

# 15. APPENDIX FOUR – GRAVE RESTORATION GUIDELINES

## **1 PRIORITY FOR REPAIR WORK**

Four categories are recommended to help establish priorities for repair work.

### **Category A, First Priority for Repair**

This includes graves that present a danger to the public because stones, walls or fences are in danger of collapsing and causing injury. It includes elements that might collapse, should people climb on them (even though they shouldn't), such as a grave floor that is cracked or broken and has a cavity underneath.

### **Category B, Second Priority for Repair**

This includes graves that are structurally sound now, but which are threatened in the future by the continued growth of trees and/or roots nearby, or by erosion. Action taken ahead of the threat will prevent such graves from becoming dangerous.

### **Category C, Third Priority for Repair**

These are graves which have historic and/or aesthetic significance, and while not being dangerous, are in need of repair because elements are cracking, broken or lost. Significance will be assessed against the following:

- Contains a significant person or family
- Has an association with a significant event, institution or theme
- Demonstrates ornate, rare, distinctive or beautiful features
- Demonstrates rare or unusual fabric or visible construction techniques
- Dates from before World War I.

### **Category D, Fourth Priority for Repair**

This category includes graves which have no special historic and/or aesthetic significance, are not dangerous, but are in need of repair because elements are cracking, broken or lost.

These categories will help to determine how the Council's resources are spent. Any family commitment to repair graves is quite independent of such priorities.

## **2 'PLEASING DECAY' OR IN NEED OF REPAIR?**

The first issue to address when considering the maintenance or repair of a grave is how much work to do. One of the significant aesthetic attributes of the Karori Cemetery is the visible evidence of the passing of time, of age, and of patina. Maintenance and repair should aim to retain the patina of age where this does not conflict with the long life of the grave.

The decision to carry out work at all should be made by a group comprising people with technical expertise in repair, with an appreciation of the aesthetic qualities of the place and how it is used, and with a knowledge of its history.

The decision on the extent of work will be influenced by the answers to the following questions. Will repair work:

- Make the grave safe?
- Slow deterioration of the grave?
- Significantly lengthen the life of the grave?
- Enhance the historical value of the grave and cemetery?
- Enhance the aesthetic value of the grave and cemetery?
- Enhance understanding and appreciation of the grave itself?

Positive answers to these questions will suggest a hierarchy of action in carrying out maintenance or repair work. It may be that work to make a grave safe will be carried out, and non-urgent, non-structural work, will be left.

Cleaning is also something that needs to be considered in the context of repair. Cleaning may be necessary where excessive build up of dirt or growth is affecting the integrity of the material, where it is unsightly, or where it is obscuring important parts of the grave. Graffiti is another reason why cleaning of graves may be required.

Notes on cleaning are included in the section on Repair Materials.

### **3 MAINTENANCE and REPAIR PHILOSOPHY**

A repair philosophy, based on the ICOMOS Charter is repeated here, in modified and expanded form, with particular reference to the maintenance and repair of graves.

#### Carry out regular maintenance

Regular maintenance is essential to the long life of graves. If maintenance is not carried out on a planned basis, repairs become progressively more difficult and expensive, and heritage value can be lost, thus diminishing the significance of the grave. A well maintained grave will survive the effects of weathering and time better than one that is poorly maintained.

#### Repair rather than replace

When repairs are necessary, cut out and replace only decayed material. It is better to have fabric that is worn and carefully patched than modern replica material, however faithfully copied. This method of repair maintains the maximum amount of the original fabric, thus ensuring the authenticity of the grave.

#### Repair in compatible materials

In carrying out repairs, materials matching the original as closely as possible should generally be used if they are available. Work to a higher technical standard is good practice in some circumstances, for example, ground retention timber (treated H5) should be used for the replacement of timbers set in the ground.

#### Restore with care

Restoration of lost features should be carried out only if there is clear evidence of the original form and detail. Such evidence could come from original features found near the grave, simply needing reinstatement, or sometimes from early photographs or records. Detailed examination of the fabric of the place can often reveal information that is not available from other sources. Restoration would normally

only be carried out in special circumstances such as in the case of the grave of an important person or a grave of particular aesthetic significance.

