



## Factsheet G12 General Series

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House of Commons Information Office

# Restoration of the Palace of Westminster: 1981-94

After many years of exposure to the air pollution of London (especially from coal fires) the external façades of the Palace of Westminster needed restoration. This factsheet explains about the restoration that occurred between 1981 and 1994.

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## Historical Background

The planners of the New Palace of Westminster were aware, from the effect of coal burning on London's stone buildings, that the choice of a suitable stone was important. Expert advice pointed towards magnesian limestone, used in Westminster Hall, and a committee consisting of Sir Charles Barry, the architect, two leading geologists, and a stone carver toured the country in 1839 looking at quarries and buildings. Anston Quarry in Yorkshire was eventually chosen because the stone could be supplied in blocks up to four feet thick and it lent itself to elaborate carving. Moreover, this quarry was cheaper than the other quarries considered.

The first stone of the building was laid by the architect's wife on 27 August 1840; the House of Lords first sat in their new chamber in 1847; the House of Commons in 1852. When Barry died on 12 May 1860, the main work on the new Palace was complete; there remained certain minor works including the restoration of the Chapel of St Mary Undercroft, the colonnade and railings in New Palace Yard and the glazed lantern and the ironwork of the roof of the Victoria Tower.

Defects in the choice of stone were apparent in 1849. Barry experimented with various compositions on the stone that even then had been damaged, and believed the decay had been halted. A committee of experts, including Barry's son and his successor as architect, was appointed in 1861 to investigate the decay of the stone. The Committee's conclusions on the cause of the decay pointed towards the harmful effects of the polluted atmosphere of London and the quality of the material used. C.H. Smith, one of the Commissioners who selected Anston stone, had offered to inspect the stone, had offered to inspect the blocks at the quarry, provided he was paid £150 a year. The 1861 Committee regretted that Smith's proposals had not been accepted, owing to the difficulty over whether the Office of Works or the architect was responsible for 'this unimportant amount.' However, the 1861 Committee held that the stone was durable and a remedy would be found to arrest or control its decay.

In 1926, the Office of Works prepared a memorandum on the defective condition of the stonework. Between 1861 and 1913, nothing significant had been done to investigate or to prevent decay. However, since 1913, the building had been under close observation. A large fragment fell from the Victoria Tower in 1920 and on the Terrace Members were advised to sit near the river rather than underneath the main wall of the building. These events led to a systematic examination of the stonework on the entire building. There had been considerable handpicking of the stone between 1913 and 1925; approximately 175 tons were removed by hand, while in 1926 another 25 tons were ready for removal. Handpicking was denuding the building of its decorative features. Decay was now attributed firmly to the poor choice of stone blocks used on site, aggravated by the atmospheric conditions in London, and by the failure to mark the stone so that it was laid in its natural bed - in other words, in the same place as that it had in the ground - in the building.

The Office proposed that the stonework be restored over a period of 12-18 years and that the new stone should be carefully selected and rough-shaped at the quarry to minimise faults. In view of the cost of carving a hard stone, the Office proposed that elaborate detail not visible from the ground should be simplified. For instance, the open semi-crowns, especially those high up at roof level, were considered inessential:

they would therefore be carved with an infilling to represent velvet, thus giving them a solid bedding into the framework, preserving the architectural effect, and "meeting the needs of economy". Work on the stone progressed during the 1930s until it was halted during the War. The scaffolding erected in 1936 around the Victoria Tower was left in place. Work on the exterior of the Victoria Tower was finally completed in the early 1950s. Pollution continued to take its toll and by the late 1960s it became clear that major repairs were once again necessary.

## Stone Conservation Programme

The effects of all these early repairs - with new stone and pointing - were to make the Palace appear as a patchwork quilt. By the 1960s questions were being asked in the House of Commons, and one Member said the Palace looked like 'Joseph's multi-coloured coat'.

