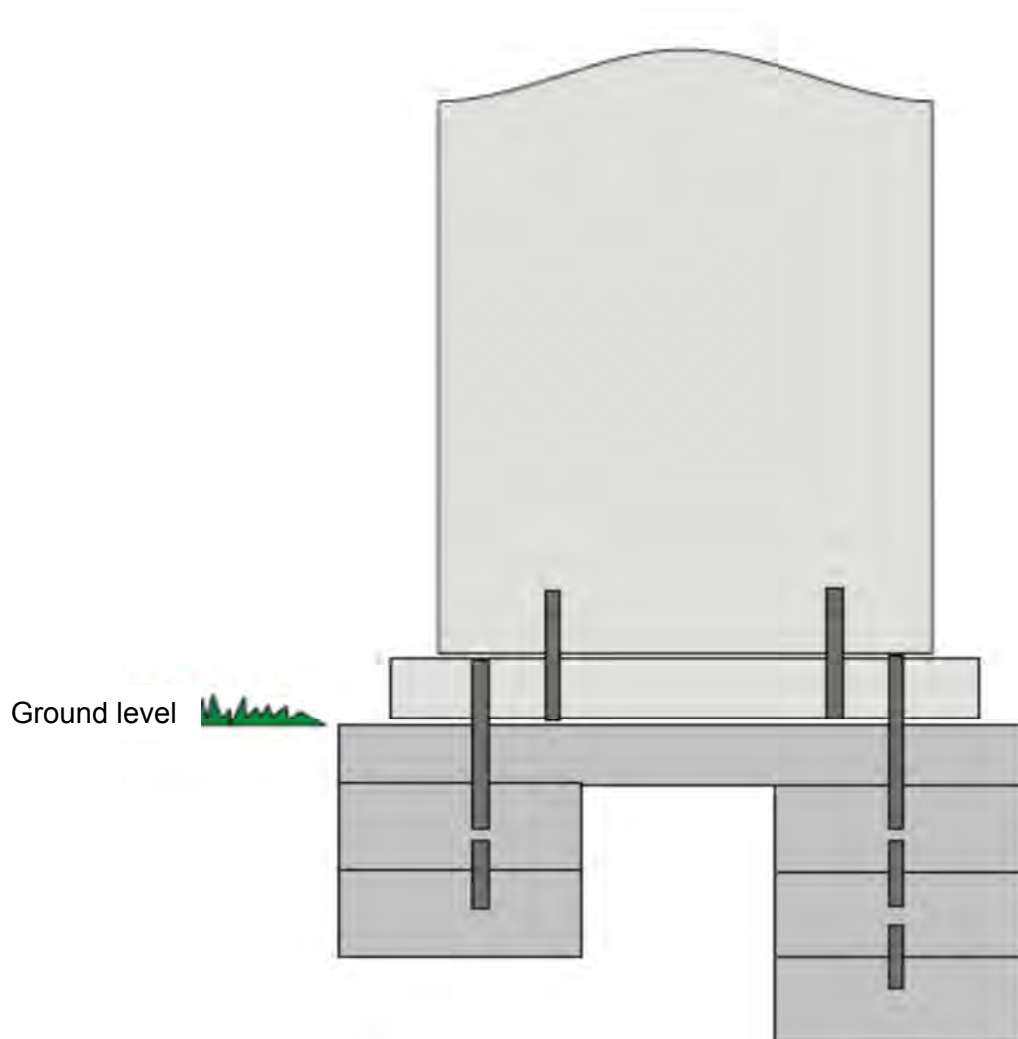
6.24 Memorials up to 625mm height from ground level, installed without a ground anchor must be appropriately doweled to a suitable foundation with its top edge level with the ground and be of dimensions that ensure the stability of the memorial.

6.25 Hydraulically pressed paving slabs are **not permissible**. All other relevant sections of the Code still apply.

**Typical Lawn memorial set on pre cast foundation****6.A**

6.26 Pre-Cast reinforced concrete Lawn Memorial foundations should be a minimum 385mm deep front to back with a recommended depth of 455mm front to back and must be larger on plan than the base of the memorial.

NAMM recommend 900mm x 455mm x 75mm

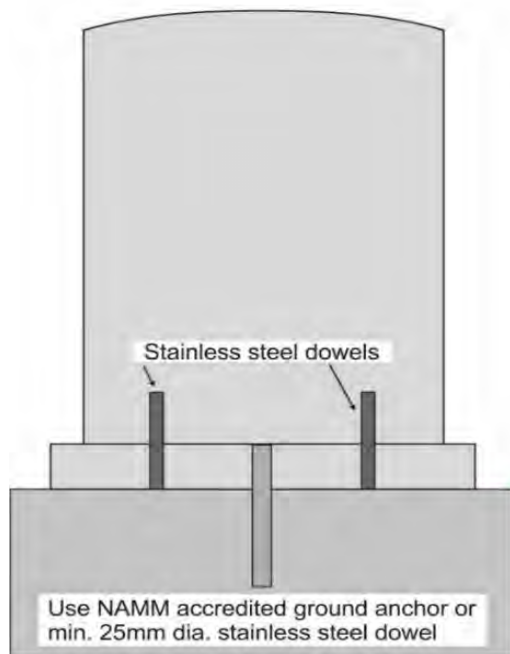
**Lawn Memorial on Block Pier Foundation****6.B****6.27**      Notes on Pier Foundation construction

- 1/ Construct the foundation at least 14 days before erecting the memorial
- 2/ Minimum individual concrete block size 375mm x 212mm x 200mm
- 3/ Concrete blocks to conform to BS6073 (underground structural concrete)
- 4/ For memorials up to 1.2m use two concrete blocks dowelled as shown
- 5/ For memorials up to 1.5m use three concrete blocks dowelled as shown

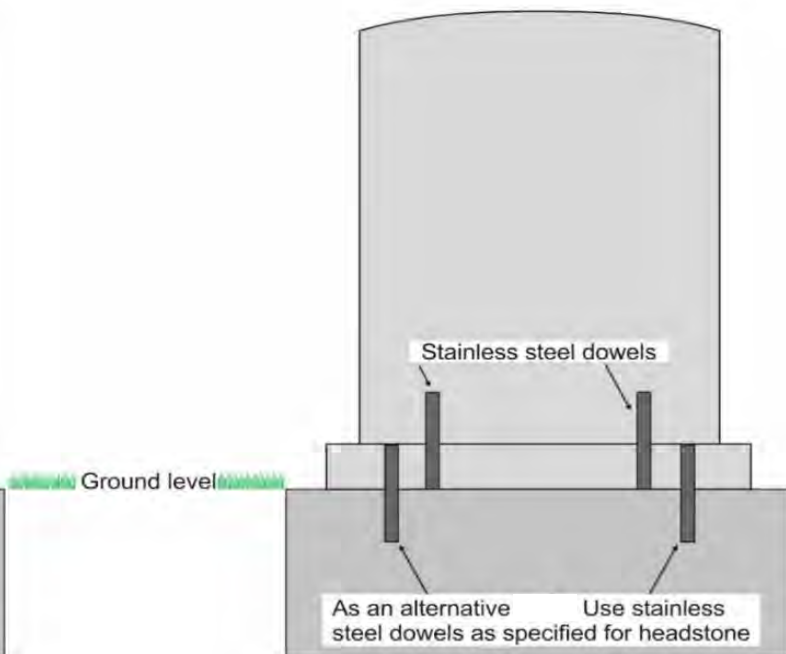


### Lawn Memorial on Concrete Foundation

6.C



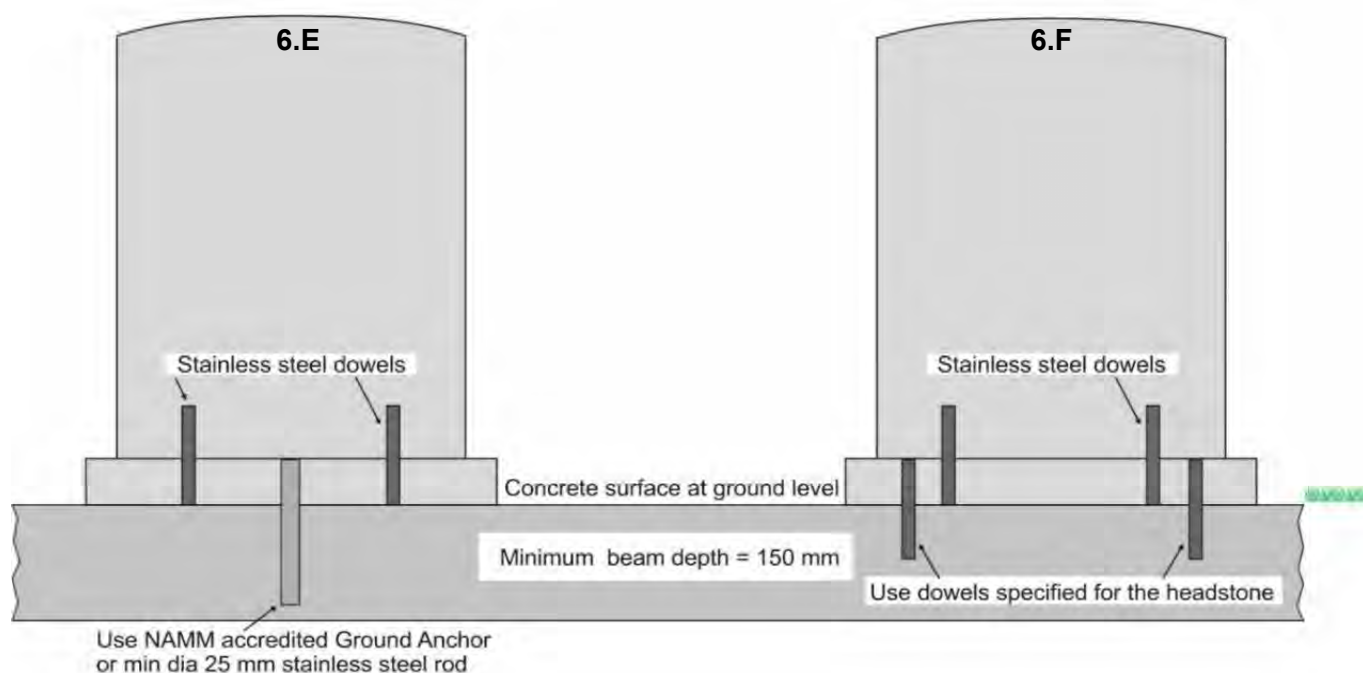
6.D



#### 6.28 Notes on single Concrete Foundation construction

- 1/ The foundation surface to be constructed level and smooth
- 2/ Larger on plan than base of memorial, minimum 385mm (front to back) 355mm deep.
- 3/ Recommended size 900mm x 455mm x 355 deep.
- 4/ The foundation must be cast at least 14 days before the memorial is erected.
- 5/ For details of preparation and mixing **see section 3**

### Continuous Beam Foundation Cast in Situ



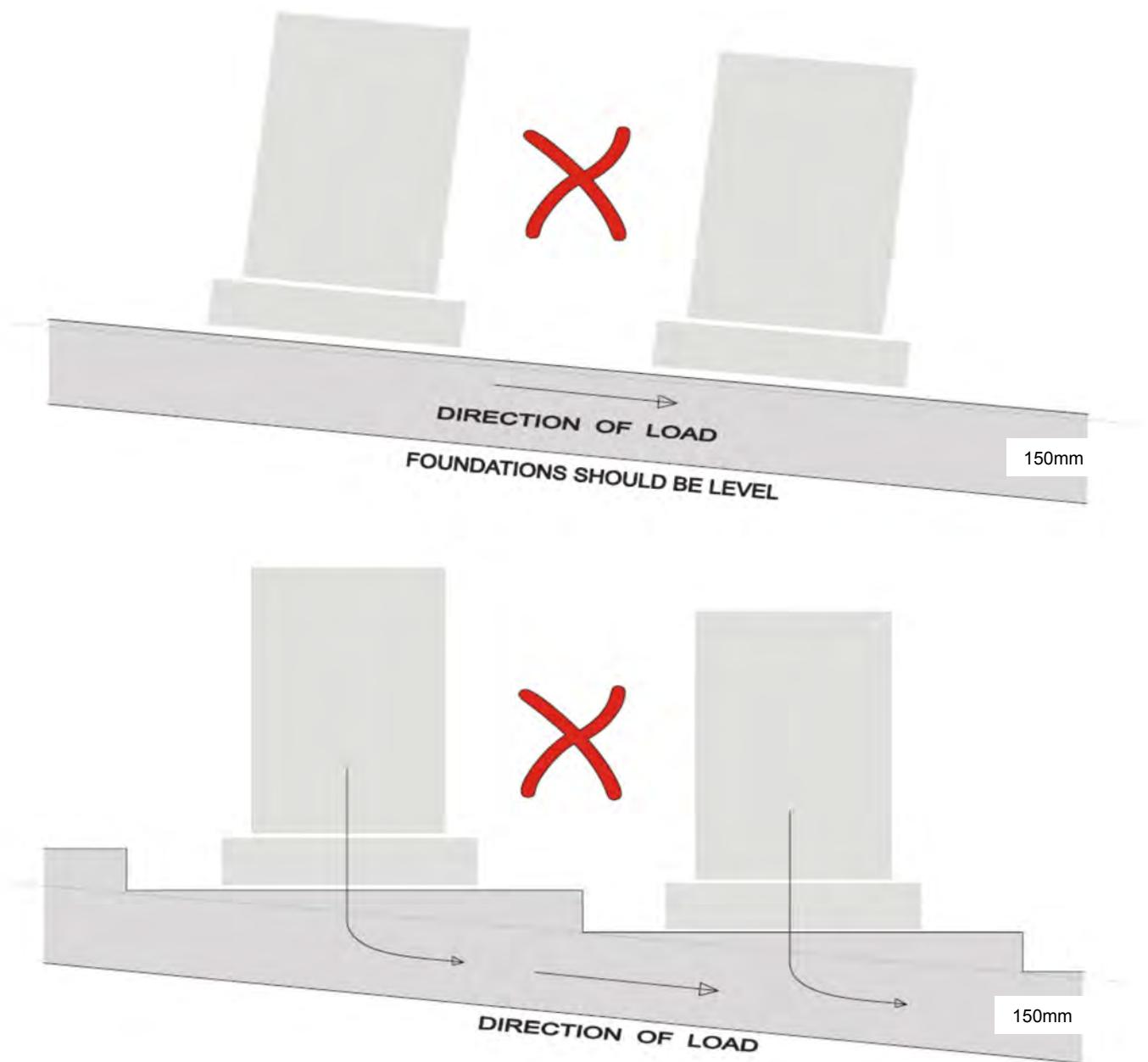
#### 6.29 Notes on Raft or Beam Foundation Construction

- 1/ The foundation surface to be constructed level and smooth.
- 2/ Size: minimum depth = 150mm deep
- 3/ The foundation must be cast at least 14 days before the memorial is erected.

6.30 Sizes indicated are for normal ground conditions. Building inspectors will recommend specifications in problem areas. Concrete should meet BS EN 206-1. Reinforcing steel used in the concrete foundations of memorials within burial grounds and memorial sites shall conform to BS 4449.

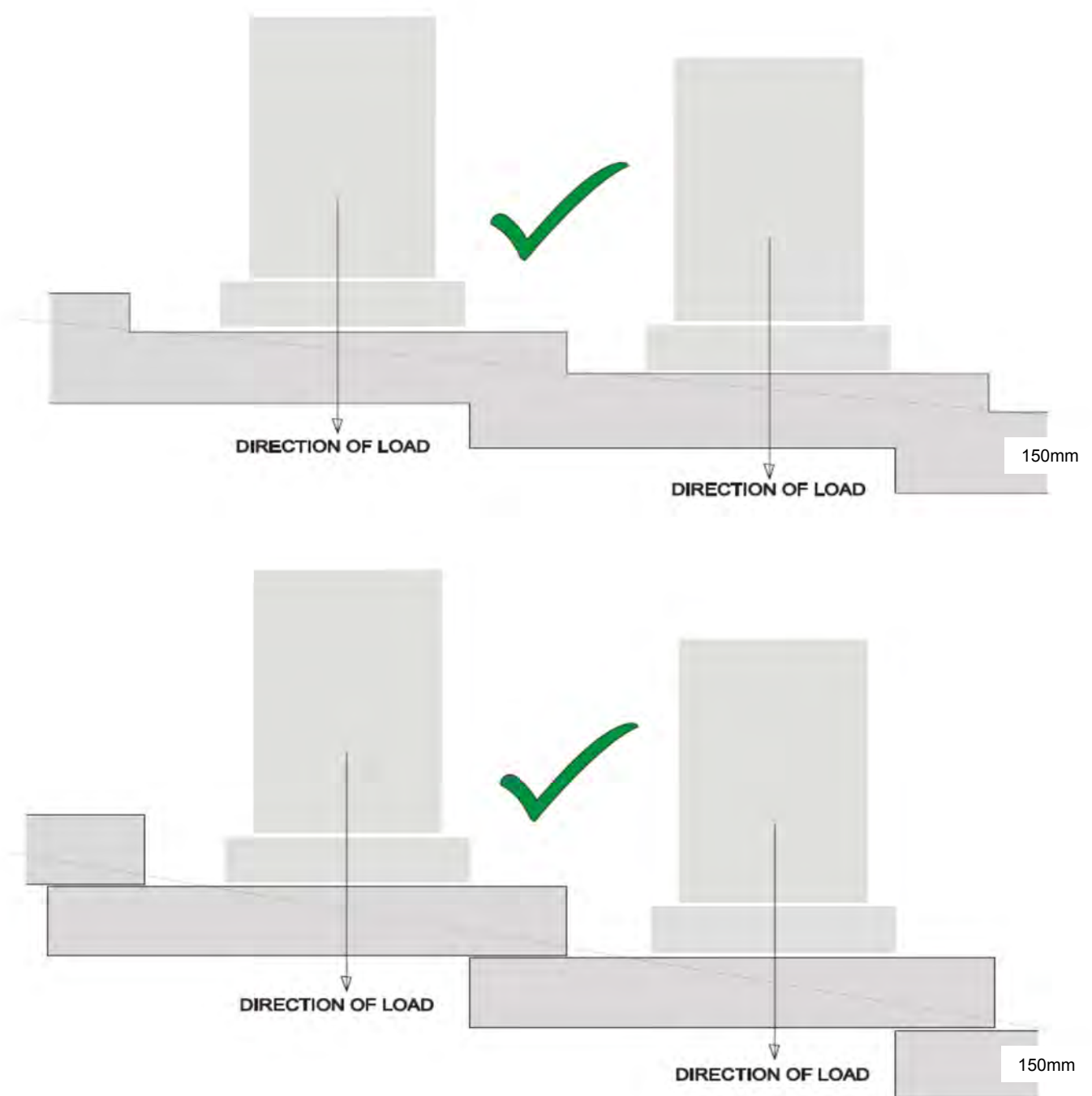
**See section 3 for more guidance on concrete.**

## 6.G



6.31 On sloping ground, continuous beam foundations should be level and stepped to ensure all loading including the weight of the foundation is correctly distributed.