#### **4 REPAIR MATERIALS**

This section outlines the decay mechanisms of the various materials found in the Karori Cemetery graves, with recommendations for appropriate repair materials. Repairs should only be effected after the cause of failure is identified and rectified. Important considerations in this respect include growth within and outside graves; the drainage of water from inside graves and from its constituent parts, and the ground conditions around and under graves.

##### CONCRETE and BRICK MASONRY

Generally the decay exhibited in the concrete components of graves relates to subsidence. Because the concrete and masonry is apparently unreinforced, it has limited capacity to span over foundation material that is either weak, or non-existent because of subsidence of the ground below. Thus graves' walls have cracked and slumped over time, and in some cases large portions of the masonry have broken away. Similar damage is caused by expanding tree root systems.

Earthquake forces may in some cases have hastened the breaking up of the masonry components of graves, especially where columns, obelisks and other features reach a height of more than say one metre.

<b>Repair materials</b>	<b>Repair standard</b>
Concrete	To match original material in strength. Ordinary grade concrete up to 20MPa with sand and aggregate to NZS 3108 concrete production, ordinary grade.
Where concrete is exposed	To match original material in strength, colour and texture. Chose cement, aggregate and formwork to give colour and texture to match existing.
Reinforcement	None, unless the original has reinforcement or in special circumstances.
Bricks	Where visible, to match the original in colour and texture. Otherwise, bricks to NZS 366 clay building bricks.
Mortar	Where visible, mortar to brickwork to match the original in colour and texture. Sand to NZS 3103 Sands for mortars and external plasters. Lime to BS 890. Pigments if needed to NZS 3117 pigments for portland cement. A possible mix is 1 : 6 cement : sand.

##### **Samples**

The reproduction of a repair mortar to match existing work can only be done by carrying out trials. It is essential that samples be prepared, using sands of different sizes and colours; that they be allowed to dry, and that they then be compared with the original work to obtain a close match. It is expected that the choice of sand, which imparts colour as well as texture to the mortar, will be critical in achieving a good match. Samples and recipes (including the source of the sand) should be kept as reference material.

##### PLASTER

Most of the graves built in concrete or masonry have a plastered finish. Plaster finishes will crack and break as the underlying structural material of concrete or

brick breaks. The plaster will always need repair when the underlying material breaks.

Plaster can also become 'drummy', losing its bond to the underlying material, and falling away. This process is hastened when cracking has occurred, the cracks allowing water into the sub-strate; this in turn will allow plants to establish, and/or frost damage to spall the plaster off.

<b>Repair materials</b>	<b>Repair standard</b>
Plain and textured plaster	To match original material in strength, colour and texture. Sand to NZS 3103 sands for mortars and external plasters. Lime to BS 890. Pigments if needed to NZS 3117 pigments for portland cement.
Typical mixes	Bond coat 2 : 3 cement : sand. Flanking and finish coat 1 : 1 : 6 cement : lime : sand.
Workmanship	To NZS 4251 code of practice for solid plastering.
Profiles	Mouldings and profiles to match existing.
Finish	Sponge, wood float or steel trowel as appropriate.
Pebble dash finish	1:3 flanking coat of plaster with carefully selected pebbles to match thrown on.
Mortar for crack repair	Flexible silicone rubber sealant (Expanditie Silaflex RTV or similar).

### **Samples**

The reproduction of a repair plaster to match existing work can only be done by carrying out trials. It is essential that samples be prepared, using aggregates of different sizes and colours; that they be allowed to dry, and that they then be compared with the original work to obtain a close match. It is expected that the choice of sand, which imparts colour as well as texture to the plaster, will be critical in achieving a good match.

Samples will not need to be prepared for each grave, since there is some uniformity between graves. Samples and recipes (including the source of the sand and aggregate) should be kept as reference material, and in due course the preparation of samples will not be necessary except in special circumstances.