It was also clear the decay in the stonework was continuing unabated, and in 1971 the newly formed Department of the Environment was asked to investigate and advise on "the feasibility of cleaning the stone facades of the Palace of Westminster". A working group of experts was formed which consisted of the Directorate of Works London, the Directorate of Ancient Monuments and Historic Buildings - the forerunner of English Heritage - and the Building Research Establishment, supported by various specialists. It was agreed that the South Elevation of the Palace - Black Rod's Garden elevation - could be used for experiment and trials, since there was little knowledge or experience of stone cleaning techniques available at that time.

Much pioneering work was done to select the best method of cleaning the stone, and to identify the likely problems and an indication of costs. The trials - which were of great benefit to the fledgling stone cleaning industry - also revealed the full extent of likely repairs. These ranged from complete recarving of statues, replacement stone blocks, in situ conservation techniques and basic maintenance such as repointing. Three clear categories emerged and these were classified as "Repair, Restoration and Conservation" - RRC for short.

Since 1928, stone used in the restoration of the exterior of the Palace had been Clipsham, an oolitic limestone from Medwells Quarry near the village of Clipsham, in Rutland. The stone was quarried in the traditional manner and carefully selected and marked to ensure correct face bedding. The working group found it had worn well over years and recommended its continued use.

The results of the feasibility study were published by the Department of the Environment in 1973. The report recommended the complete and systematic restoration of the external facades of the Palace of Westminster. The report and recommendations were eventually supported by Ministers and the "RRC Stone Restoration Programme" was born. This divided the restoration of the external facades into eight separate phases of work:-

Phase I	New Palace Yard	1981 – 1982
Phase II	Westminster Halls and Peers' West Front	1982 – 1984
Phase III	Speakers Green	1982 – 1984

Phase IV	The Clock Tower	1982 – 1985
Phase V	The River Elevation and Chancellor's Tower	1985 – 1986
Phase VI	The Central Tower	1986 – 1989
Phase VII	Black Rods Garden Elevation	1990 – 1991
Phase VIII	The Victoria Tower	1990 – 1994

It was one of the largest and most complex stone restoration projects ever undertaken in Europe. The work was planned and managed by the Parliamentary Works Office, part of the Department of the Environment, until 1992. Following the Parliamentary Corporate Bodies Act 1992, the Parliamentary Works Directorate (Serjeant at Arms Department, House of Commons) has been responsible for continuing the restoration programme.

#### **New Palace Yard** (Phase I 1981-82)

The Commons West Front faces on to New Palace Yard, with the grand Colonnade in Portland stone added in 1866-69 by Barry's son, Edward.

On close inspection the stonework was found to be in fairly good condition, although extensive repointing was necessary. Statuary and heraldic devices required extensive repairs, some of which were done off site by a team of carvers.

The first stage of the restoration was carefully to clean the stone by water washing and hand brushing. The removal of the layers of dirt and pollution revealed once again the contrast between the crisp white of the Portland stone used in the Colonnade and the warm honey-coloured Anston used in the main building.

#### **Westminster Hall and Peers' West Front** (Phase II 1982-84)

An interesting feature of this phase was the variety of historical styles and differing stones used in the original construction. Westminster Hall (1394-99) was one of the few parts of the Old Palace which survived the fire of 1834. The west side of the Hall includes a sympathetic extension by J.L. Pearson (1888), which exposed the original flying buttresses. In 1822 Sir John Soane rebuilt the two towers and the main entrance in Bath stone.

The West Front facing Old Palace Yard was among the last sections to be completed 1852-1860 by Barry. This elevation contains very few statues, but there is an abundance of decorative carvings, elegant window tracery, shields, bosses, and crocketed pinnacles.

The delicate condition of the stone of the medieval carvings on the west side of Westminster Hall above the Pearson extension made normal water washing techniques unsuitable. A combination of poultice treatment and mild air-abrasive pencil gun methods were used. The cleaning of stonework revealed that a section of wall, previously damaged by a serious fire following a bomb explosion on 17 June 1974, was unsafe and had to be rebuilt. To prevent further deterioration and damage to the carvings, a lead covering was added to the upper cornice. The medieval carvings themselves were consolidated using Brethane.