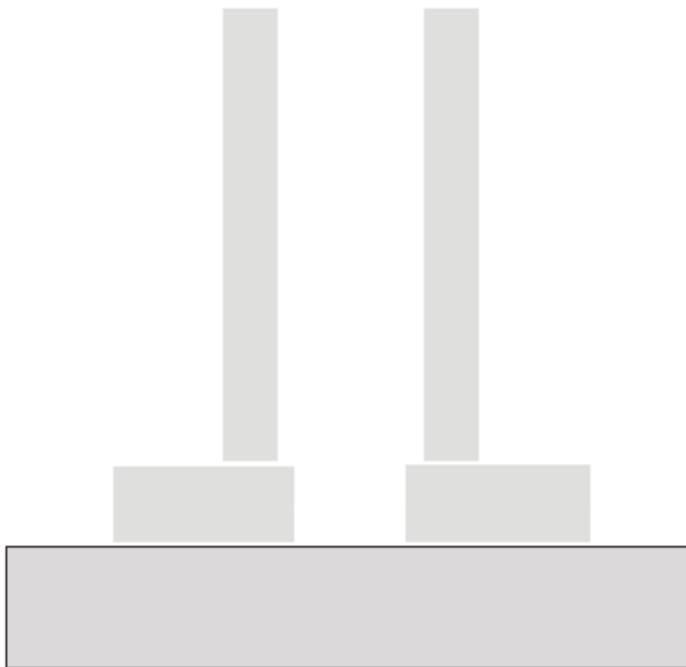
## 6.H



6.32 On sloping ground, continuous beam foundations should be level and stepped to ensure all loading including the weight of the foundation is correctly distributed.

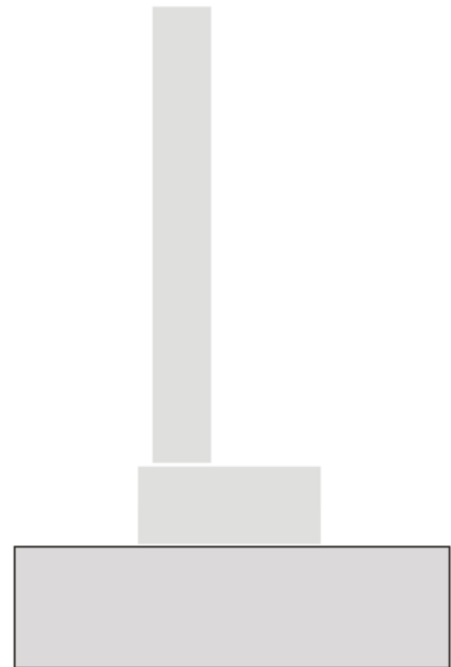
6.33 Height of risers will depend on the fall of the slope.

6.34 Overlap of separately cast sections should be at least double the height of the riser and construction should be started at the bottom of the slope.

**Continuous beam Cast in Situ Foundation side elevation.****6.1**

150mm

Concrete minimum width of  
750mm for back to back plots.



150mm

Concrete minimum width of  
380mm for single plots.



### **NAMM ACCREDITED GROUND SUPPORT SYSTEMS**

**7.1 Cemeteries are generally situated on stable ground, however local ground conditions must be considered, and an appropriate support system used. If in doubt, masons must consult the Local Authority as to the type of ground where the grave is situated and contact the Ground Anchor manufacturer for guidance or to confirm the product being used is appropriate for its intended application and correctly installed.**

7.2 It is the responsibility of the mason to assess the ground conditions and decide on the appropriate foundation and fixing method for the situation.

7.3 UK Soil data is available via a free Mobile app “ mySoil ” from the BGS and the Centre for Ecology & Hydrology, once downloaded simply enter your grid reference and it will describe the soil type in your location. <http://www.bgs.ac.uk/mysoil/>

**7.4 A Ground Support System.** This is an additional safety device designed to provide extra stability and safeguard against sudden hazardous failure of a lawn memorial and must always be used in accordance with the manufacturer's instructions.

7.5 NAMM accredited systems are classed as rigid or progressive failure systems.

7.6 It is essential to read and follow the detailed fixing instructions provided by the manufacturers/suppliers. The stability of a memorial may be compromised unless the mason ensures the correct procedures are strictly followed, particularly in relation to hole sizes and depth stops (height/protrusion of fixing above foundation surface, which is inserted into memorial base).

7.7 All fixing systems bars, tubes, dowels, pins, nuts, bolts and washers etc. must be made of stainless-steel Grade A2 or A4. All accredited fixing methods must be done in strict accordance with manufacturer's instructions and **must not** be modified.

7.8 Any depth stops **must not** deviate from the manufacturer's specified position for their approved use.

**7.9 Accreditation.** For memorials (new and reinstated) greater than 625 mm above ground level all components shall be designed and constructed so that when properly installed they can withstand a horizontal load of 70 kg applied at their apex or 1.5 m from the ground, whichever is the lower. The test loading applied in BS8415:2018 Annex E is derived from previously recorded data of ground anchor component testing implemented and undertaken by NAMM.

7.10 NAMM Ground Anchor test loading criteria was laid down by an Independent Structural Engineer and individual ground anchor component testing is supervised by an appointed Independent Consulting Structural Engineer. Accreditation has been awarded on the understanding that no change has been made to the technical specification of the submitted system or deviation from the fixing procedure to that detailed at the time of accreditation testing. The product liability is the responsibility of the manufacturer/supplier.

7.11 **Rigid System** means the memorial will stand firm when subjected to proof load testing.

7.12 **Progressive Failure System** is where a memorial subjected to a force within the parameters of test loading will progressively fail without sudden hazardous collapse.

7.13 A memorial constructed in compliance with CoWP with a Ground Anchor when subjected to undue force may result in the joint between the foundation and the base breaking. The joint may open but the memorial will lock on the Anchor and remain completely safe.

7.14 **Memorials up to 625mm** in height do not need a Ground Anchor but must be secured to a suitable foundation.

7.15 **Memorials over 625mm** in height, on an independent pre-cast or hardstone foundation, must be installed using an accredited ground anchor system.

7.16 When fixing a memorial on **Multiple Foundations** or **Bases** the length of the anchor going into the ground may be reduced, care should be taken to ensure ground anchors conform to the manufacturer's specification and are approved for the chosen method of use.

7.17 Full Grave memorials built on sectional foundations must have a Ground Anchor if any part of the memorial exceeds 625mm in height.

7.18 Full Grave memorials with a headstone fixed to a solid single piece foundation do not require a Ground Anchor, however, the memorial plate must be doweled to the foundation which provides stabilising support.

**7.19 NAMM and British Standards.** Post 1995 members of the NAMM Technical Committee revised the then long published “NAMM Code of Working Practice”. This comprehensive document provides a practical guide for memorial masons to install all types of memorials fabricated from natural quarried stones from suitable softer limestones to slate and granite.

**To add a degree of conformity to National fixing standards NAMM approached BSI to put in place a new standard around the installation of memorials. Working alongside BSI NAMM worked on a committee to create BS8415.2005 in 2005 and subsequently BS8415.2012 and the current BS8415.2018 edition.**

The new code covered the use of ground support systems as a way of preventing the catastrophic failure of memorials. As well as supporting the use of manufactured ground support systems, the NAMM Code of Working Practice provides alternative ways of ensuring the stability of a memorial such as the use of pre-poured concrete foundations installed at least 14 days before the memorial is installed.

Around the time ground support systems were being considered NAMM consulted with Professor John Knapton, who concluded that a 14 stone man would normally exert a force of 30 kg when attempting to stand by pulling himself up using a standing headstone. Based on this calculation Professor Knapton advised that memorials should be designed to withstand a test force of 70 kg without sudden collapse.

This resulted in the current ground anchor test procedure of applying an initial loading of 100kg held for one minute, if no failure occurs gradually increasing to 150kg and again being held for another minute, any failure between 100kg and 150kg must be safe and controlled and is deemed a progressive failure.

**NAMM continues to work alongside BSI to ensure that standards continue to improve and develop further.**



### WALL PLAQUES

8.1 Wall plaques can be fixed with Corbels or stainless dowels. If dowels are used then they should be set into the wall at least 10° from the horizontal.

8.2 A Corbel is a bracket projecting from the wall to give support to the plaque. They are usually set at the bottom of the plaque with a cramp on the top edge. They can be made from any material provided it will take the weight of the plaque.

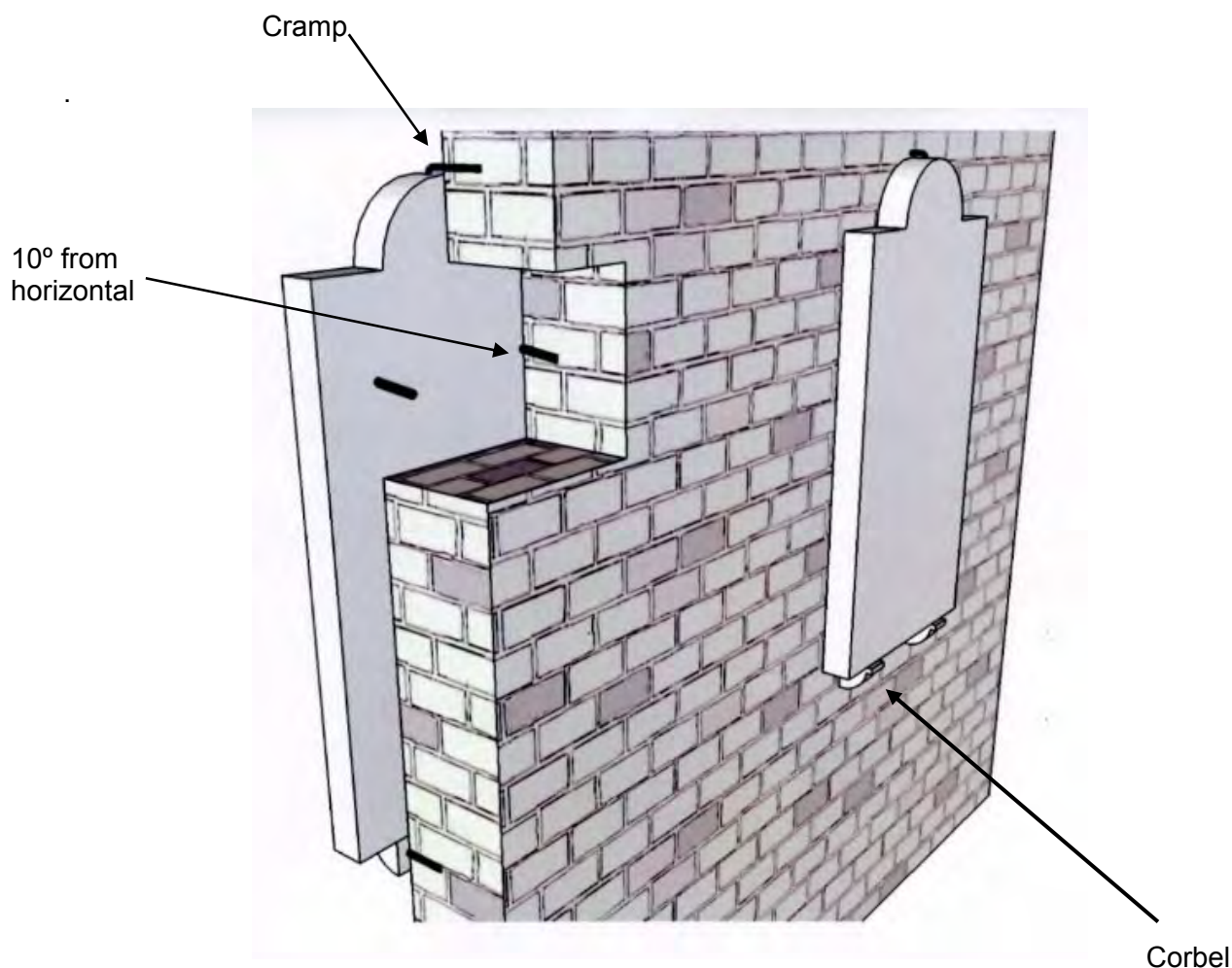
8.3 A **Corbel** is the safest support. This is a bracket projecting from a wall to give a bearing surface to take the weight of the plaque.

8.4 The back of the plaque should be roughened and fixed to the suitably prepared wall with mortar or an appropriate adhesive.

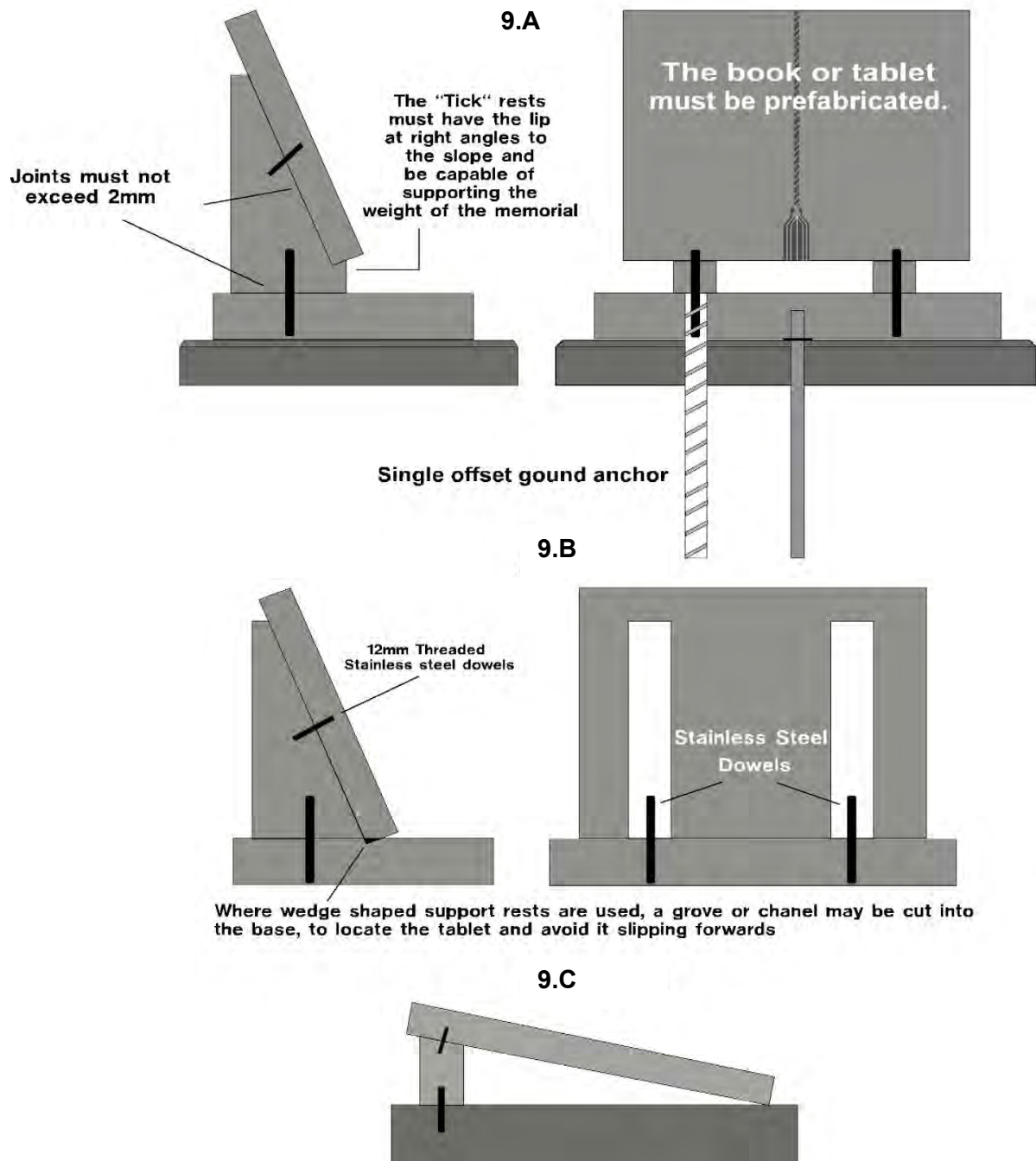
8.5 The structure on which the plaque is to be mounted must be checked to ensure it is capable of supporting the weight to be fixed to it.

