

PART 5: STONE DECAY

• 25 Stone Decay

The recording form collects information about 12 different types of decay. These are organised into 4 main groups according to how they affected stonework.

1. **Granular erosion** is where individual grains become detached from a stone's surface. This form of decay also includes the wearing away of selective parts of a gravestone.
2. **Planar erosion** is where layers of stone become detached from a stone surface.
3. **Surface deposits** are where new material is deposited onto the surface of the gravestone.
4. **Miscellaneous decay** includes any forms of decay that aren't covered by the other decay groups.

PART 5: Stone Decay					
25. STONE DECAY Tick any forms of decay visible on the memorial. Complete, where necessary, for each separate stone type showing signs of decay. Tick the relevant box to show which area of the memorial is affected and to show the extent of decay. Fill in question 26 each decay type present.					
<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26
Surface loss Granular erosion	Differential weathering Granular erosion	Cratering and pitting Granular erosion	Delamination Planar erosion	Contour scaling Planar erosion	Surface blistering Planar erosion
<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26	<input type="checkbox"/> NOT VISIBLE <input type="checkbox"/> VISIBLE - go to Question 26
Scaling and flaking Planar erosion	Pollution deposit Surface deposit	Salts deposit Surface deposit	Misc. staining Surface deposit	Cracking and crazing Misc. decay	Misc. decay

Work through each of the gravestone's faces (North, South, East, West and Upward) and assess whether there is any evidence of each of the decay types illustrated on the recording form. Information about how to identify specific types of decay are given in the **Field Guidance Notes: Decay** available from www.scottishgravestones.org.uk Tick the appropriate boxes on the recording form to show whether or not each of the listed decay types is visible. Use the space provided to give details of any other kinds of decay not covered.

If decay type is present you will need to answer question 26.

• 26: Details of Stone Decay Present

Note details about the location and extent of all types of decay present on the gravestone you are recording. Complete a separate box for each example of stone decay found on a specific stone type. For example, with a gravestone built using sandstone and marble if both show evidence of surface loss complete two boxes. One box would record decay on the sandstone part while the other would cover the marble part of the gravestone. Similarly, if pollution staining is found across a gravestone built from grey and pink granite, complete two boxes, one for each colour.

26. DETAILS OF STONE DECAY PRESENT: Complete a separate box for each example of stone decay found on a specific stone type (e.g. if one decay type is present on two stone types fill out two boxes). Tick the relevant box to show which memorial face(s) are affected, which part of the memorial face is damaged (top / middle / bottom / all) and the extent of decay.															
Decay Type:	Decay Type:					Decay Type:									
On Stone Type:	On Stone Type:					On Stone Type:									
EXTENT	N	S	E	W	U	N	S	E	W	U	N	S	E	W	U
Major	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moderate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Minor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LOCATION	N	S	E	W	U	N	S	E	W	U	N	S	E	W	U
Top 1/3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Middle 1/3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bottom 1/3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
All over	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Using the tick boxes show:

- which face(s) (N, S, E, W or Upward) are affected;
- which part of the gravestone's face is affected (top / middle / bottom / all over);
- the extent of decay that is visible (Minor, Moderate or Major). Details about how to gauge the extent of decay are given below.

Use the Comments box where possible to provide more detailed descriptions about any decay patterns on the gravestone you are recording.

Granular erosion is material loss whereby individual grains become detached from a stone's surface. This type of decay also includes the wearing away of selective parts of a memorial. There are three different types of granular decay:

- surface loss
- differential weathering
- cratering and pitting

Decay types	Description	Criteria to identify the scale of decay	Problem: Level 1 – minimal	Problem: Level 2 - moderate	Problem: Level 3 - major
Surface loss	Individual grains become detached from the surface layers of a memorial. The memorial's face takes on a roughened granular appearance, resulting in a loss of definition to carvings and edges	The key factor determining the severity of surface loss is whether the stone actively disintegrates when an inconspicuous, uncarved area of the stone affected by this decay type is gently touched	The stone's surface has become roughened but when stroked gently with a finger, no individual grains are lost	As level 1, except when gently stroked with a finger, individual grains come away from the surface	As level 2, except, when touched with a finger numerous grains become detached as small crumbs of stone
Differential weathering	Some parts of the stone have weathered deeper than others. This type of decay may be more localised than surface loss and often results in cavities and hollows. In extreme cases, holes through the stone can be the result. One common type of differential weathering is surface run-off patterns that are furrowed areas within the stone face caused by water being channelled along specific parts of the stone face, often as a result of the shape of the memorial. This process may reveal a stone's layers / bedding planes	The criteria used to calculate the scale of differential weathering are the amount of material lost (visible as cavities) and whether the structural stability of the memorial is threatened	There is a loss of material beyond the surface layers resulting in an uneven face but with no depressions visible	There is a loss of material beyond the surface layers resulting in hollow concave areas	There is a loss of material beyond the surface layers resulting in hollow concave areas which threaten the structural stability of the memorial
Cratering and pitting	Visible as small dimples or hollows on a memorial's surface. A number of different factors can cause this type of decay. One cause is the wearing away of naturally-occurring inclusions that are softer than the surrounding stone	The criteria used to assess the scale of pitting are the depth, diameter and number of the pits	Occasional, small shallow pits that are less than 1/2cm in diameter	Frequent shallow pits or occasional large pits which are more than 1/2cm in diameter	Numerous large pits



