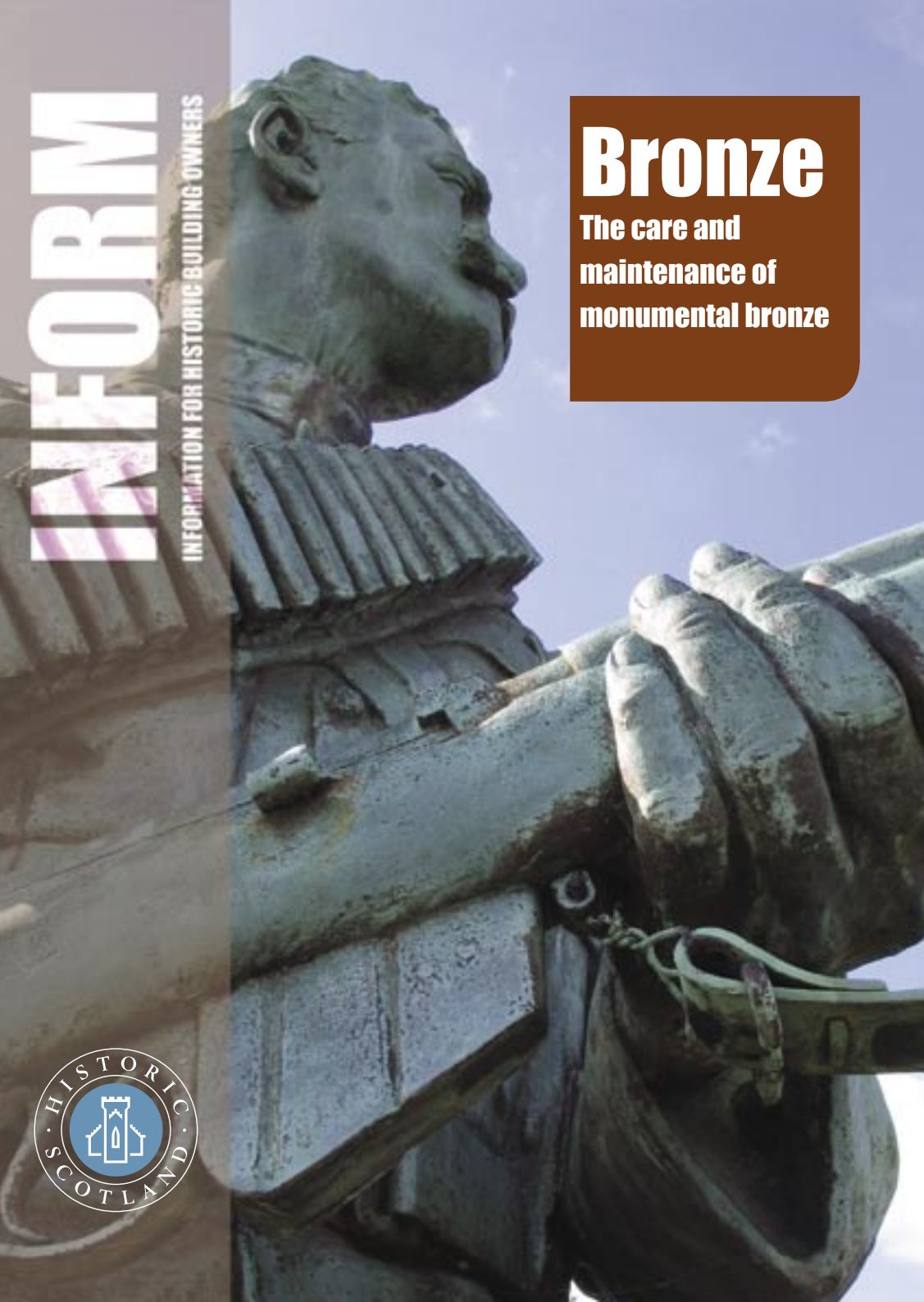
INFORM

INFORMATION FOR HISTORIC BUILDING OWNERS

Bronze

The care and maintenance of monumental bronze



HISTORIC SCOTLAND

Bronze monuments form an important part of the built environment, reflecting the history of a locality by commemorating key figures or events. Commemorative plaques are traditionally manufactured in bronze, and Scotland has much exemplary work in this regard. An understanding of the material, its production and its decay mechanisms is required to appreciate the needs of the monuments.