8.6 A **Cramp** can be used to tie in the plaque to the wall.

8.7 **Stainless steel dowels** can be used if the plaque has sufficient thickness. These dowels should be set in the wall, with an upward slope of at least 10° from the horizontal so that the plaque can be hung. These dowels must be set in the wall in advance of placing the plaque.



### TABLETS PLAQUES AND OPEN BOOKS



#### **Memorials on Rest (s)**

9.1 All rest(s) must be dowelled to the Plaque or Book and the Base.

9.2 When fixing the rest(s) to the Plaque or Book each joint must have at least one 12mm threaded stainless steel dowel set in before leaving the workshop. The joint must not exceed 2mm thick.

9.3 When the memorial is on **Tick Rests** the lip must be at right angles to the slope of the Rest and deep enough to support the weight of the memorial. See Drawing 9.A

9.4 When just Rest(s) are used a 'V' groove or channel may be cut into the surface of the base to take the bottom edge of the book to prevent the book sliding forward. See Drawing 9.B

9.5 When a tablet is set at a low angle and raised on one edge by a support, all should be dowelled together. See Drawing 9.C

9.6 For memorials that do not require a Ground Anchor the grave marker or commemorative stone should be dowelled to the foundation using two dowels.

9.7 The supporting "Tick" book rest or tablet sloping rest must be fixed to the tablet or book in the workshop prior to on site fixing using a threaded dowel.

The Minimum contact area between each rest(s) and the base

Height of Memorial	Contact Area between Rest(s) and Base	
	<i>For 2 rests</i>	<i>For a single rest</i>
Up to 625mm	100mm x 75mm	100mm x 150mm
625mm to 915mm	125mm x 75mm	125mm x 150mm
915mm to 1220mm	150mm x 75mm	150mm x 150mm

### **LAWN MEMORIALS**

10.1 A typical Lawn memorial is built up from 3 basic components usually consisting of a headstone or plate, standing on a base and fixed to a foundation.

10.2 It is recommended that the headstone is set approximately 25mm from the back edge of the base.

10.3 The joint between the headstone and base should be strong enough to resist a reasonable pressure applied to the memorial.

10.4 Lawn memorials can become unstable if they go out of level. An appropriate foundation and ground support system is essential to ensure the long-term stability of the memorial.

10.5 Foundations for Lawn Memorials should be fit for purpose and constructed from reinforced concrete, hard natural stone or other suitable material having regard to its structural integrity and durability.

10.6 Hard stones such as granite with a density of at least 2400 kg/m<sup>3</sup> can be used for foundations and must be at least 60mm thick. Horizontally bedded Silica stones such as Yorkstone are acceptable provided they are at least 75mm thick. Pre-cast reinforced concrete should have a smooth finish and not be less than 75mm thick. **See Section 6 Foundations.**

10.7 Concrete foundations should be wire brushed or abraded to remove traces of shuttering oil or surface salts and dampened before applying mortar for jointing or bedding purposes.

10.8 Additional or tiered foundations may be required where unusual ground conditions prevail or where the memorial is unusually large. They may also be a feature of the design.

10.9 Where possible the foundation should be wider than the grave excavation with a recommended minimum width of 900mm where permitted by the cemetery. If the foundation is acting as an anchor it should be larger on plan than the base of the memorial and of sufficient weight and proportions to meet the design requirement as stated in BS8415. **See Section 6 Foundations.**

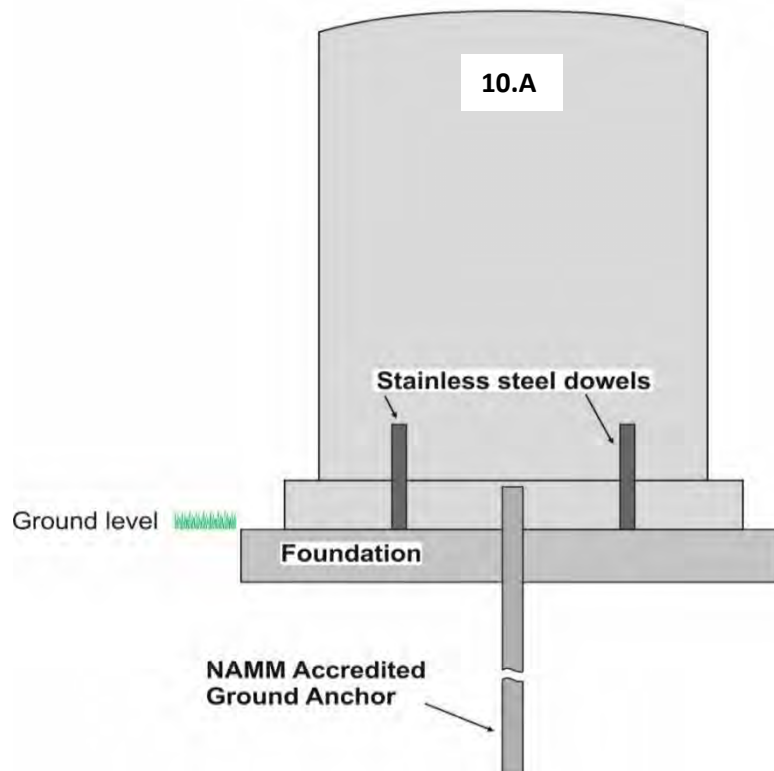
10.10 Memorials on independent cast foundations may need a ground anchor. An anchor is not necessary if the foundation (cast in situ) is of sufficient weight (150kg) or over 914mm wide x 385mm depth x 355mm thick with a memorial up to 915mm high. **See Section 6 Foundations.**

10.11 Memorials up to 625mm height from ground level, installed without a ground anchor must have a suitable foundation with its top edge level with the ground and which provides satisfactory stability to the memorial. All other relevant sections of the Code still apply.

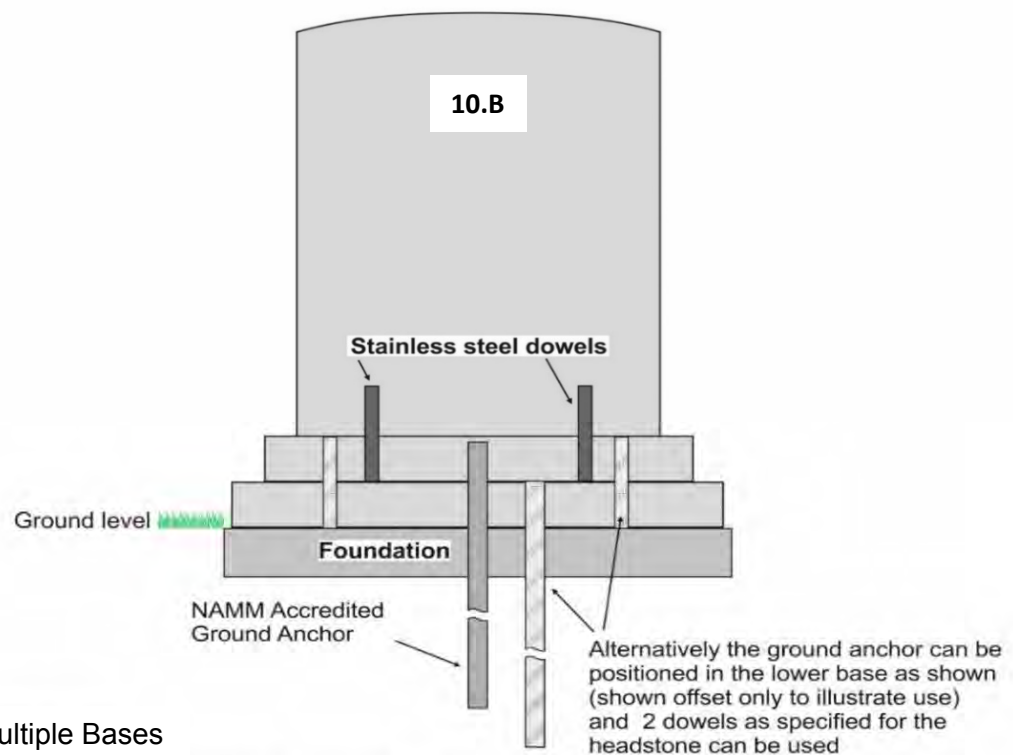
10.12 For Lawn memorials over 625mm in height from ground level set on an independent pre-cast foundation a NAMM accredited Ground Support System will be necessary as it is designed to make the memorial safe. **The manufacturer's instructions must be followed.**

10.13 There should not be any backward or forward lean unless the specific design dictates. To allow for the variances in levelling equipment a tolerance of + or – 2mm is acceptable, (when using a 600mm level)

### Typical Lawn Memorial Construction



### Example of fixings on Multiple bases



#### 10.14 Notes on Multiple Bases

- 1/ The NAMM accredited ground anchor **must** be approved for multiple bases.
- 2/ The depth of the anchor into the ground for which the device is accredited must not be reduced.

**Dowel sizes for hard Limestones Marble Slate and Granite**

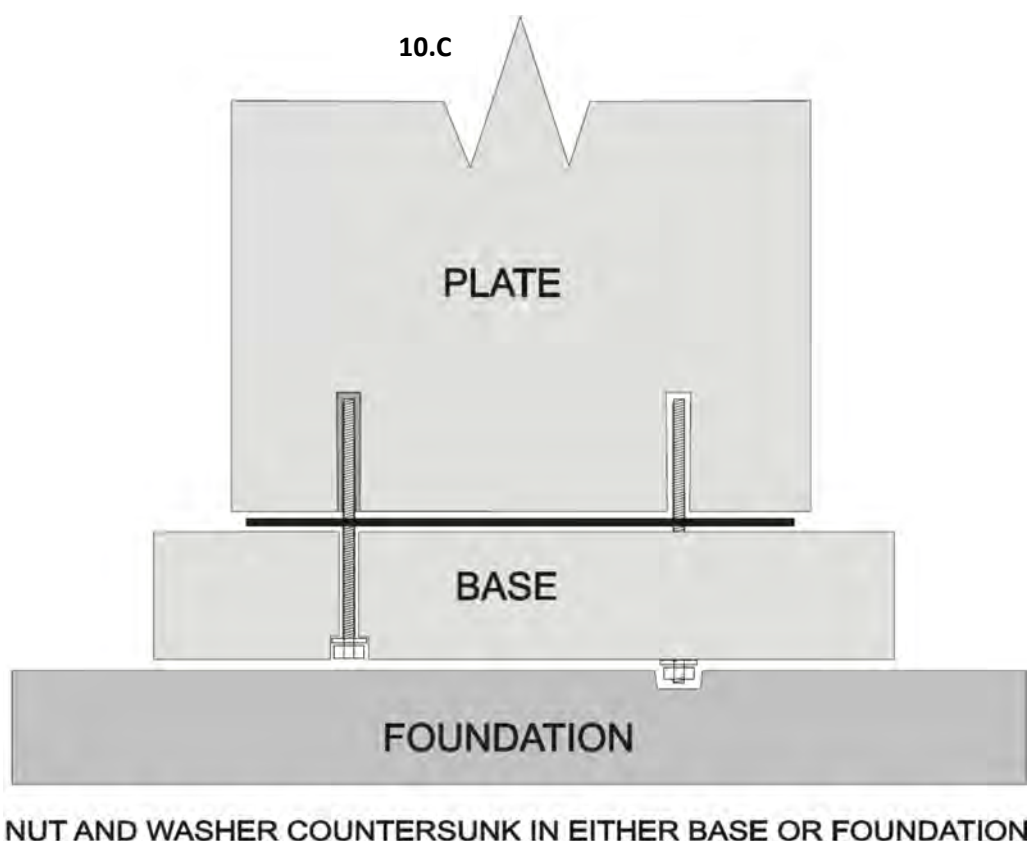
<b>Memorial Size</b>		<b>Nominal Dowel Size</b>			<b>Maximum Hole Diameter</b>	
Height of Apex	Thickness of Vertical Component	Diameter	Minimum Length into		Into Upper Section	Into Lower Section
			Plate	Base		
Up to and including 625 mm (24" 5/8 )	50mm minimum	12mm x 2	75mm	50mm	16mm	16mm
	50mm to 63mm	12mm x 2	75mm	50mm	16mm	20mm
	Over 63mm	16mm x 2	75mm	75mm	20mm	24mm
625mm to 915mm (3ft)	Over 63mm	16mm x 2	75mm	75mm	20mm	24mm
915mm to 1220mm (4ft)	Over 75mm	16mm x 2	100mm	75mm	20mm	24mm
1220mm (4ft)	Over 100mm	25mm x 2	100mm	100mm	30mm	35mm

For memorials over 1200mm increase length of dowel into headstone 25mm every 300mm

**Dowel sizes for soft Limestones and Sandstone**

<b>Memorial Size</b>		<b>Nominal Dowel Size</b>			<b>Maximum Hole Diameter</b>	
Height of Apex	Thickness of Vertical Component	Diameter	Minimum Length into		Into Upper Section	Into Lower Section
			Plate	Base		
Up to 625mm (24" 5/8)	75mm	12mm x 3	75mm	50mm	16mm	20mm
625mm to 915mm (3ft)	75mm	12mm x 3	100mm	75mm	16mm	20mm
915mm to 1220mm (4ft)	100mm	16mm x 3	150mm	75mm	20mm	24mm

**Bolting Method** for fixing plate (headstone) to base.



10.15 Threaded Dowels sizes for bolting method

Height of Memorial	Diameter of Dowel	Minimum Length of Dowel into Memorial Plate
Up to 915mm (3 ft )	12mm	75mm
Up to 1220mm (4 ft )	16mm	100mm
Up to 1830mm (6 ft )	16mm	150mm

Recommended torque applied to the nut:

Up to 12mm - 40Nm

Up to 16mm - 90Nm

Note: Care must be taken **not** to over-tighten the nuts.

10.16 A sprung washer can be used between nut and main washer to prevent the fixing becoming loose over time.

10.17 A polyester resin adhesive should be used to fix threaded dowels.

**See Section 4 Adhesives.**

10.18 A waterproof membrane (such as plastic damp-proof course material) that will not cause staining must be placed between plate (headstone) and base to provide softening and prevent damage when tightening the nuts to the appropriate torque setting.



10.19 The dowel holes shall be dust free and dry when fixing takes place and the work must be carried out in a workshop with a dry atmosphere. Diamond core drilled holes should be suitably roughened and ideally wider at the bottom of the hole to provide a key for the resin.

10.20 Threaded dowels (rods) and nuts must be of different grades of stainless steel (e.g. dowels could be A4 grade, nuts A2) to prevent the possibility of their binding together.

10.21 Two threaded dowels are required in hard limestone, marble, slate and granite. Three threaded dowels are required in soft limestones and other stones.

10.22 The dowel holes in the top of the base should be sealed around the threaded dowel with a suitable sealant to prevent the ingress of water.

10.23 The main washers must be at least 3mm thick and be over 50% larger than the lower dowel hole diameter. Using more than one washer to make 3mm is not permissible.

**10.24 Reinstated Memorials.**

When reinstalling any memorial such as those removed for adding an inscription etc or a failed memorial (laid down or removed as a safety measure) all components such as foundations, dowels and ground anchors **must** comply with current standards.

10.25 Stainless steel dowels were first introduced by NAMM in 1996, the NAMM dowel table is an Industry recognised standard derived from rigorous component testing by NAMM and is reproduced with NAMM consent in BS8415-2018 and previous BS8415 guidance since 2005.

10.26 When refurbishing or adding inscriptions to memorials prior to 2005 it is usual procedure to carefully separate the headstone from the base, once achieved the old dowels can be removed and replaced with new dowels conforming to the NAMM dowel table. It is recommended to use a core drill for this procedure. Care must be taken not to use too large a core drill for this procedure which could result in oversize holes and effectively reduce the strength of the remaining material.