### **MARBLE**

Marble is a hard recrystallised limestone composed predominantly of calcium carbonate, is capable of taking a polish, and is often of red, brown or grey colour which derive from impurities. While there are some graves built entirely in marble, most examples of its use are for headstones and monuments.

Graves built in marble, or indeed any stone, can suffer structural damage in much the same way, and for the same reasons, as for those built in concrete and brickwork. There are also a number of other mechanisms of decay, which include:

- The action of soluble salts leading to efflorescence on the surface of stonework, or to spalling in some circumstances (salts may derive from the stone itself, from adjacent materials, from the atmosphere, or by capillary action from the ground in the absence of any damp-proof course).
- The growth of mosses and lichens on the surface of stone, which can over time affect the surface finish of the stone.

- The growth of weeds, small plants and even trees which might take hold in mortar joints, eventually loosening and dislodging stones.
- The expansion of tree roots from nearby trees which can cause structural cracking and damage as they push up parts of a grave.
- The leaching of mortar from between joints in the stone which can gradually affect the stability of the stonework.
- The rusting of the iron cramps which are often found as the mechanical fixing of stone to stone, caused by the ingress of moisture (rusting iron can expand up to 10 times its original volume).
- The shading of nearby trees which can slow the drying out process, encouraging higher than normal moisture levels in and around graves, thus aiding the establishment of plant growth.
- Spalling when wet masonry is exposed to frost conditions. Since spalling of stone can result when freezing water expands (such damage may result only after a number of freeze/thaw cycles).
- Inherent defects in the design and workmanship of the grave which may lead to slow deterioration (such matters might include the laying of the stone off its natural bed, or the use of a too weak or too strong mortar).

As with all repair, the cause of the decay should be established and rectified before repairs are carried out.

<b>Repair materials</b>	<b>Repair standard</b>
Marble	To match original material in strength, colour and texture; for preference, stone should be obtained from the same source as the original.
Mortar	To match original material in strength, colour and texture. A possible mix is 1 : 2 : 8 of cement : lime : sand.
Dowels for assembling components	Non-ferrous, preferably bronze.

#### OTHER STONE

Other stone found in the cemetery includes granite (a hard crystalline coarse-grained rock comprising more than 65% silica, which is capable of taking a polish) and limestone (composed of calcium carbonate, a soft sedimentary stone that is easily carved stone; although porous, it is nevertheless durable when properly laid and maintained). Mechanisms for the decay of these stones are similar to those listed above. Granite however, is relatively immune to decay caused by the ingress of moisture or the formation of soluble salts, while limestone is more prone to decay from these causes. The presence of clay in limestone can accelerate weathering. All are susceptible to mechanical damage.

<b>Repair Materials</b>	<b>Repair standard</b>
Granite, limestone, sandstone, etc	To match original material in strength, colour and texture; for preference, stone should be obtained from the same source as the original.
Mortar	To match original material in strength, colour and texture. For granite, a possible mix is 1 : 3 : 8 of cement : lime : sand. For limestone, a possible mix is 1 : 3 : 10 of cement : lime : sand.
Dowels for	Non-ferrous, preferably bronze.

assembling components	
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### **Samples**

The reproduction of a repair mortar to match existing work can only be done by carrying out trials. It is essential that samples be prepared, using sands of different sizes and colours; that they be allowed to dry, and that they then be compared with the original work to obtain a close match. It is expected that the choice of sand, which imparts colour as well as texture to the mortar, will be critical in achieving a good match. Samples and recipes (including the source of the sand) should be kept as reference material.

### **WROUGHT and CAST IRON**

Wrought and cast iron components are generally found as railings around the outer edge of graves. These materials rust as part of the general weathering process, but this mechanism of failure is very slow. More significant damage has been as a result of mechanical breakage, perhaps by vehicles or by careless use of tools.

Sometimes wrought iron components have become dislodged (and then lost) because the slumping of the grave has pulled rails away from their posts.

<b>Repair materials</b>	<b>Repair standard</b>
Wrought iron	Hand worked to match.
Cast iron	Cast to match (moulds can be taken from existing remnants).