This guide provides a brief introduction to the care and maintenance of monumental bronze.

Bronze Effigy, Isle of Bute © D S Mitchell

What is bronze ?

Bronze is an alloy, comprising copper (at around 90%) alloyed with tin, lead, and zinc. Small amounts of other metals such as iron, nickel or silver may be found. Like cast iron, bronze founders used various metals in the casting process to take advantage of properties such as increased fluidity (zinc) and casting sharpness (lead).

Patination

Patination is a change to the surface colouration of the bronze, caused by the natural reaction of the bronze to chemicals in the environment, corrosion, or applied in the foundry using chemical means. 'Artistic' bronzes often vary in patination from those used in a commemorative context that were often patinated to a brown-black lustre. The patination is much more than a simple colouration of the surface. The sculptor may have intended to create a patination which varied across the metal surface, to accentuate features or to create optical highlights. On completion, the surface of the bronze would be heated to a high temperature. Traditionally, beeswax was then applied. Contemporary microcrystalline waxes perform the same function but without the chemical disadvantages of beeswax. On commemorative plaques, the raised letters would often be polished to provide a contrasting highlight.

A brown lustre is formed by cuprite on the surface of the bronze, and has an almost translucent finish. The green finish visible on many statues is the result of copper sulphates forming on the bronze surface (see Surface Deterioration).

Foundry repair to bronze monument © D S Mitchell

Artistic Bronze Patination, Chemical patination © D S Mitchell

Care and maintenance of monumental bronze

Significant conservation and maintenance of bronze is a specialist field. However, the best means of ensuring the continued preservation of a monument is to carry out regular maintenance. Such work is part of the day-to-day responsibility of owners.

You should carry out the following steps:

- Research and record condition
- Assess condition
- Consider whether any repairs are necessary
- Undertake repairs
- Establish a regular maintenance regime
- Undertake measures to prevent future damage

Research and record condition

Patination loss by handling © D S Mitchell

A thorough understanding of the historical development of a monument is a necessary preliminary to repair. Archival information can be particularly valuable. Photographs or postcards can provide information on original patination or missing components. Historical accounts of dedications or openings were often recorded in the local press, providing a fruitful source of information. The bronze itself may provide the name of the sculptor and foundry at some location, and often a date for manufacture.

A periodic photographic record can be a useful tool in monitoring the condition of a structure over time. Any works undertaken should be fully recorded.

Assess condition

The best way of monitoring the need for and effectiveness of maintenance, and also of assessing when major repairs are required, is to carry out a periodic, detailed, condition inspection. This detailed assessment should not replace the need for specialist advice where major repairs are required, but can identify minor defects and problem areas before they become serious. The monument should be inspected for signs of physical or structural damage, or for loose components, paying particular attention to security of fixings.

Inspection using hydraulic platform allows full access © D S Mitchell

Following the casting of a bronze, minor defects in the casting are repaired in the foundry, or detail chased in by hand. This original work can often be mistaken for subsequent repairs. Examples include small patches, 'stitch'-type repairs using bronze rods or larger plated repairs. Pins used to hold the core in place during the manufacturing process are sometimes visible. Statues may also be assembled from smaller castings. Joint lines may be evident on close inspection. The maintenance of the supporting plinth (usually in masonry) is also important to the structural integrity of the statue itself, and should be evaluated.

Where an inspection identifies a potential major problem, specialist advice should be sought. It may be necessary to remove the monumental bronze from site to a workshop, where specialist works can be more easily undertaken.

Consider whether any repairs are necessary

When considering repairs, maintaining the integrity of the historic fabric is crucial. The implications of various approaches to the repair of the fabric should be assessed. Could the monument, for instance, be carefully

cleaned and maintained in its current condition with no further repairs? Or might it be considered appropriate to protect the existing fabric by the application of waxes (a reversible treatment)? Perhaps the original surface patina has been lost or components are found to be missing, and it is thought necessary to recreate the original appearance. Where a monument is Listed, Listed Building Consent will be required, and advice should be sought from the Local Authority Planning Department and Historic Scotland (see Useful Contacts).