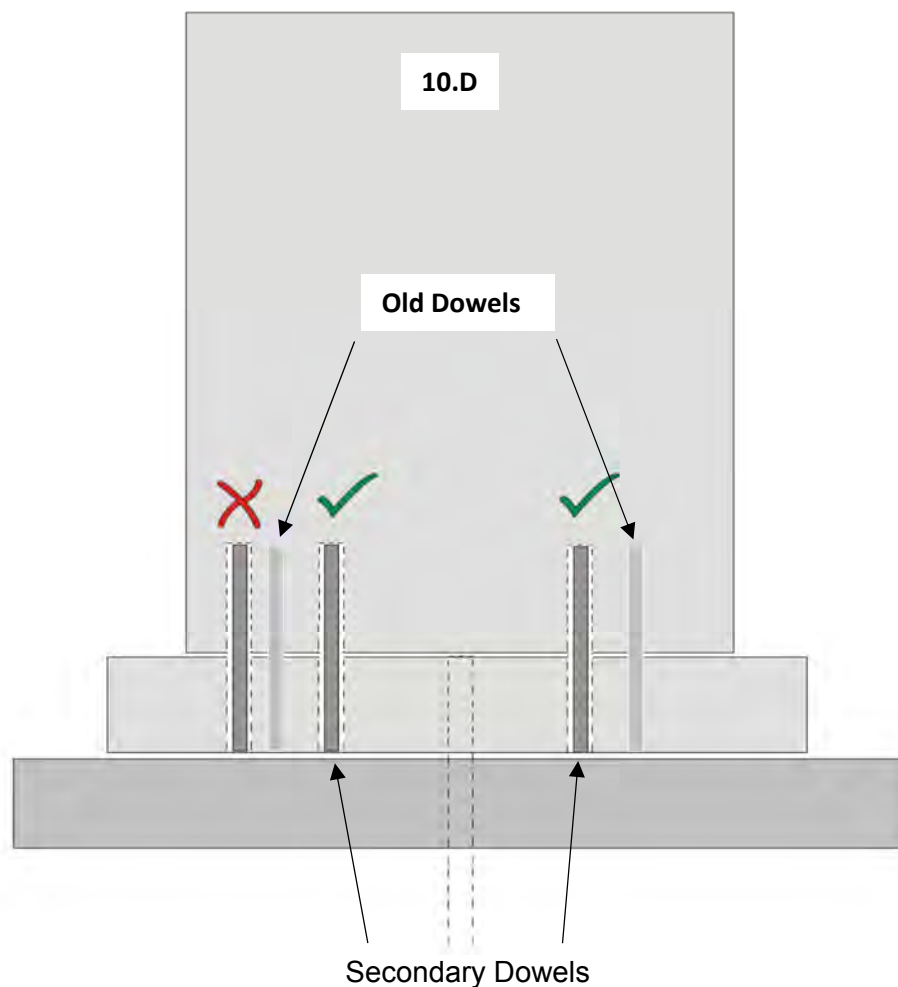
**Refer to the dowel table to ensure dowel holes and dowels are correct size the size of memorial and material type.**

10.27 If a memorial is removed from a grave and the plate and base remain firmly attached making it impossible to determine the condition of the dowels and it is considered that attempting to separate the plate and base may cause damage, then a secondary dowel fixing method must be used to ensure appropriate dowels are fitted. See drawing 10.D

10.28 **Secondary fixing** is achieved through the use of an appropriately sized core drill and drilling up through the base of the memorial and into the bottom of the headstone plate to the required depth in accordance with the dowel table. During this procedure great care must be taken to ensure the core drill is always kept parallel to the face of the headstone plate.

10.29 When re fixing older failed memorials, secondary fixing is not usually applicable, as the components would generally already be separated, the correct procedure in these instances would be to remove existing dowels which will most probably be of a material susceptible to rust and therefore should not be left in situ when the memorial is re fixed.





10.30 Dowel holes are usually supplied pre-drilled at 300mm centres in the base and headstone plate. To avoid weakening the plate at the bottom corners, new secondary dowels should be fitted slightly nearer the centre to that of the existing dowel holes.

**Memorials supplied with a NAMM guarantee of conformity should not require secondary fixing.**

### MONOLITH

11.1 Monoliths can be set directly into the ground and do not require a Ground Anchor. The mason must ensure that the material has sufficient strength to be used as a monolith. Special care must be taken if the monolith is erected within the disturbed grave space

11.2 It is strongly recommended that these memorials are best set into a concrete or hard natural stone shoe to provide a firm fixing and to lower the centre of gravity.

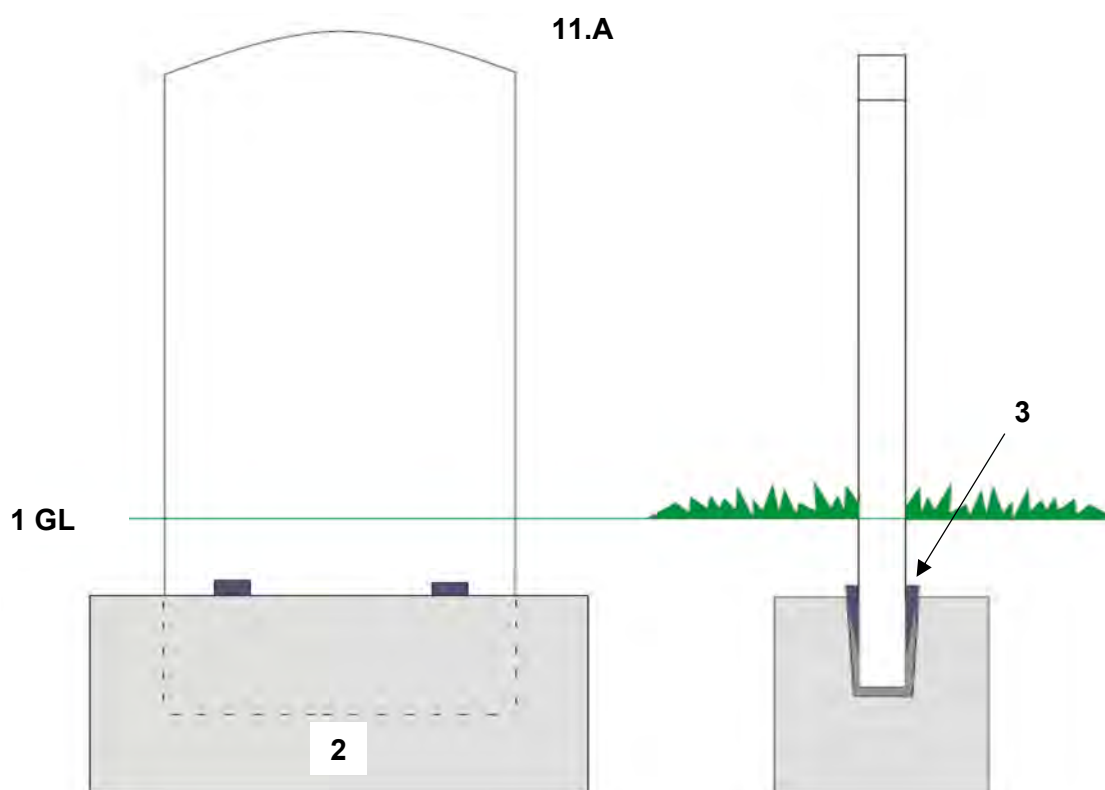
11.3 When fixed in a shoe at least a third of the total weight including foundation should be below ground level.

11.4 A Monolith that does not have a foundation or shoe must be buried with at least a third of its exposed height or 325mm, whichever is the greater, below ground level. For example, a memorial standing 900mm high at ground level should have 325mm buried giving an overall stone size of 1225mm, a memorial standing 1500mm high at ground level should have 500mm buried giving an overall memorial size of 2000mm.

11.5 The infill around the memorial must be well consolidated once in place.

11.6 Other fixing methods are acceptable provided they give good stability and are compliant with BS 8415. See Drawings 16.C and 16.D

11.7 Monolith must be fitted with at least a third of the total weight of the memorial (including foundation) below ground level when erected in a pre-cast or solid natural stone shoe



11.8 Notes on Monolith

1/ Ground Level

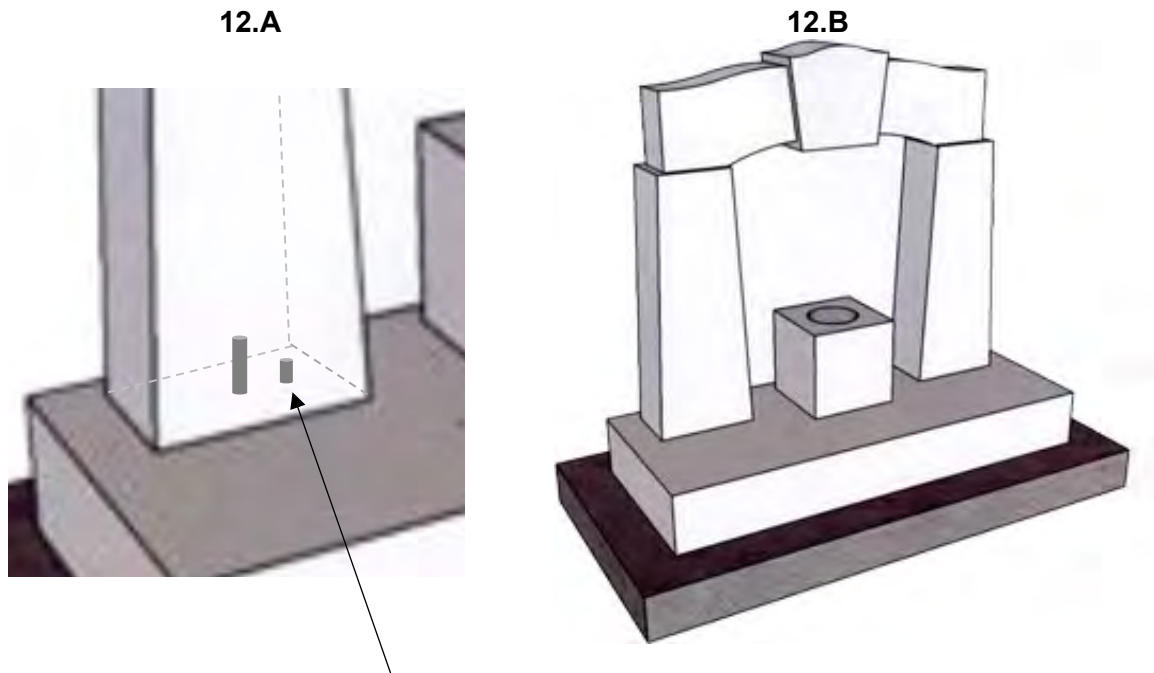
2/ Cast Concrete or hard natural stone shoe

3/ Slate wedges can be used to secure stone upright until cement sets.

### CANOPIES AND ARCHES

12.1 The memorial known as '**Gates of Heaven**' and others of similar design must have the side pillars, head and wing pieces all firmly dowelled together to give strength to the structure.

12.2 The **Pillars** must be designed to have sufficient strength to take the weight of the superstructure.



12.3 In addition to normal Doweling, short dowels should be incorporated into the bottom bed joints of the supporting pillars to prevent twisting.

12.4 The length of the dowels must be calculated by measuring the total height of the structure including the base or platform the structure stands on and referring to the dowel table.

12.5 Every care should be taken to accurately drill dowel holes and align the various sections.

12.6 The dowel holes in the pillars and the arch or canopy should be as tight on the dowel as possible, allowing clearance for the cement.

12.7 All the joints in the structure must be doweled and fully bedded.

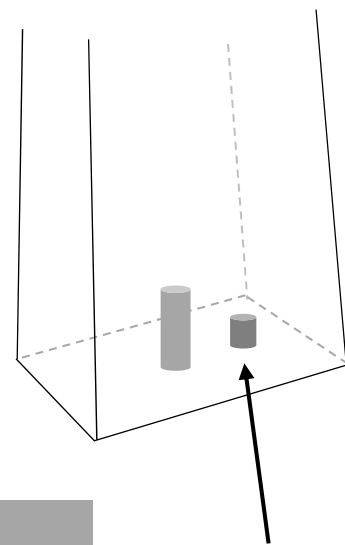
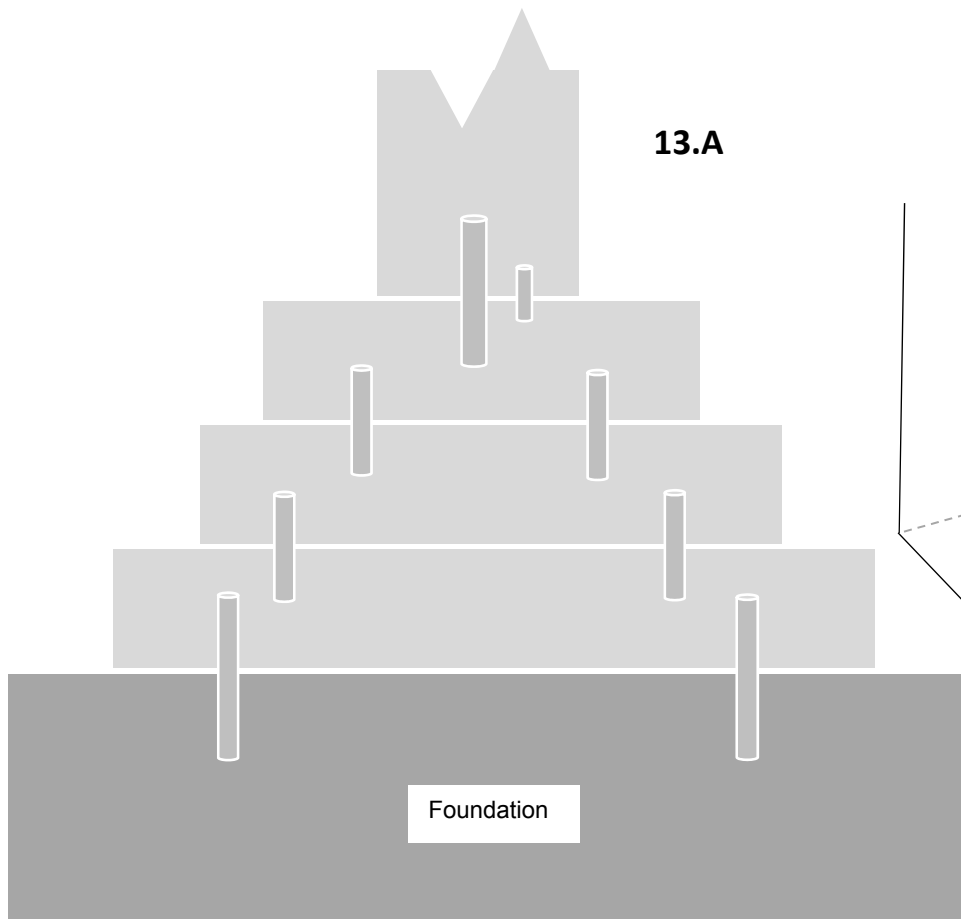
12.8 The foundation must be stable enough for the size, weight and design.

**CROSSES**

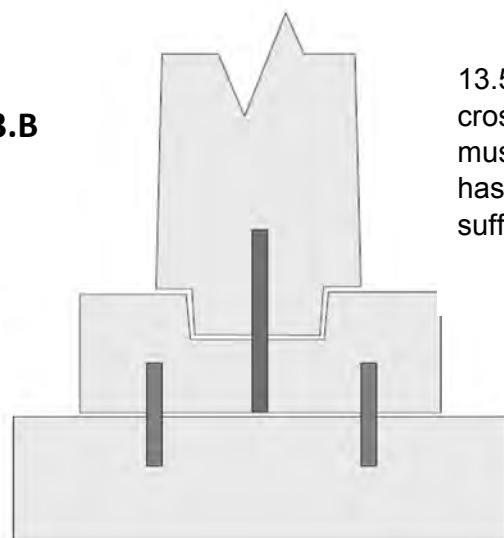
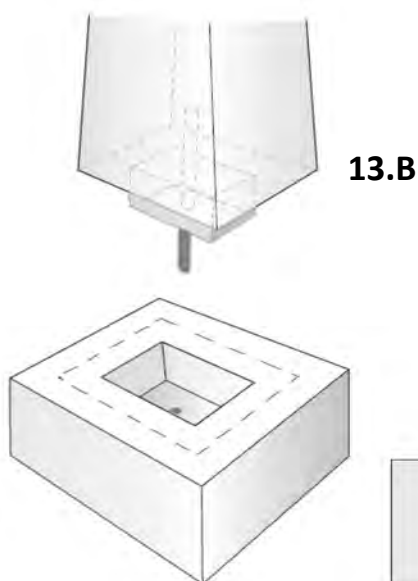
13.1 The foundation used must be appropriate for the size, weight and design of the structure and the ground conditions.