### **TIMBER**

General weathering of timber has led to decay. More particularly, timber posts in the ground (even of totara which was the commonly used timber) have a limited life, say up to 50 years. With the rotting of posts, railings fall down and will decay more quickly.

<b>Repair Materials</b>	<b>Repair standard</b>
Timber in the ground	Radiata pine, treated H5, sawn or dressed to match.
Timber rails, pickets etc	Radiata pine, clears grade, profiles and surface finish (usually dressed) to match.
Fixings	Galvanised.
Paint finish	Three coat paint finish, waterbourne exterior gloss (Resene spec 2e 1.1 or similar).
Paint colour	Ascertain from paint analysis, will generally be off-white, say BS 4-046.

### **LEAD LETTERING**

Lead lettering is common on headstones. Although the material has a very long life in terms of oxidation, it tends to fail by the loss of the mechanical key that holds the lead in the stone reveals. Workmanship, the parent stone, and the degree of shelter/exposure influence how long lead lettering will survive. Repair material should match the original.

### **BRONZE**

Several bronze plaques forming headstones remain in very good condition, although with a heavy patina of surface corrosion. Repair material should match the original.

## TILES

Ceramic tiles have weathered well. Where they need repair is in those graves where the sub-strate of masonry has failed, loosening the bond with the tiles.

<b>Repair materials</b>	<b>Repair standard</b>
Tiles	To match original tiles as closely as possible.
Bedding and pointing	To match existing.

## WASHING

Washing of all materials that make up the cemetery graves is best carried out with clean water. Pressure washing or steam cleaning may be required in some instances, for instance for the removal of graffiti, and a suitable non-ionic detergent may also be employed. Care should be taken not to use excessive water, and surface scrubbing should be done with a soft (non-ferrous) brush to protect surface finishes.

Abrasive blast cleaning of any sort is not recommended because of the potential for damage from pitting of surfaces, loss of mortar etc.

<b>Washing materials</b>	<b>Repair standard</b>
All materials	Reeson Quadclean.
<b>Stain removal</b>	
All materials	Reeson Powerkleen.

## **5 SOME WORKED EXAMPLES**

Following are some typical examples of failures to common grave types, with recommended repair procedures.

<b>Fault</b>	<b>Reason for repair</b>	<b>Repair</b>
Tree growth within grave	To prevent structural damage in the future.	Remove tree carefully at ground level; leave roots.
Tree growth outside grave	To prevent further structural damage	Remove tree carefully at just above ground level, taking care to protect cross. Carry out repairs to grave – see below.
Cracking to walls and floor	To keep water out of the grave; note that repair will not prevent the cracking from getting worse.	Rake out the cracks to form neat V-shaped joints. Fill cracks with silicone rubber sealant.
Cracking to floor only	As above.	As above.
Missing floor	To keep water out of the grave.	Cut concrete to neat edge; cast new concrete slab on compacted hardfill.
Half missing floor	To keep water out of the grave.	Cast new concrete on compacted hardfill; note colour and texture to be matched.
Falling headstone	To prevent collapse of headstone.	Carefully remove headstone and base; form new concrete foundation on compacted hardfill, casting headstone in.
Sinking headstone	To prevent deterioration of the stone.	As above. Surrounding floor may need repair at the same time.

Missing headstone		Do nothing, unless headstone is found, in which case re-attach.
Structural collapse of wall and floor	To prevent further collapse.	Remove broken components on left side of grave (retain most of floor slab); cast new concrete wall on compacted hardfill; plaster to match. Consider cleaning whole grave.
Collapsed timber fence	To prevent loss of fence and improve appearance.	Fix new corner post to match; make up and fix new railings with pickets to match; clean down all timberwork and paint.
Missing wrought iron railing	To improve appearance.	Make up new two new wrought iron railings to match; fit in place.
Fallen/broken components	To save elements from loss and to improve appearance.	Carry out repairs to walls and floor of grave; clean, repair and reassemble fallen components in original location.