Figure 72
Major surface loss



Figure 73
Minor surface loss



Figure 74
Moderate
cratering and
pitting



Figure 75
Moderate
Differential
weathering



Figure 76
Major contour
scaling on
carved
surface



Figure 77
Moderate
contour
scaling on flat
surface



Figure 78
Major
delamination

Planar erosion is material loss whereby layers of stone become detached from a stone's surface. There are four types of planar decay

- delamination
- contour scaling
- surface blistering
- scaling and flaking

Decay types	Description	Criteria to identify the scale of decay	Problem: Level 1 – minimal	Problem: Level 2 - moderate	Problem: Level 3 - major
Delamination	The detachment or loss of a layer of stone that follows the alignment of bedding planes. [Headstones are normally constructed with the bedding planes parallel to the face of the stone. Tablestones are normally constructed with the bedding planes parallel to the top surface of the table slab.] The cleavage between bedding planes always extends to the edge of the stone (i.e. is visible on the flank of a stone)	The key factors determining the severity of delamination are the number of bedding planes detaching and the extent of material loss	Cleavage visible between bedding planes, minimal or no material loss from face	Cleavage visible between bedding planes, material loss from one bedding plane	Cleavage visible between bedding planes, material loss from more than one bedding plane
Contour scaling	The layer of stone that is detached or lost may or may not follow the alignment of a bedding plane – the key difference to delamination is that the break always occurs parallel to an architectural profile. This may be a carved or a worked face. Detachment or loss may be localised or run along an entire profile. It can occur in relation to more than one profile and on more than one face	The criteria used to calculate the scale of decay are the number of profiles affected and the extent of the overall loss of material	The detachment/ loss of one profile; no or very limited material loss	The loss of one profile; the extent of material loss moderate	The loss of two or more profiles; extent of lost surface major
Surface blistering	A blister forms in the surface layers of the stone, i.e. in the few outer millimetres. Blisters are characterised by a bowing or lifted surface	The criteria used to calculate the scale of blistering are the size of the blisters and whether or not material loss has occurred	Scattered small blisters, but no loss of material	As level 1 except blisters have burst and the surface layers of the stone lost	As level 2 except that the blisters are large
Scaling and flaking	Any other loss of layers of stone not clearly falling into the above three decay types	The criteria used to calculate the scale of scaling is the extent of the stone surface affected	Isolated patches only affected	Less than 1/2 of the memorial's surface affected	More than 1/2 of the memorial's surface affected



Figure 79
Major surface blistering



Figure 80
Minor scaling and flaking

Surface Deposits. The following decay types are characterised by the deposition of new material at the stone surface. There are three different types

- pollution deposit
- salts deposit
- miscellaneous staining

Decay types	Description	Criteria to identify the scale of decay	Problem: Level 1 – minimal	Problem: Level 2 – moderate	Problem: Level 3 – major
Pollution deposit	Atmospheric pollution products have become attached to the surface of the stone	The key factors determining the severity of pollution deposit are the thickness of the layer deposited and its adherence to the stone when an inconspicuous, uncarved area of the stone affected by this decay type is gently touched	Sooty layer only present i.e. particles of the deposit can be removed when gently touched	A thin hard deposit present i.e. no particles can be removed when the surface of the stone is gently stroked	A discernible crust has formed i.e. a thicker deposit
Salts deposit	Salt crystals are deposited at the surface of the stone. Common salt deposits include a line of salt crystals parallel to the ground in the bottom 1/3 of the stone. This type is caused by the deposition of salts from ground water. Deposits are also common in the top 1/3 of wall monuments where salts derived from the mortar used in the memorial and the surrounding wall are often the source of the salt	The criteria used to calculate the scale of salt deposition are the number of separate deposits and their extent	one salt deposit visible; very limited extent	one salt deposit; moderate extent	two or more discrete salt deposits; major extent
Misc. staining	Any other staining of the stone surface clearly not caused by the above 2 decay types	The criteria used to calculate the scale of staining is the extent of the stone surface affected	Isolated patches only affected	Less than 1/2 of the memorial's surface affected	More than 1/2 of the memorial's surface affected



Figure 81
Major salts deposit



Figure 82
Major pollution staining



Figure 83
Major pollution staining



Figure 84
Minor misc. staining

Miscellaneous Decay is any decay that has not been covered above.