13.2 The cross or figure must be doweled and fully bedded to the top base.

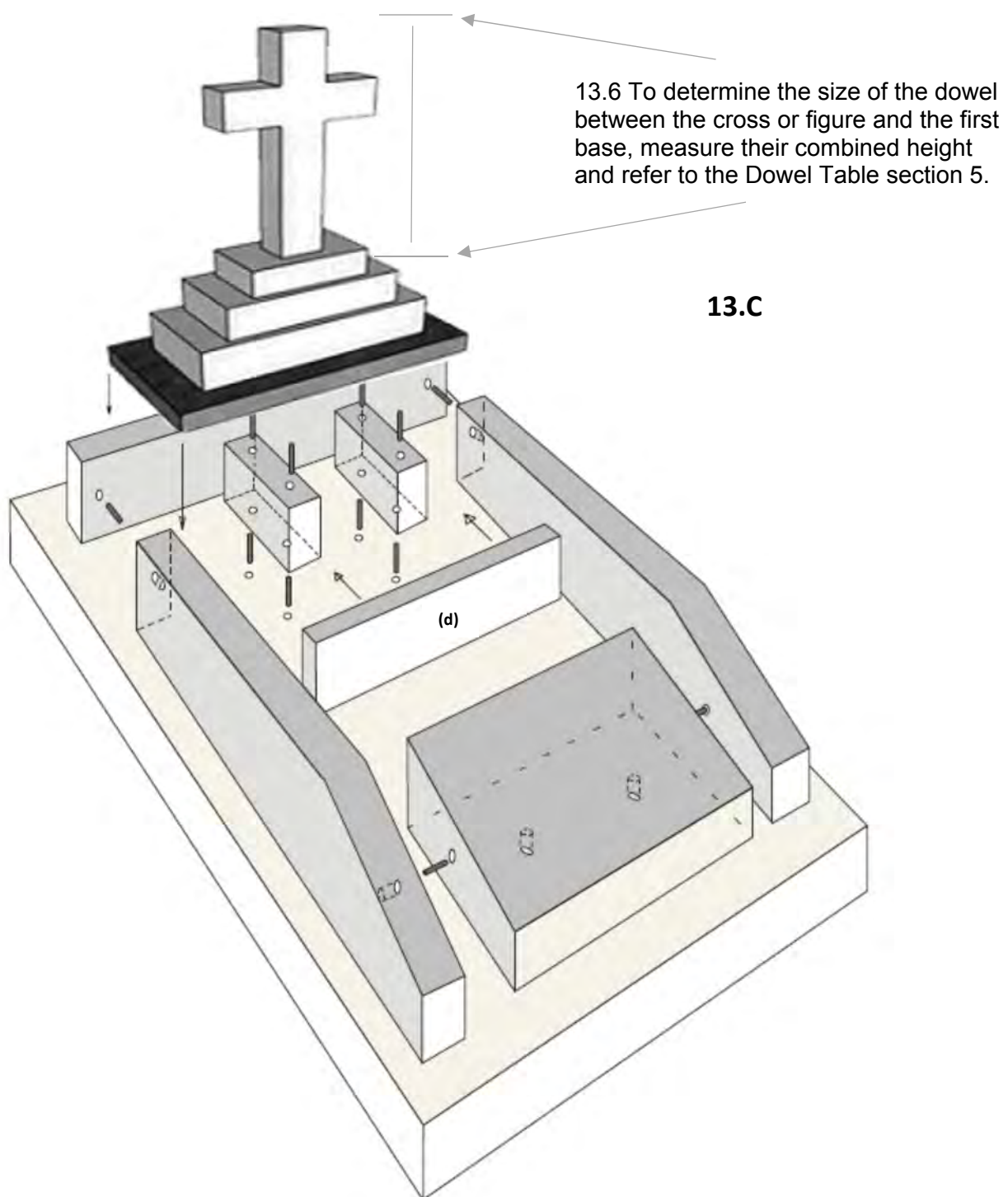
13.3 Each base below the top base must be doweled to the base below and the bottom base doweled to the foundation.



13.4 When fixing a cross using a single dowel on a squared off bed a small dowel should also be used to prevent twisting.



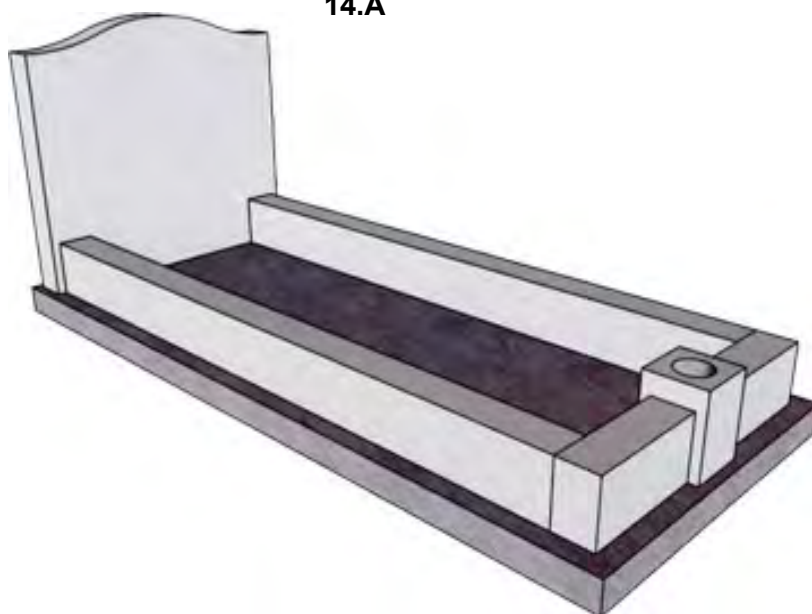
13.5 A **Joggle** can be used between the cross shaft and the first base, but it must also be doweled. Where a cross has a joggle one dowel in the centre is sufficient.



13.7 When a cross or statue and bases are fixed over kerbs, the base must be fixed on supports which are in turn doweled to the foundation. When installed in this way, an apron (d) placed underneath the bottom base of the cross / figure between the kerbs will conceal the supports.

### **FULL GRAVE MEMORIALS WITH HEADSTONES AND KERBS**

14.A



14.1 When the memorial plate is fixed to a one piece or solid cast in situ foundation (Drawing 14.A) the headstone must be dowelled to the concrete foundation. (Drawing 14.B)

14.2 When the memorial is fixed on sectional foundations the headstone must be dowelled to the foundation header section and will also require a Ground Anchor. (Drawing 14.G)

14.3 When a memorial or similar is set on a base within a kerb surround, their base should be doweled to the full grave foundation, if a lawn memorial or similar over 625mm in height is fixed on a separate pre-cast foundation within a kerb surround a ground anchor must be used.

14.4 If the full grave memorial is on sloping ground it may require a special foundation due to potential problems of soil slippage and erosion. Foundations should be level except where the approved design of the memorial dictates otherwise.

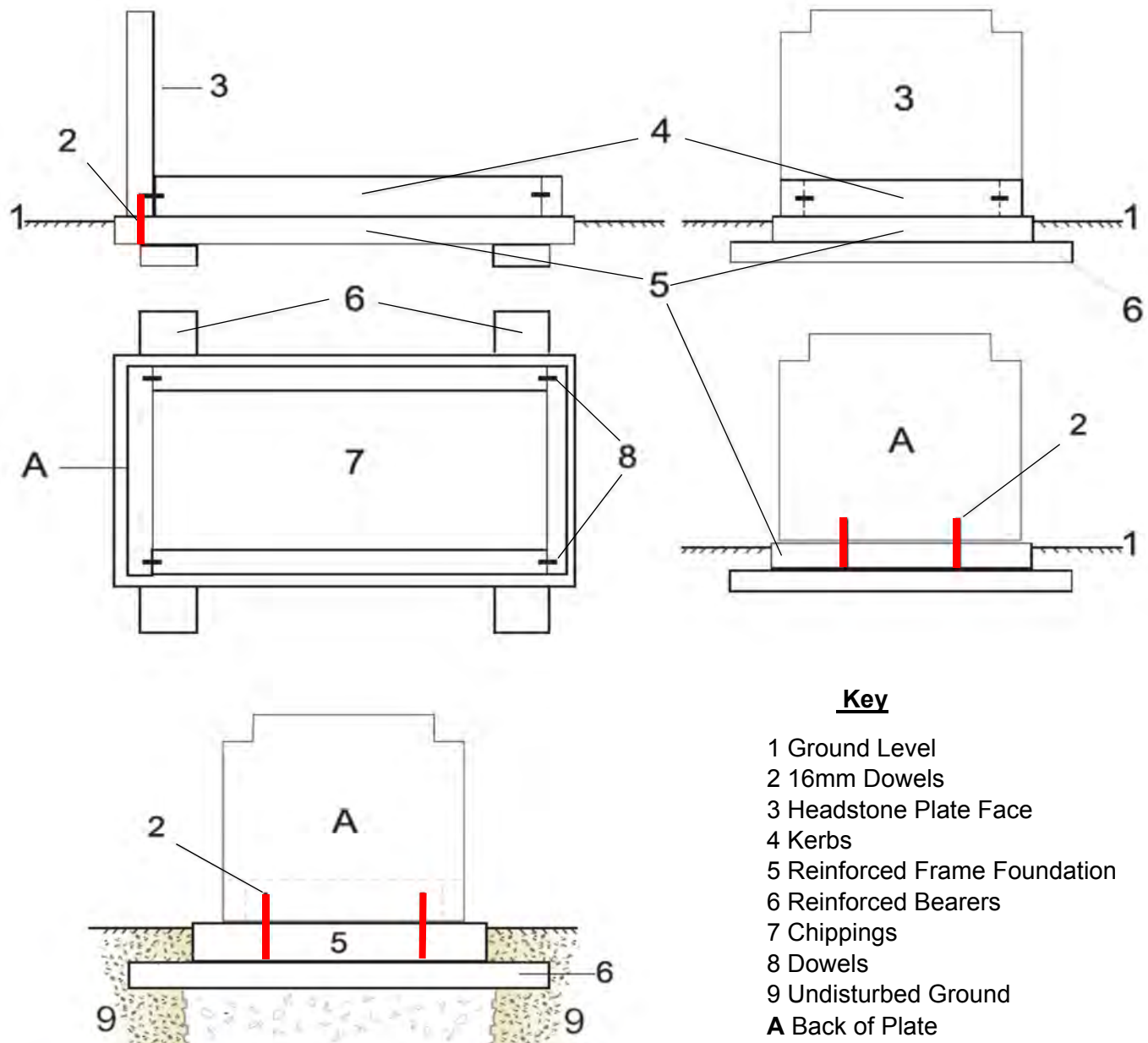
14.5 **Drainage** must be incorporated in the memorial. (example Drawing 14.D)

14.6 When fixing on a solid landing appropriate drainage must be provided so that the inside of the kerbs do not become waterlogged. If vase posts or other features are incorporated into the design to take containers or to retain soil for flowers, good drainage is essential.

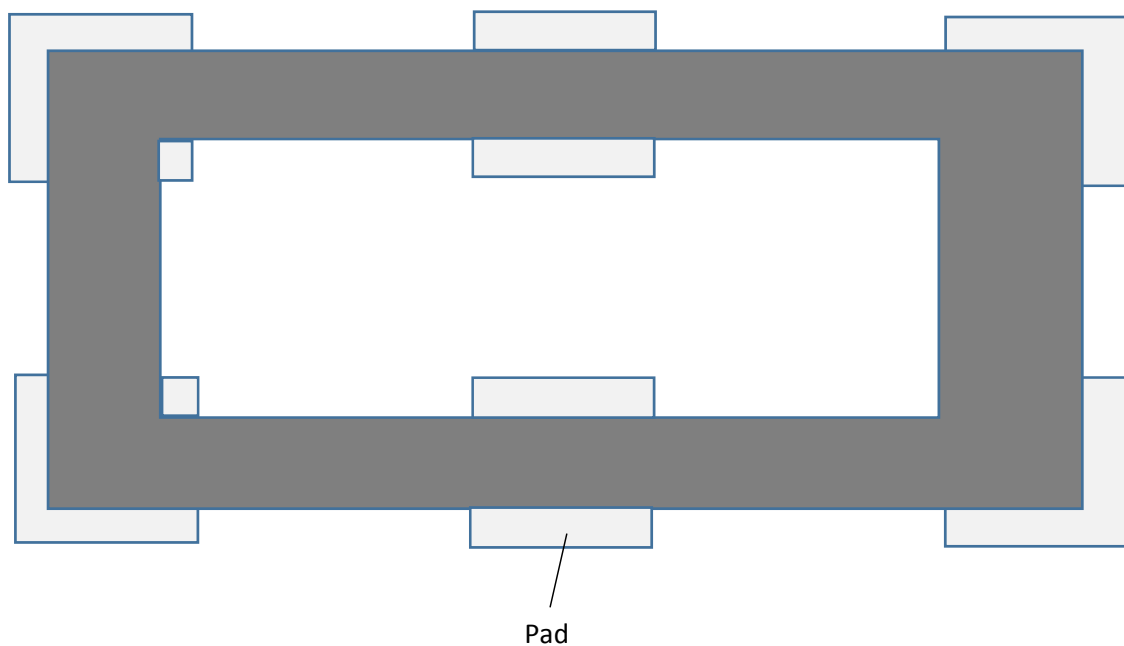
#### **14.7 Full Grave Memorials**

In burial grounds allowing full grave memorials the foundation now most often used is called a **Frame Landing**, these are pre-cast steel reinforced concrete single units which as their pseudonym indicates are shaped like a picture frame. Solid full grave landings are called raft foundations, and these are usually cast in situ. A headstone doweled directly to a pre-cast frame landing or solid cast in situ raft foundation do not require a Ground Anchor as the memorial plate is dowelled directly to the foundation and the foundation itself is of sufficient size to stabilise the headstone.

**Typical installation of a single full grave headstone and kerb memorial on a reinforced concrete frame landing where the total weight of the memorial components does not exceed 650 kg.**



14.8 If the disturbed grave area is larger than the foundation being placed upon it the ground must be well consolidated and bearers should be used to span the grave to provide additional support. Each end of the bearer should sit on firm ground capable of supporting the weight placed on them. For a normal size single full grave granite memorial with headstone and kerbs memorial, the front to back width of each bearer should be 200mm x 75mm deep of reinforced concrete and be of adequate length to suit the required application.

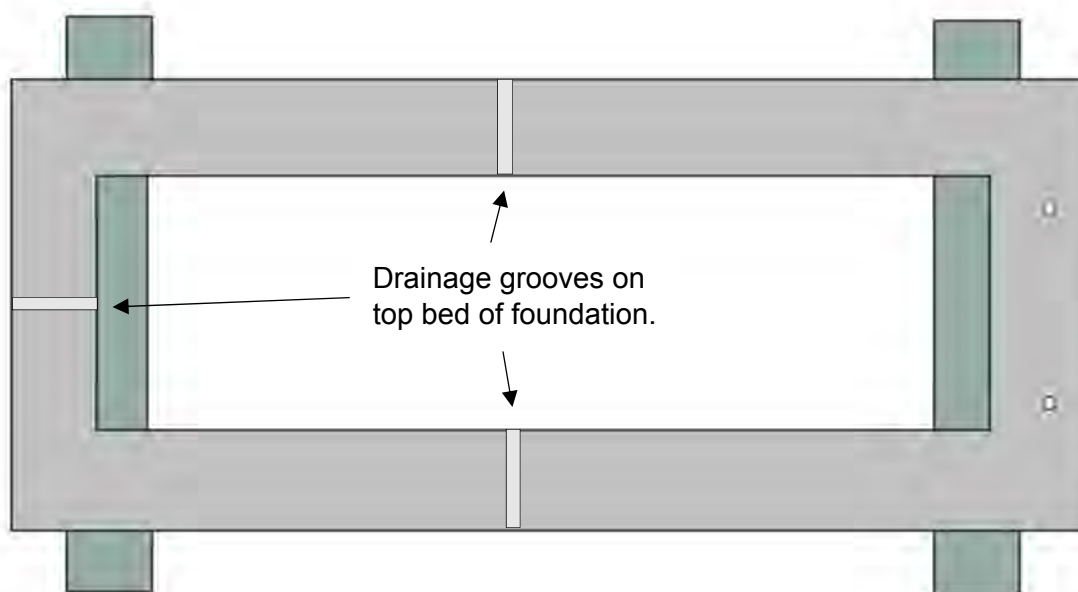
**Solid pre-cast Reinforced Landing Foundation on pads.****14.C**

14.9 When space between plots restrict the use of bearers' concrete pads under a one-piece pre-cast landing can help with their installation as it is relatively easy to manoeuvre and level the individual pads in preparation to place the foundation. Once all the pads are correctly placed and level with each other the foundation can be lifted onto the pads. If the pads are correctly positioned the foundation should be level without need for any further adjustment.

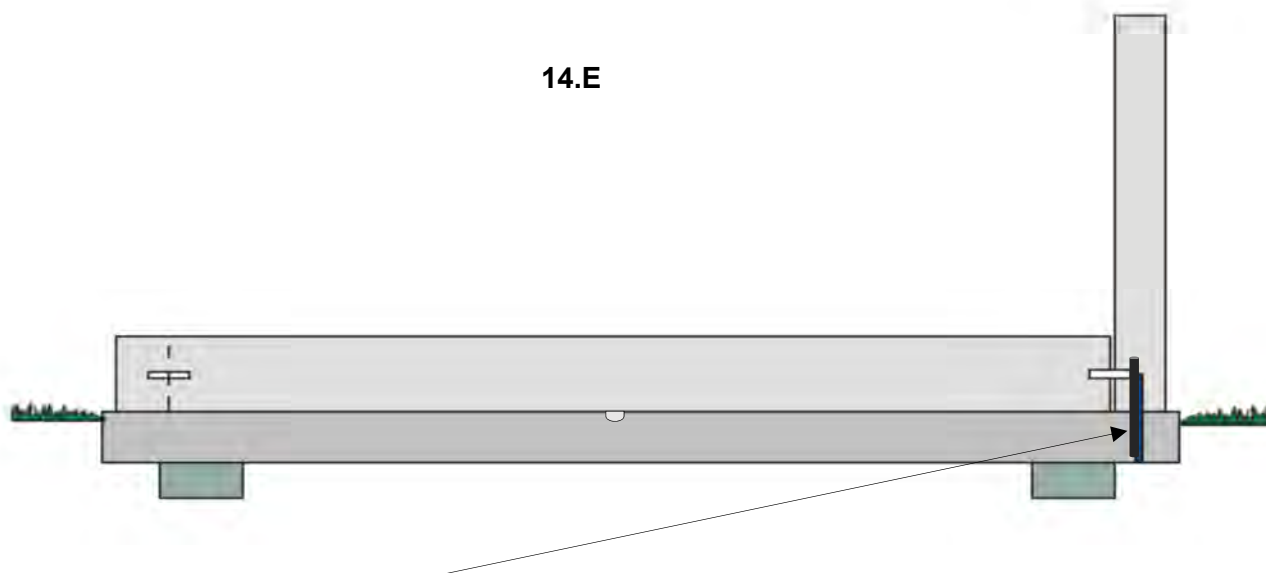


Reinforced concrete bearers under a pre-cast frame landing help spread the load onto firm ground either side of the grave area.