Restoration and repair work on the Peers' West Front included the recarving of heraldic devices, repointing, the regilding of standards, orbs and crosses, the installation of pigeon netting and work on Sir Ninian Comper's stained glass memorial window in the south wall of St Stephen's Porch.

#### **Speaker's Green Elevation** (Phase III 1982-84)

The Speaker's Green elevation runs from the Clock Tower towards the River Thames and includes the Speaker's Tower. The elevation contains two pairs of windows to each bay between piers; the bays are separated by niches containing statues of Kings and Queens of England from the Heptarchy to the Norman Conquest, in historically appropriate costume.

Strict controls were placed on the amount of water used in the cleaning process owing to the proximity of the fine interiors of the State Rooms in Speaker's House. The cleaned stone was found to have suffered bomb damage during the Second World War. Both here and at the rear of Speaker's Tower several areas of stonework were replaced where there was a risk of structural failure or water penetration. Many of the carved features such as sceptres, badges and inscriptions were carefully repaired and conserved by injecting resins to conserve the stone and reduce the rate of decay.

#### **The Clock Tower** (Phase IV - 1982-85)

The Clock Tower - often (erroneously) called Big Ben - is 314 feet high. It is constructed on a framework of cast iron girders, with Caen stone and brickwork for the interior and Anston (original) and Clipsham (replacement) stone for the exterior.

In 1934 the Clock Tower received a wash and facelift to repair damage caused by years of soot, smog and pigeons. This had been undone by the 1970s: the 1982 repair, restoration and conservation works required a massive scaffolding, using a total of 27 miles of tubing. The stonework was cleaned using water washing techniques. Various repairs were carried out.

An interesting aspect of this phase was survey and restoration of the clock faces. The minute hands are made of copper sheet, hollowed and fashioned into shape. They are 14 ft long and weigh 2 cwt each. The hour hands are of solid gun metal, weigh 6 cwt and are 6 ft long. All the components were inspected and tested using x-ray analysis in conjunction with scientists from the Atomic Research Establishment at Harwell. The hands were then repaired and repainted.

Another important aspect of this phase was the repair and restoration of the cast iron roof and lantern. The tiles were first shot-blasted to remove grime and corroded paintwork followed by inspection and extensive repairs, an anti-corrosion treatment of hot zinc spray and sealing with a paint system.

After proper historical research and analysis of the existing paint layer, extensive redecoration and gilding works were carried out to the metal work, clockface, shields and heraldic devices and surrounding details, so as to return the Clock Tower to its former glory. In all 4000 books of gold leaf were used.

**The River Front and Chancellor's Tower** (Phase V - 1985-86)

The river front comprises Speaker's Tower and Chancellor's Tower with two further smaller towers dividing the main elevation into thirds, the central section being raised an additional storey. The raised River Terrace has a retaining wall comprising a granite lower section and an upper section in original Anston and restored Clipsham.

Owing to the risk to the libraries from water penetration, the stonework was cleaned by mild air abrasive techniques, which required great care in the selection of nozzle sizes and pressures to minimise any damage.

The condition of the stonework was found to be considerably worse on this phase and more extensive repairs had to be carried out. Of particular interest was the replacement of the large carved panels on Chancellor's Tower. Owing to the quantity of stone required it was necessary to augment the Clipsham stone with Anstrude stone from France. Other works carried out included the gilding of standards, orbs and crosses; renewal of lead flashings; cleaning of the river wall; repointings and painting the metalwork.

**The Central Tower** (Phase VI 1986-89)

The Central Tower was originally designed to act as a great chimney for both vitiated air and smoke from open fires. Barry turned a purely engineering necessity into a great Gothic Spire soaring 300 ft in the air.