- Craze and cracking
- other decay (please describe)

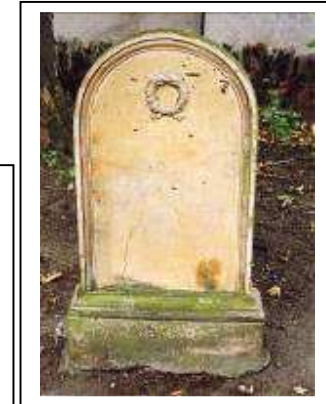
Decay types	Description	Problem: Level 1 – minimal	Problem: Level 2 – moderate	Problem: Level 3 – major
Crazing and cracking	Cracking through the thickness of material or crazing through surface layers.	Crazing only visible	Small cracks visible	Large cracks visible



Figure 85
Minor Crazing



Figure 86
Major Cracking



PART 6: FACTORS AFFECTING DECAY

- **29. Date of Memorial**

PART 6: Factors Affecting Decay			
29. DATE OF MEMORIAL:	No date available <input type="checkbox"/>	Date of memorial (year)	is this year:
the date stone was erected <input type="checkbox"/>	year of death of the first person mentioned on the stone <input type="checkbox"/>		
first legible date of death <input type="checkbox"/>	other <input type="checkbox"/> - state		

Where the inscription is legible, use this to calculate the date of the gravestone. This should be the year the gravestone was erected, the year in which the first person mentioned on the gravestone died or the first date you can read.

• **30. Factors Affecting Decay**

Stone decay can be influenced by a variety of factors. Five possible factors are given on the recording form. Read the description of each factor and tick the appropriate box to show whether each factor is:

- a) acting as a trigger for stone decay
- b) helping to protect the gravestone from decay
- c) or having no effect on the gravestone's condition.

<p>30. FACTORS AFFECTING DECAY: The following factors may trigger stone decay, offer protection to the memorial or have no effect at all depending on individual circumstances. Consider how, or indeed if, they have influenced the condition of the memorial you have looked at. Please tell us about any evidence which influenced your judgment.</p>	
Factor	Relevance and Comments
<p>Stone selection can influence the rate of decay. Even when sourced from the same quarry, stone durability varies. Harder wearing stone should have been selected for key structural or ornamental parts of the memorial or for gravestones in exposed locations but this may not always be the case. Less durable stone may have cracks or numerous inclusions. Compare the memorial you are recording to other gravestones nearby which are of a similar shape and made from the same type of stone. If your memorial is in a better condition, then stone selection has possibly offered some protection against decay. If your stone is worse off, then it is likely that stone selection has contributed to its decay. If there is no major difference between your memorial and similar gravestones close by, then stone selection is not a relevant factor affecting decay.</p>	<p>Has no effect <input type="checkbox"/> go to next section. Acts as a trigger for decay <input type="checkbox"/> Protects the stone <input type="checkbox"/> Please give details....</p>

When you note that a factor is affecting a gravestone, either as a decay trigger or protecting the stone from harm, provide further details where possible in the space provided.

Details of the 5 factors to be considered are given below.

Stone selection

Stone selection can influence the rate of decay. Even when sourced from the same quarry, stone durability varies. Harder wearing stone should have been selected for key structural or ornamental parts of the memorial or for gravestones in exposed locations but this may not always be the case. Less durable stone may have cracks or numerous inclusions. Compare the memorial you are recording to other gravestones nearby which are of a similar shape and made from the same type of stone. If your memorial is in a better condition, then stone selection has possibly offered some protection against decay. If your stone is worse off, then it is likely that stone selection has contributed to its decay. If there is no major difference between your memorial and similar gravestones close by, then stone selection is not a relevant factor affecting decay.



Figure 87
 Compare the condition of the sandstone headstone in the foreground to the one in the background

Stone working, the design of a memorial and carving.

The way the stone has been prepared by the mason can affect how a memorial decays. For example, a stone erected with its bedding planes running vertically is more vulnerable to decay. Some memorial designs can cause water to pool on the surface or run down the face of the stone. In other circumstances projecting stonework can protect underlying areas of a memorial.

Carving (which increases the surface to volume ratio of the stone) can also make a memorial more vulnerable to decay - so stonework with high relief forms or intricate ornamentation could experience greater erosion than flat plain faces.

The juxtaposition of different stone types and materials

The juxtaposition of different stone types and materials may act as a trigger for decay. Some stones are more robust than others. A stronger stone will increase the stress placed on the weaker or more porous material it's placed next to, making the latter decay more quickly.

The method of joining different stone types together can also cause problems if iron dowels and clamps are used. This is because metals have different properties to stone. As temperatures change iron fittings will expand and contract or if they rust, they will expand greatly which may force the surrounding stone to crack.

Cement and concrete.

Cement may be used as a mortar between stone blocks or for repairs; stones may also have been reset in concrete (see Figure 84 for a gravestone made entirely of concrete). Lime mortar is more porous than stone – hence any water in the stone moves to the joints and evaporates from here. In contrast cement and concrete are far less permeable and can cause water to accumulate above joints, which may increase decay in the adjacent stonework. If local sand is used for mortar, it may be sea sand and therefore a rich source of salts. Salts are particularly damaging to stonework.

Other Factor(s)

For example, in the graveyard neighbouring structures or trees may shelter a memorial from the weather, but in other situations these factors could also cause problems by directing rain or wind onto the gravestone.



Figure 88

Compare the condition of the sandstone headstone in the foreground to the one in the background



Figure 89

The tree in this photo is directing water onto the gravestone as evidenced from the dense algae coverage.