14.D



14.E



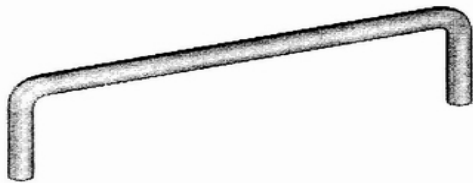
14.10

Memorial Plate **must** be doveled to the pre-cast frame landing / solid cast in situ foundation.

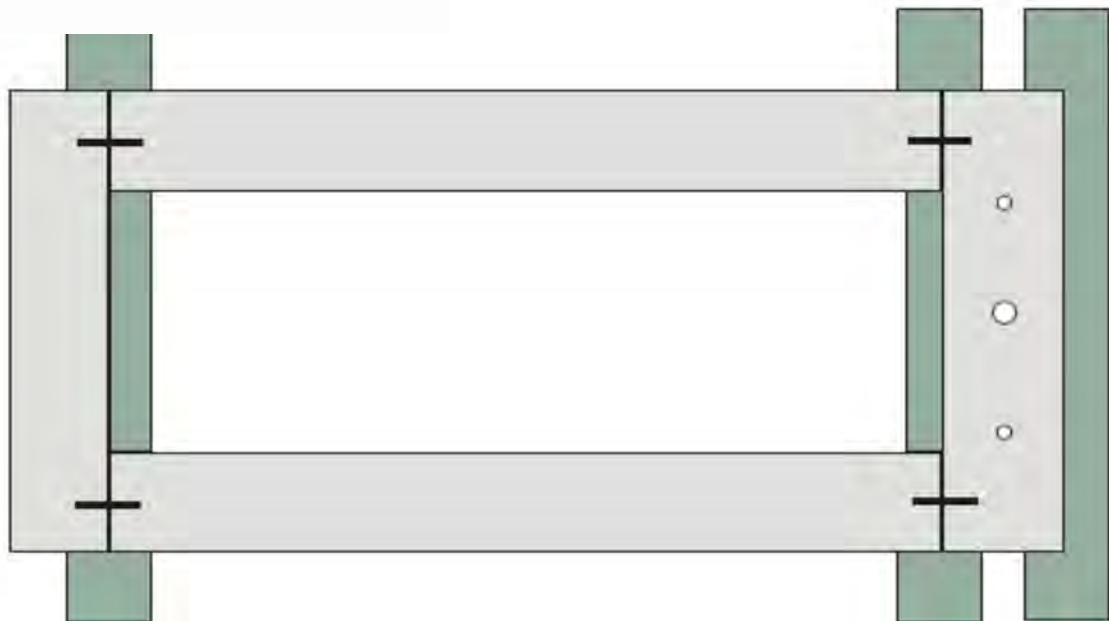
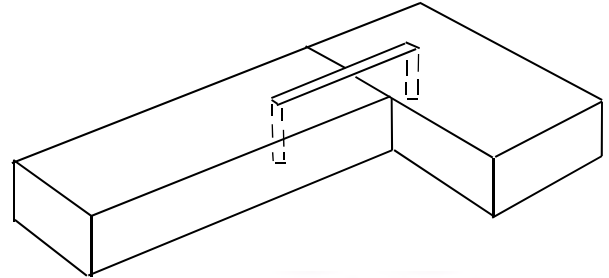
14.11 Sectional Foundations must have a cramp at each joint and ground anchor. 14.12 Dowels should not be used on their own to join sectional foundations.

### Cramp

Must always be used at 90 degrees to the joint.



14.F

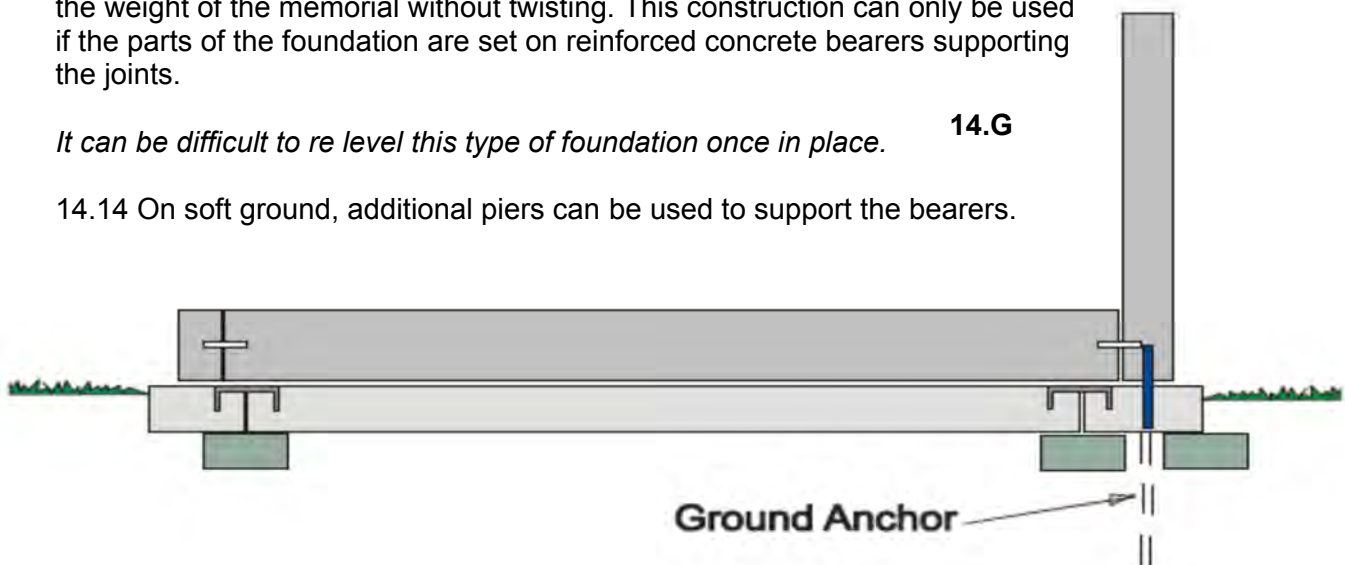


14.13 Sectional foundations must be cramped together and capable of taking the weight of the memorial without twisting. This construction can only be used if the parts of the foundation are set on reinforced concrete bearers supporting the joints.

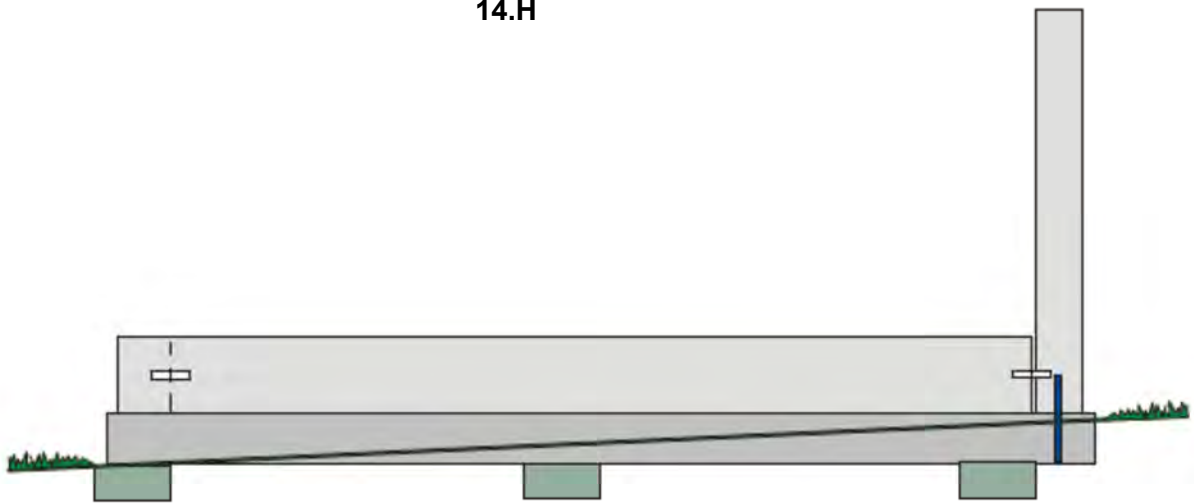
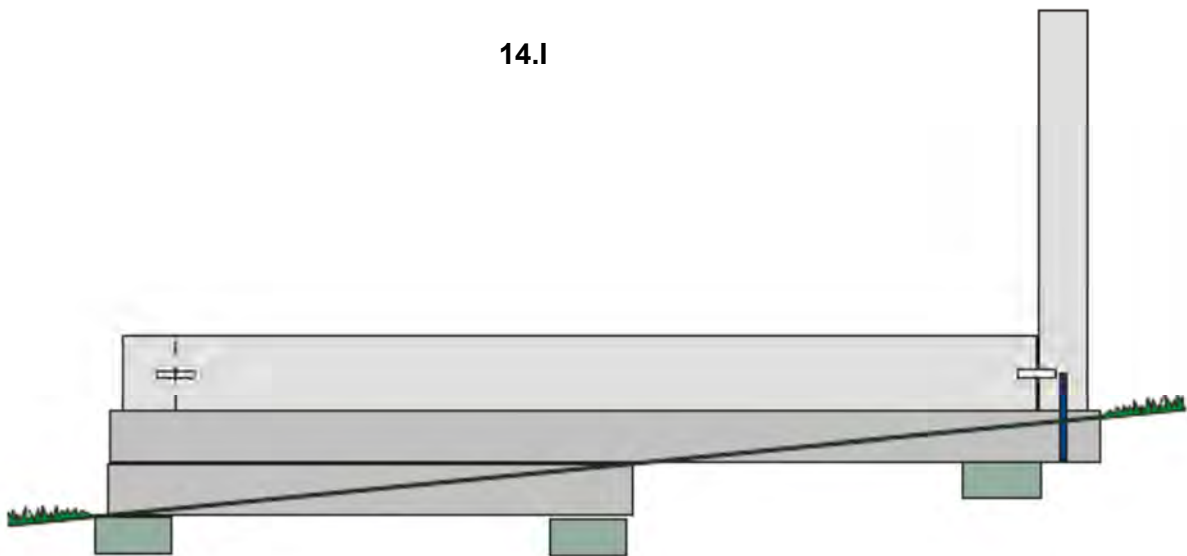
*It can be difficult to re level this type of foundation once in place.*

14.G

14.14 On soft ground, additional piers can be used to support the bearers.



14.15 Foundations should be level and cut into the ground and tiered if necessary on sloping surfaces to ensure the weight of both the memorial and the foundation are fully supported.

**14.H****14.I**

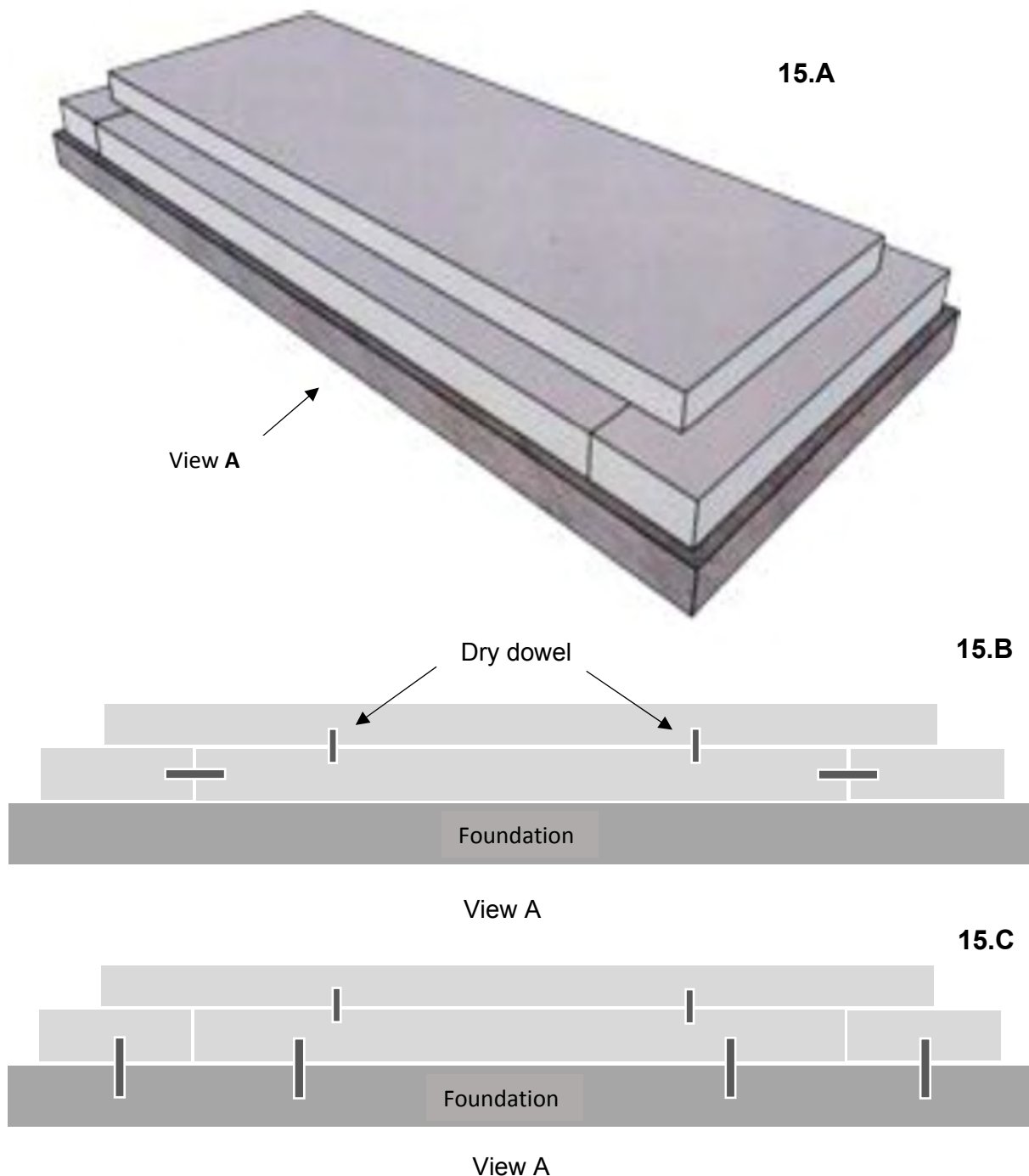
14.16 On sloping ground, it is especially important that infilling in and around the full grave memorial foundation memorial is well consolidated to prevent soil erosion caused by water runoff.

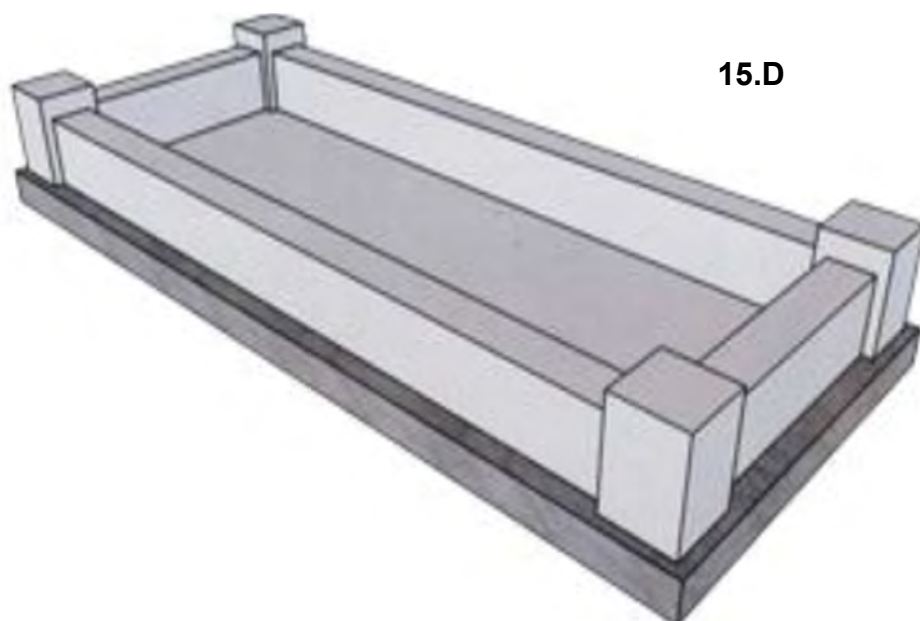
### **FULL GRAVE MEMORIALS WITH COVER SLAB AND KERBS**

15.1 Where a ledger is fitted directly to the foundation or placed over kerbs it is good practice to have at least two dry dowels on its bottom bed to prevent movement. Dry Dowels should be first fixed into the underside of the ledger prior to placing in the Cemetery and these are then located into corresponding holes drilled in the underlying kerb or foundation.

15.2 A minimum of one horizontal dowel 75mm x 10mmØ with at least 37mm into each adjoining kerb should be used in each joint of the supporting kerb or plinth sections. (Drawing 15.B)

15.3 Alternatively, vertical dowels may be placed in the bottom joint (bed) between the kerb and foundation, (Drawing 15.C) however this method may make removal more difficult, so more appropriate for a final fix.