Because of the complex arrangement of pinnacles, it was necessary to ensure that the entire scaffolding system was independent and self-supporting. As part of the restoration works pinnacles, which had been missing since the Second World War, were rebuilt.

Other restoration works included the rebuilding of unstable pinnacles, the replacement of decayed and fractured window tracery, the regilding of standards, orbs and crosses, repairs to the stained glass in the lower lantern, and the installation of a stainless steel reinforcing band to the structure of the upper lantern.

**Black Rod's Garden Elevation** (Phase VII 1990-91)

Because of the extensive cleaning trials that were carried out on the South Elevation between 1971 and 1972 the surface of the stone was relatively clean. Some build up of pollution had occurred, however, mainly from particulate matter from car exhaust fumes. The elevation itself was also patchy in appearance between bays and this was ascribed to the different cleaning techniques used in the earlier trials. It was therefore decided to clean the stonework lightly to give a uniform appearance and to carry out a full inspection to determine the extent of decay.

This elevation contains numerous statues and heraldic devices, and these were found to be in a satisfactory condition. During inspections defective ashlar was identified in a number of bays and this was replaced with new stone. Extensive repointing was also carried out and a number of the small pinnacles at roof parapet level were taken down and rebuilt and the orbs and crosses regilded.

## **The Victoria Tower (Phase VIII 1990-94)**

### **Introduction**

In many ways the Victoria Tower restoration was the most challenging and complex phase of the RRC programme. Often its sheer size is not appreciated.

At the time of its construction it was the tallest building in the world, four times larger on plan than the Clock Tower. There were other complications as well. For example: constant access was needed both through the Sovereign's Entrance and the site compound in Black Rod's Garden for emergency vehicles, ancient manuscripts stored in the Tower meant that dust and water had to be excluded at all costs, Peers and Law Lords either side of the Tower were to remain in occupation and the State Opening of Parliament required access for the Sovereign's coach as well as the BBC outside broadcasting engineers and the Royal Corps of Signals!

### **Survey and Inspection**

In planning the present restoration, one of the first tasks was to ascertain its overall condition and to identify particular problem areas. In late 1988 and early 1989, a team of surveyors had carried out a detailed inspection of the external masonry using high-powered binoculars. This was followed by a careful examination of the statuary and decorative details using a system of cradles suspended from the roof. The information obtained from these surveys formed the basis for the contract specifications, drawings and detailed estimates.

The detailed survey had revealed that, whilst most of the statuary was in a sound condition, the crown pinnacles and some of the lion pinnacles were showing signs of deterioration. Although the stonework was generally in a good condition, the build up of pollution from coal burning in the late 19th and early 20th centuries - and more recently from exhaust emissions - had taken its toll in various locations. It is a credit to those involved with the initial surveys that very little additional work was found necessary on site and the project finished within budget and ahead of programme.

### **Scaffolding and Preliminary Work**

The intricate web of scaffolding that encased the Victoria Tower for three years was the subject of considerable interest and comment. With its 68 miles of scaffold tube, and its 125,000 fittings it was one of the largest independent scaffolds in Europe. The entire scaffolding, weighing 1,000 tonnes, was supported by a system of heavy duty structural steel Bailey Bridges and Towers. This load was transferred on to a ring of concrete piles cast at strategic points around the base of the Tower to a depth of 26m. Engineers carefully monitored the scaffolding to ensure that the stability of the Tower was not affected by the works.

Once the scaffolding was clad in protective sheeting, the interior of the Tower - containing many important historic Parliamentary archives - was connected to a mechanical ventilation and filtration system located in Black Rod's Garden. This ensured that stable environmental conditions were maintained in the archive rooms throughout the restoration process.

Restoration and Conservation Work

### **Stonecleaning**

Once a proper access system was in place, the first basic task was to remove the

accumulation of dirt and pollution from coal burning and exhaust emissions. This cancerous growth had eaten into the limestone and begun to attack its crystalline structure, causing decay and spalling. The cleaning process consisted of a combination of water washing and hand brushing, air abrasive techniques and poultices.