In any case, for all but the most minor of repairs, the advice of a specialist should be sought. Unnecessary replacement of historic fabric, no matter how carefully the work is carried out, will have an adverse effect on the appearance of the monument, will seriously diminish its authenticity, and will significantly reduce its value as a source of historical information.

Undertake repairs

Access to public monuments can often be awkward, and may require 'out-of-hours' work to minimise traffic disruption. Some monuments are accessible by temporary scaffolding or a hydraulic platform. Care should be taken at all times to protect the monument from damage.

Vandalism: Pinned letters on commemorative plaques can be prised off, and smaller components such as swords, buckles and fine details are particularly susceptible to damage. Graffiti can be a particular problem, as bronze monuments are often public landmarks (see Inform: *Graffiti and its safe removal*). Prompt action to remove graffiti is important, as the chemicals in the graffiti medium can in time chemically combine with the surface materials. Over time, it will become increasingly difficult to remove the graffiti without damaging the patina. Chemical treatments should be considered only as a last resort, and are not recommended. Steam cleaning can be an effective technique in the hands of an experienced operative (at low to medium pressures) but extreme caution is advised. Abrasive blast mediums can cause irreversible damage to the surface patina. The preservation of any remaining original patina is crucial.

Structural problems: Iron armatures (often wrought iron) are commonly to be found within statues, left over from the casting process or left in place to offer some structural support. Wrought iron expands considerably as it corrodes, which can cause 'corrosion jacking' of the surrounding bronze. Armatures may also have been knocked out of position into the path of the hot bronze during the casting process. Fixings into masonry can be areas for concern, as can the stability of the masonry sub-structure. The advice of a specialist should be sought to determine appropriate repairs.

Wrought iron armature captured in bronze during casting, subsequently corroding © D S Mitchell

Surface deterioration: Whilst a green (copper sulphate) finish may have been the intended patina, it is more likely to be the result of atmospheric attack by sulphur compounds in the atmosphere on a foundry patinated bronze, which may originally have been brown in colour. Industrialisation and the burning of fossil fuels left black soot deposits on many statues, and released sulphur compounds into the atmosphere that promoted the formation of copper sulphates. Interestingly, this surface finish is often described as a 'natural' patina, but it is not a stable finish. Some post-1945 examples use proprietary patination products, which effectively dye or colour the surface of the bronze. Other foundries used bronzing powders.

Proximity to heavy traffic, together with acid rain, has been shown to deteriorate bronze surfaces, when compared to surface deterioration on a monument in a park at a distance to traffic. Bronze exposed to a marine, salty environment will corrode, while droppings of roosting birds are also harmful to the patina, being particularly corrosive, and should be washed off at the earliest opportunity.

Poor Maintenance: Many monumental bronze pieces have suffered from well-intentioned, but often ill-informed, attempts at maintenance or repair. This might include bronze-work being painted with gloss paint to minimise maintenance, or the over enthusiastic use of blast cleaning, which may have destroyed the original patina.

Establish a regular maintenance regime

A simple maintenance strategy would involve an annual inspection and written record of monuments. A planned maintenance schedule may prove to be cost effective in the long term, when set against the significant costs often associated with major repairs. The management and execution of basic maintenance must be carefully controlled, but may be carried out by staff who have received appropriate training. The monument may be cleaned with water, possibly using a mild detergent (not under pressure). The cleaning and re-waxing of outdoor monuments every two to three years may be appropriate, depending on location.

Undertake measures to prevent future damage

It may be possible to deter access to the monument by mounting the monument on a masonry plinth, which may be surrounded by planting.

Useful contacts:

Historic Scotland Conservation Bureau & Technical Enquiry Service
Room G33, Longmore House
Salisbury Place, Edinburgh EH9 1SH
Telephone: 0131 668 8668
hs.conservation.bureau@scotland.gsi.gov.uk

Historic Environment Grants Team
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Historic Scotland Inspectorate
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PMSA Chief Executive
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War Memorials Trust
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