**FULL GRAVE WITH KERBS**

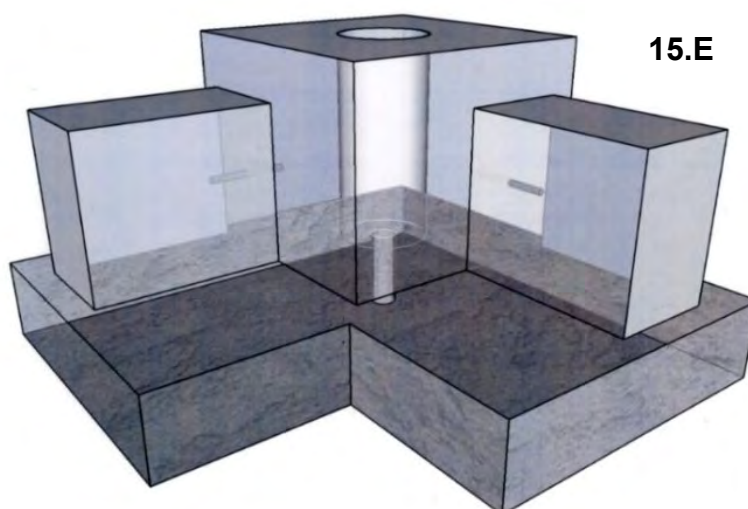
15.4 Drainage must be incorporated into memorial (See example section 14 Drawing 14.D)

15.5 Kerbing should be fixed in place with cement and doweled together with a minimum of one horizontal dowel in each joint between kerbs and posts. (Drawing 15.E)

15.6 When a **Cover Slab** is placed on or between the kerbs, central supports are necessary if the material is under 50mm thick.

15.7 When a sloping tablet (mousetrap) is incorporated in the design it should be doweled to adjoining kerbs and the foundation. **See Section 13 Drawing 13.C**

15.8 When a plaque (50mm thick) is incorporated at the foot of the grave between the kerbs, then the kerb ends at the foot should be doweled to the foundation to prevent them from parting.



**Posts and Vases** should be fixed as the diagram

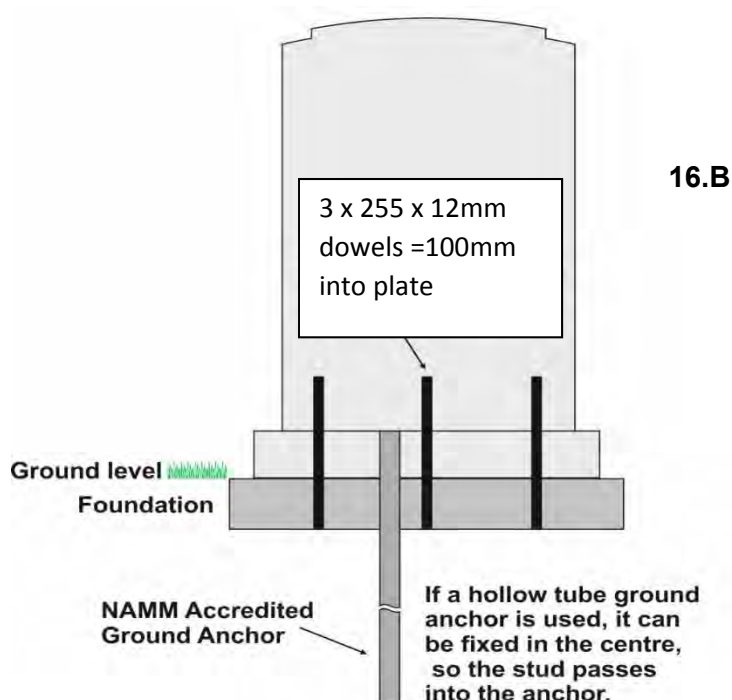
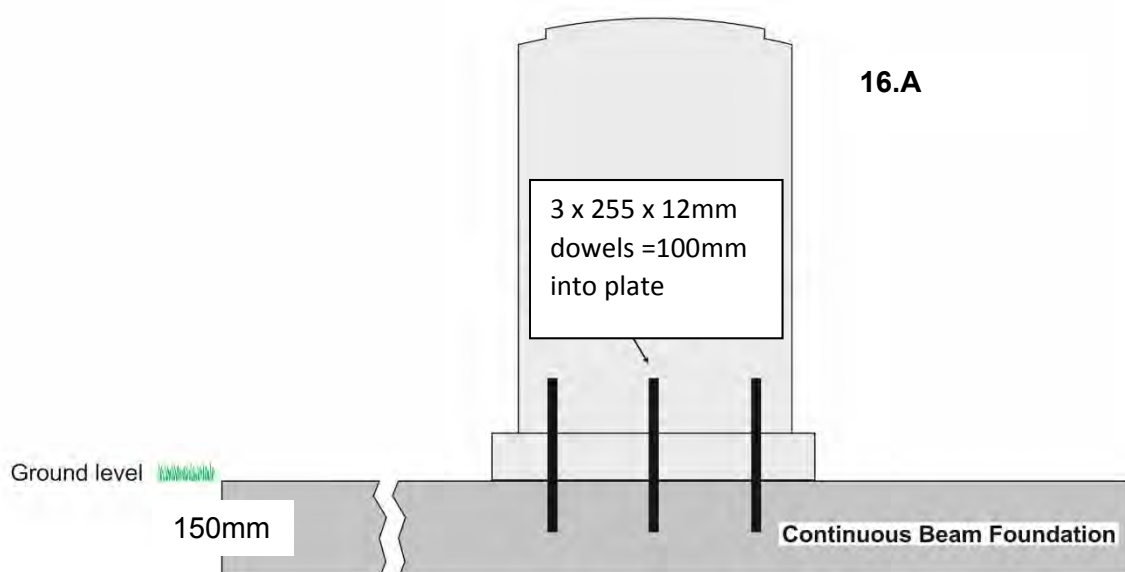
**Vases** **must** always have drainage.

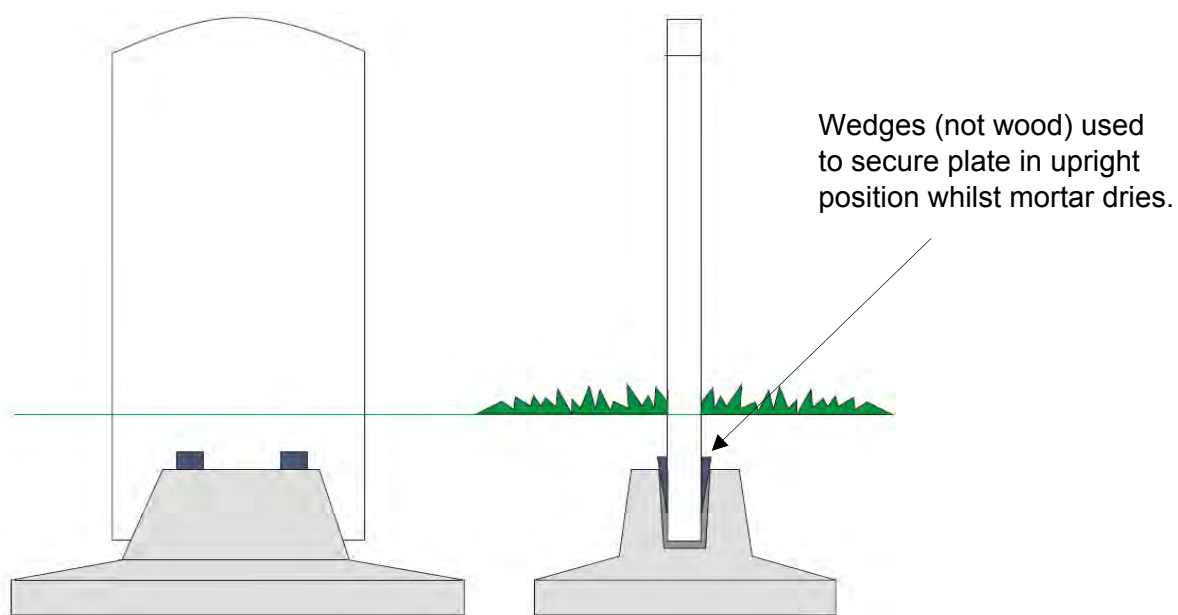
### **MOD STYLE HEADSTONES**

16.1 Ministry of Defence War Grave Memorials, having a maximum height of 915mm and 400mm wide. When fixed to a continuous concrete beam foundation, should be dowelled using 3 x 12mm diameter dowels, 255mm long with 100mm into the plate.

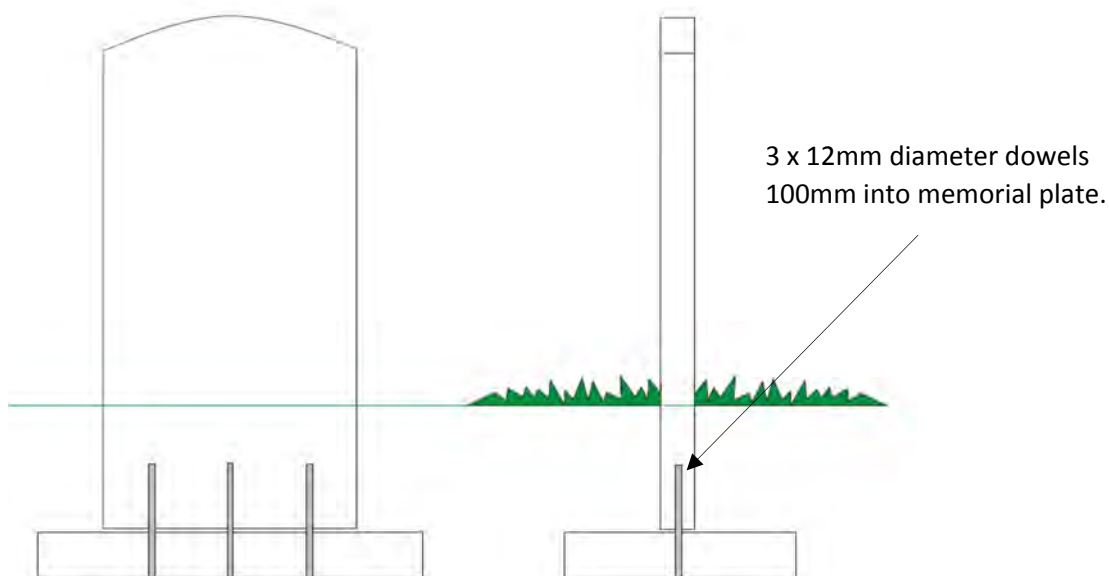
16.2 Memorials in Portland or Sandstone with a narrow base on a continuous concrete beam, such as the Ministry of Defence Memorials, should be fixed with three dowels as shown in Drawing 16.A and Drawing 16.B. These are to be inserted through the base and into the foundation.

Alternative methods of installing MOD style memorials are shown in Drawing 16.C and Drawing 16.D.



**16.C**

The minimum depth below ground is 375mm (15") or 25% of the overall height (including the foundation) whichever is greater.

**16.D**

16.3 Portland MOD style memorial doweled to concrete or hard stone below ground foundation.

16.4 The minimum depth below ground is 375mm (15") or 25% of the overall height (including the foundation) whichever is greater.

16.5 MoD (SPVA) Urn Plot Markers (UPM) should be set where possible, on a suitable foundation directly into the ground and the UPM then fixed at ground level. The adhesive should be waterproof cement, or a flexible bonding agent specified in BS ISO 11600 and be appropriate to the expected joint movements.



## CLEANING MEMORIALS

### Methods of Cleaning

Acids are **DANGEROUS** and **DESTRUCTIVE** and correct **PPE MUST** be used and manufacturers data sheets and guidelines **MUST** be used at all times.

**Granite and Silica Stones** For granite and sandstones such as York, approved cleaning products containing acid can be used. The most effective cleaners contain Hydrofluoric acid or Hydrochloric acid. Some Ammonia-based products work.

When cleaning, some of the Silica is dissolved from the face of the material as dirt is released. Extreme care must be taken on polished surfaces. Washing with water is best when cleaning reflective surfaces as acid can remove the polish. When using cleaning agents containing acid, the polished face of the headstone should be wetted first, and the chemical washed off as soon as possible to avoid damage to the lettering and smearing on the polished areas.

On some imported materials a surface polishing agent is used to enhance the shine. This surface treatment suffers in the weather and is easily removed if stringent cleaning chemicals are applied.

**Marble and Lime Stones** are alkaline. Alkaline cleaning agents should be used. Often a cleaned area re-soils quicker because the surface density has been broken down. Acid will dissolve the surface material and is not recommended for cleaning these materials. Some cleaning products have a 'buffer' included in the cleaner to prevent the material dissolving or 'burning' but are not always effective. Only cleaning agents with a pH below 5 should be used.

First wash with clean water to remove any surface dirt. If this does not work, then careful use of a wire brush may be needed. Badly eroded Marble can be resurfaced with a machine or a Tungsten tipped scraper.

**Portland Stone** should not be cleaned using a concentrated cleaning agent, as small particles of the material will be dissolved and the stone suffers from surface erosion. The stone can be wet rubbed with a fine carborundum block to remove any hard shell that protrudes through the surface.

**Brushing** A Bronze and Fibre hand brush is generally the best. Rubbing with a steel wire brush can be too abrasive, especially on carved work. If used, the wire brush must be clean and rust free so as not to affect the stone and used gently. Moss or lichen can be removed in this way. Use plenty of water for the process and then wash all the surfaces with clean water when finished.

**Pressure Hose** cleaning must be carried out using a controlled fan shaped jet so the surface is not damaged. If chemicals have been used, thoroughly wash all areas first with water to avoid chemical splash. Steam cleaning may cause spalling of the surface of the stone.

**Ground Staining** Chemicals drawn up from the ground by capillary action can cause staining. This type of stain may gradually fade as the memorial dries. A residue is often left just below the surface. Sunlight and exposure to the elements over time usually lessens this type of staining.

**Rust or Bronze** staining is difficult to remove. Poultice methods may reduce the stains. Chemicals recommended by English Heritage will be aqueous solutions, for rust 'Ammonium Citrate' and for bronze 'Ammonium Carbonate'.

**Lead Lettering** Usually this is raised on granite and is flush on marble. Cleaning chemicals may cause a reaction and make the lead oxidise, which will stain the memorial. On marble a rust coloured stain appears and on granite a white smear. If staining starts to happen, wash off the chemicals immediately and apply a neutralising agent such as vinegar. Residual ghosting may remain after cleaning.

**Gold Leaf Lettering** is very delicate, and the least abrasion affects the surface.



## **Chemicals**

**Manufacturer's instructions must always be followed.**

**Precautions.** Most chemicals have a detrimental effect on your health. No chemical should be allowed to come in contact with any part of your body. The gases given off by some chemicals can cause lung damage and others cause burns on the skin. When using these substances, the Health & Safety C.O.S.H.H. Guidelines **must** be followed. Always use protective clothing, long rubber gloves and face and throat protection.

Great care must be taken not to get any chemicals on the surrounding memorials or adjacent graves. When finished, chemicals must be thoroughly washed away and the residue made safe.

**Trials** If uncertain, a trial should be carried out on a discreet area of the memorial to ensure that minimal damage is caused to the material.

**Industrial Bleach** based products may damage the memorial and be harmful to the surrounding environment, household bleach should not be used to clean memorials.

Some **Hydrofluoric acid-based** cleaning products come in Crystal form (Ammonium Bifluoride). This is safe to handle when completely dry, but dissolves in water. Warm or hot water dissolves the crystals best, but gives off dangerous fumes. The chemical should be applied with a brush. **Do NOT** breathe the fumes. **Beware** acid can 'Burn' cement!

Hydrofluoric Acid can cause serious burns that can continue to destroy flesh long after the acid appears to have been washed from the skin. It particularly affects breathing, the eyes and around the nails.

**Detergents** generally do not work well when cleaning heavily soiled memorials.

**Poultices** can be used in extreme cases but take time and skill.

**Sealing against the weather.**

It is not recommended by the Portland Stone suppliers that sealer be used on their stone. They advise that the stone should be allowed to breathe naturally and build its own surface hardness.

There are circumstances, however, when the problem of dirt penetration needs to be addressed and a surface sealer is needed after cleaning. It is not possible to stop stone outside in the weather from getting dirty. Limestone is quite porous and sometimes the pollutants in the atmosphere do cause discolouration.

### **LISTED AND HERITAGE MONUMENTS**

All listed memorials must be treated with the utmost respect.

It is necessary to ascertain why a memorial was listed. Is it the person who is buried in the grave, or is the memorial itself of some merit because of its architectural or aesthetic value?

The question as to who listed the memorial is important. It may not be the National Organisation but the Local Authority or even the local Historic Society.

Often the Owners of the grave do not know of the Listing. If they do not, the Listing Authority must deal with the grave owners. These people may still have a Right of Burial and Authorities will find it very difficult to override this right.

Any work on these monuments must be detailed and have the approval of the relevant authorities and all others concerned.

If the Listing is because of the person buried in the grave, it may be possible, with approvals, to construct and install a new monument.

Grants are available for renovating existing War Memorials from the War Memorial Trust:

[info@warmemorials.org](mailto:info@warmemorials.org)

## **REPAIR AND REINSTATEMENT OF EXISTING MEMORIALS**

### General Advice

All loose parts of a memorial must be dismantled and re-fixed to current standards and doweled at each joint. Removing, or separating firmly fixed parts of a memorial may break, or compromise, the strength of the material.

Memorials do not need to be split apart where there is no evidence of movement in a specific joint, however where the integrity of the current dowels is unknown or suspect, then secondary doweling **MUST** be used.

If the dowel sizes as specified would compromise the strength of the material, then thinner dowels are permissible, increasing the number of dowels can improve the strength of the joint. The length of dowel is the most important factor in ensuring a safe structure.