### **Repairs and Repointing**

After cleaning, each area was reinspected and a detailed schedule of works was prepared. Altogether 1,200 individual repairs were carried out and 7,000 yards of defective joints were repointed, 1,000 cubic feet of decayed or defective stonework was replaced and over 100 shields or heraldic devices were recarved on site by a team of stonemasons.

### **Stone Pinnacles**

Non-destructive testing of the lion pinnacles on the four Corner turrets and the crown pinnacles on the roof parapets revealed that a number were unstable. In view of the risk to public safety, six crown pinnacles and thirty-two lion pinnacles were taken down and rebuilt using salvaged stone and stainless steel dowel bars. The opportunity was also taken to reintroduce the gilded standards to the lion pinnacles, thus restoring Barry's original scheme.

### **Roof Works**

Various types of repair were carried out on the extensive cast-iron roof, including stitching of cracked tiles and cast-iron components, renewing fixings and replacing a small number of castings. The cast-iron roof and flagmast were cleaned back to bare metal and given an anti-corrosion treatment of hot zinc spray, followed by a proprietary paint system.

### **Decoration and Gilding**

Historical research and site inspection revealed that the original extent of gilding to the cast-iron decorative features on the roof had been much more extensive. A large amount of overpointing had occurred during the 20th century and the loss of gilding was now in marked contrast to the restored Clock Tower.

Samples of the existing paint were taken from all parts of the roof for laboratory examination, and this evidence together with historical research, provided an accurate account of the original decorative scheme. Teams of craftsmen faithfully restored the decoration and gilding to its former glory and the completed scheme achieves a balance with the restored Clock Tower at the north end of the building.

### **Miscellaneous Work**

Pigeons are a perennial problem at the Palace and a system of netting now protects statues and other vulnerable points. The opportunity was also taken to comply with the latest British Standards Code of Practice on lightning protection and a new system, carefully concealed, now protects the Tower.

Anyone who lives in an old building knows that it is expensive to maintain. Time is an unfriendly guardian of buildings, and worse are pollution and decay. The Palace of Westminster was a building that set its stamp on an era. We of a generation used to soaring towers and massive buildings can have little conception of the impact it had on the mid-Victorian imagination, but without doubt the Palace was the most



influential and most far-sighted of its generation. To those who come after falls the job of conserving, making good, and interpreting Barry and Pugin's masterwork, and also of undoing the shortcuts and unsympathetic adaptations of those who lived through a time when Victorian work was deeply unfashionable. The cleaning and restoration of the Great Palace - a World Heritage Site - has been achieved only with massive effort, by expert and artisan; and at great expense. This Factsheet has tried to chronicle the work for posterity.

The purpose of this Fact Sheet is to provide an informative account of the history, planning and restoration work undertaken between 1981 and 1993. It is not intended as a definitive documentary record of the restoration.

A detailed archive report on each phase is in preparation which will document all aspects of planning, specifications and bills of quantity; contact action; scaffolding; access and logistics; survey and inspection; the extent and location of repairs; restoration and conservation work; lightning protection; miscellaneous works; photogram metric records; and progress and completion photographs.

These documents, running to several volumes, will be deposited in the House of Lords Records Office and in the technical library of the Parliamentary Works Directorate. This archive information as well as being an invaluable source of information for architectural historians recording the buildings' history over time, will also be essential to those who come after us and continue the tradition of conserving and where necessary restoring Barry and Pugin's Palace.

The completion of the restoration of the Victoria Tower in 1994 brings to a conclusion the major programme of external stone repair, restoration and conservation which commenced in 1981. The restoration work relied on the skills and expertise of many individuals and was characterised throughout by a dedication to a great goal - that of preserving our heritage for future generations. As a result of the high standard of conservation and restoration work, the Palace of Westminster has received numerous awards and commendations. The most recent of which was the award of the Worshipful Company of Masons, presented by the Lord Mayor of London in November 1994.

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