For thin materials 12mm dowels should be used with as tight a hole as possible. Care must be taken when drilling (using wet core drill) to ensure the holes are parallel to the face of the material. Dowels of 10mmØ are permissible on non-structural parts of a memorial.

It is always better to set the doweling into thin materials and allow the cement to set before fixing.

On semi-transparent materials white cement can be used to hold the dowel.

It is possible to add to the thickness of the material on an unseen side to increase the durability of the stone.

Some older memorials need to be preserved for historic or sentimental reasons. These memorials, because of condition or the thickness of the material, may be outside the scope of the Code and special care and skill is needed in their repair. Specialist conservation skills are required.

**Ground Support Systems.** (Ground Anchors) if required, consult manufacturers for correct type.

**Also see section 7**

## **MATERIALS AND FINISHES**

### **Materials**

When producing a new memorial, consideration must be given to the customer's requirements, location and cemetery and churchyard regulations. A sound durable, naturally quarried material should be selected which will accommodate the required design and lettering.

#### **"GRANITES"**

These are the hardest materials and cover all igneous stones. Colours range from black to light grey, pink to red, blue and green. Some have a pearl effect when polished showing the mica within the rock.

Finishes: All types

#### **"MARBLE"**

Carrara, sometimes called Sicilian is the usual marble used for memorials. Marble is generally white and has a blue grey vein. As it weathers it turns grey and becomes sugary, due to surface erosion.

Finishes: All types except polishing.

#### **"LIMESTONE"**

The material is formed under water and contains shells, as in Portland stone. The colour ranges from cream to beige. Nabresina from Trieste in Italy is denser and finer grained than many British Stones.

Finishes: All types except polishing.

#### **"SANDSTONE"**

Silica stones, such as York, can be harder and more durable than Limestone. The colours vary from sandy to grey.

Finishes: Fine rubbed, tooled or pitched.

#### **"SLATE"**

Chemically similar to clay, this material is compressed into laminated form and is very strong. It can be split or sawn into thin slabs. It is usually blue/black or green.

Finishes: Fine honed or Riven - split through the lamination.

### **Finishes**

**Exposed Surfaces** of the memorial should have an even character, except when natural or quarried faces have been chosen.

**Scratches** should not be visible on any exposed faces of the memorial.

**Natural surface** holes should be filled, if required.

A **Chamfer** is used to remove the **Arris** or 'sharp' edge on the memorial and should be equal along its length and all corners and checks, properly squared, unless the design dictates otherwise.

**RUSTIC** Natural rock-like appearance achieved with a minimum of work to split away the unwanted stone.

**PITCHED** Natural rock finish left by splitting the material by hand (Pitching tool and hammer) or machine.

**FINE PUNCHED** As punched but material is worked to give a reasonably uniform surface.

**FINE AXED** A rustic finish finely tooled to give an even surface, used on rough granite for inscription panels.

**FLAME TEXTURED** Surface is spalled by the application of heat, giving a uniform appearance similar to riven.

**RIVEN** Naturally split giving a smooth undulating surface, only applies to slate.

**TOOLED** Various textures achieved by masoning.

**SPARROW PECK** A tooled even texture achieved with a finely pointed chisel.

**SANDED** Fine rubbed or sandblasted to remove the irregular markings, giving a uniform surface.

**EGGSHELL** Non-reflective smooth matt finish.

**HONED** Finish between eggshell and polished.

**POLISHED** A gloss polished finish giving a glass-like smooth reflective surface.

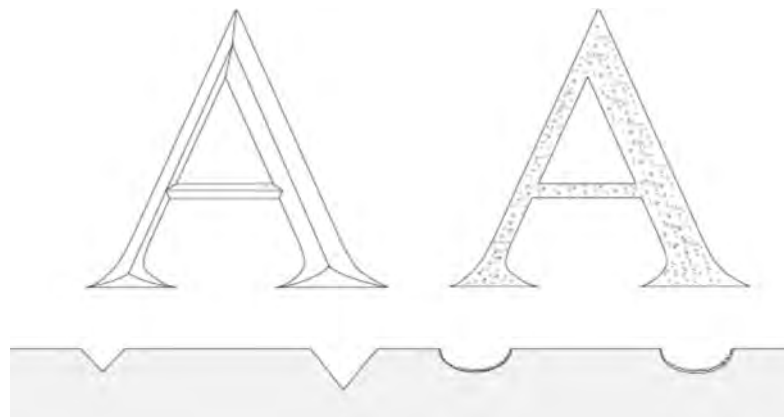
**LETTERING**

21.1 The **Inscription** must be legible, and the lettering spaced in a ratio suitable to their size. The edges of the letters must be clearly defined.

21.2 **Additional Inscriptions** should, where possible, match the preceding inscription in style and spacing. If the style differs it must be approved by the customer.

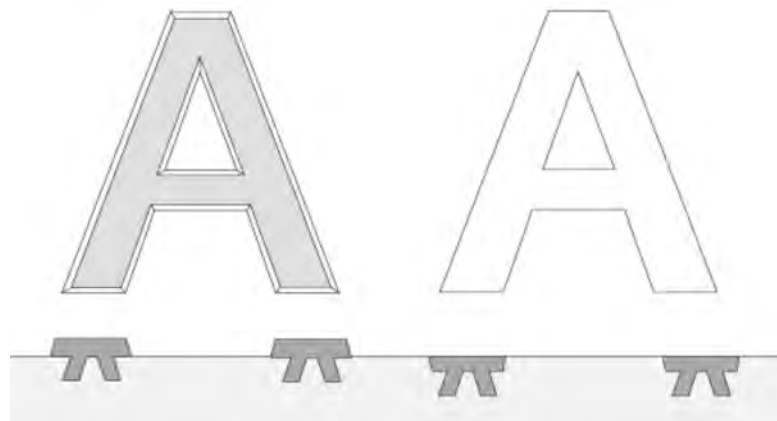
21.3 **Paint and other applied Finishes** must carefully be chosen as being suitable for memorial work and must be applied in accordance with the manufacturer's instructions.

21.4 The customer must be advised that some applied finishes have a limited life and may need periodic renewal, especially Gold-Leaf finish.



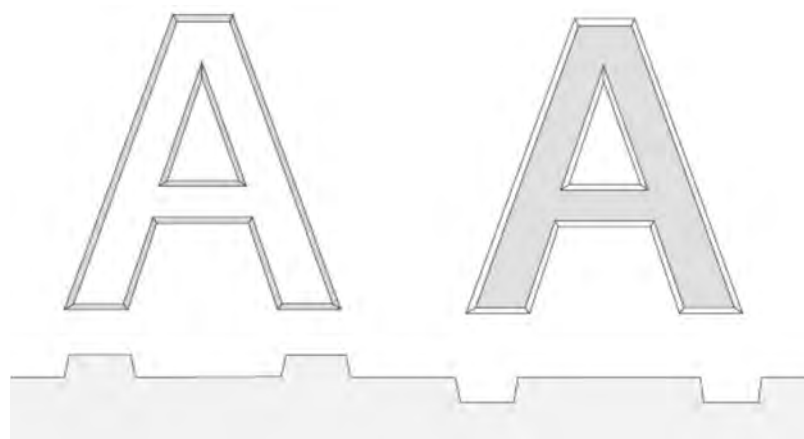
Vee Cut

Incised / Grit Blasted



Raise Lead

Inlaid / Flush lead



Raised

Recessed

### **SAFETY ASSESSMENT OF MEMORIALS**

**Operators must ensure operatives undertake appropriate certified training for the role of memorial safety inspection.**

**NAMM City and Guilds SIAM training and assessment (Safety Inspection and Assessment of Memorials) covers all aspects of the safety inspection of memorials procedures, from the initial planning right through to the practical implementation and recording of details.**

**Final assessment of candidates is essential to determine candidates have the necessary knowledge and skills to safely and appropriately assess memorials. NAMM City and Guilds Assured Certification requires passing a final practical and written assessment to demonstrate practical competence and clear understanding of the whole process of memorial safety inspection and assessment of memorials.**

Before commencing any assessments, suitable procedures including an escape strategy must be in place.

Ownership of memorials remains with the family of the deceased and for this reason advice is needed for operators on communicating with the memorial owners, the bereaved and the wider community as part of the arrangements for managing memorials. There is potential for much distress when this is overlooked. Where memorials are found to require maintenance, every effort should be made to contact the family to effect repairs. When a memorial poses a significant risk, such as imminent collapse immediate action must be taken to control the risk.

Gaining knowledge of the different types of memorial currently installed in the Burial Ground is beneficial, for example, through a site survey that identifies the various designs and materials of individual memorials and groups of memorials, their historical and social importance and the likelihood of members of the public visiting or walking past particular memorials.

An inspection methodology for assessing the risk of each memorial must include:

A procedure for prioritization and recording findings.

Procedures and equipment available for exit strategy, i.e. remove a danger once recognized.

A visual 360 deg check for obvious signs that a memorial is likely to be unstable.

Where a visual check suggests no stability defects, a hand test (as demonstrated during NAMM SIAM training) to confirm no imminent risk or identify a stability. (25kg maximum hand pressure)

The Five Step approach suggested by the Health and Safety Executive for their risk assessment:

Step 1: **Identify the hazard** – e.g. a potentially unstable memorial.

Step 2: **Identify who might be harmed and how** – these might be employees, contractors, volunteers or visiting members of the public who may be struck by a falling memorial.

Step 3: **Evaluate the risk** of a memorial falling and harming someone and decide on the precautions needed to control this risk.

Step 4: **Record the significant findings** of the risk assessment and take steps to implement the precautions needed.

Step 5: **Review** the risk assessment periodically to see if anything has changed and update it if necessary.

Operators should consider local factors which might affect the design and style of the memorial as well as environmental and historical factors. The following are some of the considerations operators should take into account to focus and prioritise the inspection and assessment process:

- Memorials alongside or within a short distance of paths are more likely to present a risk to visitors than those which are less accessible. Memorials of well-known people, or memorials widely appreciated for their architecture or aesthetic qualities are also more likely to attract visitors. Less frequented areas may attract anti-social behavior or may need greater maintenance as relatives are no longer tending memorials. Memorials situated on sloping or uneven ground may present an increased risk. Large memorials which due to their height and weight and methods of construction require a lesser angle of lean to become unstable.
- More recent memorials should be designed to British Standard 8415 and the construction, dowels and fixings should be in accordance with the **National Association of Memorial Masons (NAMM) Code of Working Practice**. Memorials installed to these standards have greater assurance of good stability.

### Inspection of Memorials

A 360 deg visual inspection should be the first step in assessing the risk of a memorial falling. It takes little time, uses simple common sense and judgment, and yet acts as an effective early warning system to help operators prioritise memorials that need more detailed inspection.

Problems to look out for include:

Damaged or eroded bonding.

Movement of parts of a memorial from their original position.

Kerb stones breaking apart.

Undermined or unstable foundations. (Water run off erosion/ overuse of weed killer.)

Leaning memorials – particular if there is evidence of recent movement.

Evidence of structural damage or disturbance (e.g. Cracks.)

The presence of vegetation, which may cause joints to widen. (Tree roots etc.)

The profile of memorial types in the Burial Ground, together with the visual inspection will help determine those memorials that require a hand test, and how to prioritise those hand tests:

Inspection by a suitably qualified person may reveal a hazard on a very large memorial which will require specialist assessment for remedial works, the location and frequency of visitors to these areas will help determine the timing of that specialist inspection. It is not normally appropriate to use a hand test to confirm stability of these large memorials.

Where lawn memorials have visible signs of damage or defects such as joint or component failure, a hand test may be used to determine stability of the memorial.



Operators should note that many memorials installed in recent years on independent foundations are **fitted with a ground support system**. These memorials may move, even rock if the base to foundation joint is broken but do so within designed tolerance limits and **represent no danger** as the memorial will lock on the ground anchor.

Hand testing is appropriate for many memorials, such as the modern, lawn type, as well as smaller stepped designs or tiered crosses. Much larger, heavier memorials, such as older columns or obelisk types, require an assessment by a specialist engineer, suitably qualified mason or a person with an appropriate qualification specific to this task. Those inspecting memorials need to be mindful of, and consider, the risks to their own health and safety and the safety of others in the local vicinity.

**The routine use of mechanical test instruments as inspection tools is not recommended.**

Any precautions taken must be proportionate to the risk of people suffering harm. In most cases the actual level of risk from an unstable memorial will be very low such that a warning sign near to, or in some instances on, a memorial alerting visitors to the potential danger will suffice until repair has been arranged. If the circumstances make this impractical, for example there is the potential for confusion as to which memorial any warning refers, a memorial may need to be cordoned off until it is made safe.

Where a memorial may be so unstable there is an imminent risk of it toppling, immediate steps must be taken to reduce the risk e.g. warning signs and restricting access using suitable sturdy barriers to a safe distance or laying the memorial flat.

Full MOJ document: <http://www.justice.gov.uk/publications/safety-burial-grounds.htm>

See also BS8415:2018 Annex A (normative) and NAMM SIAM Manual

**TALL AND LARGE MEMORIALS**

These memorials will usually require special approval from the Authority that manages the Burial Ground or Churchyard.

It is important to know the weight of the individual components of the structure and to understand how they are to be placed and fixed.

Heavy memorials must have sufficient foundations for the loading and be designed to take account of possible seasonal changes in soil conditions, their specifications may require independent calculations of total component loading and ground suitability by a suitably qualified person.

If the memorial is to be removed for further interments, it must be designed so that it can be easily dismantled and replaced.

The logistics of getting the memorial to the site must be evaluated and once on site a safe route planned to the final location.

All safe systems of work must be implemented, and operators of mechanical lifting equipment must be appropriately qualified.

When using lifting equipment, it will be necessary to cordon off the immediate work area, appropriate PPE must be worn at all times, and if any equipment is used above shoulder height helmets must be worn.

## CODE OF WORKING PRACTICE

### **Complete Revised Copy Issued September 2018**

*(This edition supersedes any previous version of the Code)*

### **REVISION HISTORY**

During the process of updating the NAMM Code of Working Practice, there has been a number of revisions to previous documents dated March 2010 and June 2014. And in keeping with previous revisions this September 2018 edition supports BS 8415.2018 and current memorial masonry practises.

### **NOTE**

This Code of Working Practice is regularly revised and updated to include any changes such as:

- Changes in British Standards, which may be applicable.
- New information coming to light as a result of research and development being undertaken regarding memorial stability etc.
- Results of tests on a range of memorial sizes and types etc which may not yet be included in this Code.
- Any other matters which the National Association of Memorial Masons deems to affect this Code.

### **CODE OF WORKING PRACTICE**

Refer to the NAMM website [www.namm.org.uk](http://www.namm.org.uk)

For a bound hard cover printed copy contact NAMM Head Office on 01788 542264

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## GLOSSARY

**A Memorial Mason.** A craftsperson who is able to manufacture, inscribe, repair reinstate and provide expert trade specific guidance regarding the supply of memorials and who meets the National Occupational Standard criteria for the occupation of “Memorial Mason”

**Alignment:** Following the general line of the previously erected memorials, the graves or the landscape design laid out in a cemetery or churchyard.

**Arris:** The sharp edge where two faces of the material meet. If this edge is removed it then becomes a small chamfer.

**Base:** Part of the memorial usually forming the plinth to the headstone. It will be dowelled/bolted to the headstone and fixed to the foundation.

**Beam:** Also called a Strip or Raft, is a length of concrete laid for the fixing of lawn memorials. Provided it is of sound construction and at least 150mm thick a Ground Anchor is not required.

**Bevelled Edge:** Small chamfer at 45°.

**Chamfer:** Flat surface formed by working an angle between two right angle faces.

**Corbel:** A bracket projecting from a wall to give a bearing surface to support a plaque. (Section 8)

**Cramps:** Shaped lengths of stainless steel or non-ferrous metal suitably bedded into sinking's cut into the stone units to tie them together. (Sections 5 and 14)

**Dowels:** Lengths of solid stainless steel sunk into adjacent hidden faces to align and/or to prevent movement. (Sections 5 and 10)

**Foundation/Bearer:** The support for the memorial. (Sections 6 and 14)

**Ground Support System:** A system of anchoring a memorial to the ground. (Section 7)

**Headstone:** The upright part (Plate) of a memorial on which the inscription is usually cut.

**Joggle:** This is a mason's name for a mortise and tenon. (Section 5)

**Kerb:** Memorial unit used as an edging around the grave. (Sections 14 and 15)

**Landing:** A foundation on which to build a full grave memorial, it can be a solid one piece or sectional. (Section 6)

**Stone:** Natural quarried material suitable for memorials.

**Weights:** Dry concrete 300 x 300 x 300 = 68kg (150 lbs per cubic foot) approx 2400kg/m<sup>3</sup>  
 Granite - 300 x 300 x 300 = 72.5 – 81.5kg (160 – 180 lbs per cubic foot) approx 2600kg/m<sup>3</sup>  
 Marble - 300 x 300 x 300 = 77kg (170 lbs per cubic foot) approx 2500kg/m<sup>3</sup>  
 Lime and Sand stones 300 x 300 x 300 = 68kg (150 lbs per cubic foot) approx 2400kg/m<sup>3</sup>  
 Water - 300 x 300 x 300 = 29.5kg (65 lbs per cubic foot)

### **Proof Load for Memorials**

All memorial ground anchor designs and support systems in the Code have passed the test set by a consultant structural engineer in accordance with BS8415-2018. This is to ensure memorials are strong enough to withstand any reasonable force to which they might be subjected.

The above proof load criteria does not apply to **memorials less than 625mm high.**



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