



# Scotstoun House

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Sust. Programme.



**Architecture+DesignScotland**  
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# Scotstoun House

*The adaptation and extension of a poorly performing but listed 1960's office building to provide a BREEAM Excellent and EPC A-rated building to meet the client's needs for the next 20-30 years.*



## BACKGROUND

Already overflowing its central Edinburgh offices first established in 1960, in 1965 Arup Scotland purchased Scotstoun House at South Queensferry (near the just completed Forth Road Bridge). They demolished the 18th century house and in 1966 built a low, single-storey, pavilion-like office building (designed by Peter Foggo of Arup Associates) at one end of the walled kitchen garden, with outlooks into the walled garden and over the lawns of the former house. A cottage and stable at the other end of the walled garden were converted into a plant room and a caretaker's house.

Originally designed to house 60 staff, by 2005 100 were working in the building and its cellular layout, adapted with much effort over the years, was inflexible and did not suit the way the company wanted to work. The space was cramped, poorly ventilated, had only one meeting room with limited facilities such as a staff kitchen; there was not enough room for printing equipment and a prefabricated structure had been tacked onto the building for archives storage. In the concrete and glass structure (with limited insulation), the occupants were cold in winter and overheated in summer; with the window blinds down almost continuously to protect its inhabitants from glare, heat or cold, and with its wood-panelled partitions and ceilings, the building was dark and the fluorescent strip lights were on for 12 hours every day. Despite some affection for its growing status as a classic building of the 1960's it was not a comfortable place to work, and did not provide a good image for Arup in the 21st century.

With an open mind as to whether the building could be converted or extended to meet their current and future needs, or whether they should demolish the building and re-build, or sell the building and move elsewhere, Arup Scotland commissioned haa design to look closely at their business, how they wanted to work, what the business might look like in 20 or 30 years' time, and to look at how future needs could be met with their existing site and building. In 2005, while this process was still taking place, and after haa had drawn up an initial design for extending the

^ Planting and setting of site was preserved

> New entrance

<< Exterior of building



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existing building on two sides, Historic Scotland spot-listed the building as B grade. The listing covered the 1960's building, much of its interior furnishings, the walls of the kitchen garden, the cottage and outbuilding, with the pavilion-like setting of the new building in the old park something that Historic Scotland were keen to see preserved.

Exterior junction between old and new buildings ^

The factor of the listing brought the options for Arup and for the development of the building into closer focus. If the building could not be altered or extended in a way that would meet Arup's needs, they might have to move and develop on a different site; this could then bring a threat to the survival of this building – what other uses could be found for it? But if the building could be adapted and/or extended in a way that suited Arup and met Historic Scotland's aspirations for preserving the building (which could also be seen as part of Arup's heritage) then everyone would be satisfied.

## APPROACH

One aspect of sustainable design was therefore embedded in this project from the very beginning – the re-use of an existing building and its ultimate conversion to meet present-day standards of energy use and environmental quality for its occupants. Continuing to work on how to accommodate Arup's needs, haa design proposed the creation of a simpler addition, connected to the south-east face of the existing building, and extending within the space of the walled garden. With its height carefully designed to complement the 1966 building, and new and old separated by a clear link, this proposal was able to satisfy Historic Scotland's requirements of enabling the 1966 building to continue to be read separately and leaving



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its relationship to the garden and the park clear. The proposal was also able to satisfy Arup's requirements by providing an additional 625 sq. m. of space to accommodate a new range of core service areas, meeting-rooms and break-out spaces, together with a new entrance into the building and a much better public face to the business.

The confirmation that this option was feasible and the detailed designing and planning that ensued came from a process of continual discussion between Arup as client, haa design, Historic Scotland and the planning authority The City of Edinburgh Council (CEC). Haa had worked with Arup before (on the re-modelling their Glasgow office) so they already had a good working relationship with them. As recognised leaders in the field of promoting sustainable design, Arups were in the process of developing a strategy for the design of sustainable buildings to use with their clients, contractors (subsequently published by Arup as 'Designing Sustainable Buildings'). Engineers from Arup's Edinburgh office became part of the design team, and staff in their London office also provided input. The Arup Scotland directors set a target of the new building achieving a BREEAM rating of 'Very Good', and an EPC A-rating. When the building was being designed, the City of Edinburgh Council had a staff team dedicated to assessing the sustainability of planning proposals, who requested proof that the building would achieve BREEAM 'Very Good'. This required a full sustainability assessment before the planning application was lodged. They also expected that the building would conform to Section 6 of the 2008 Scottish Technical Standards, desirable, but not a requirement for a refurbishment project.

With a dedicated BREEAM facilitator in the Edinburgh office, and full backing from Arup Directors and staff in both Edinburgh and London, the sustainability assessment for the building was started at RIBA Stage B, and fully costed by Stage C. Having a discussion about sustainability embedded in the conversations from such an early stage meant that the approach agreed was inherently part of the design and then subsequently also of planning conditions. Although detailed measures were a subject of continual discussion and cost-checking, the commitment was not an add-on, and could not be reduced; measures were in fact enhanced as the project developed, with the building finally achieving BREEAM 'Excellent'.

From the beginning, the project had specific aims of bringing as much natural light as possible into both the old building and the new extension, creating excellent air quality, cooling and ventilation through passive means throughout the whole building, providing a low-carbon source of heating and reducing energy bills and carbon emissions. After determining the overall plan, form and orientation of the building, extensive analysis of the existing building and modelling of air-flows, temperature variations etc., was carried out to detail the performance of the external envelope and refine the design, specify glazing and ventilation solutions and select low energy systems. The preservation of the external walls of the old building, the fenestration and the timberwork fitted internally into these walls (which came as part of the listing of the old building) defined certain parameters; equally new interventions, such as the opening up of the interior space of the old building and the introduction of more natural light, were appreciated by Historic Scotland for the degree to which this showed

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off the character and detail of the old building. A continuous dialogue with both Historic Scotland and the CEC planners led to both bodies buying into the changes proposed and gaining increased confidence in the approach of the design team and the solutions being proposed. For example Arup's environmental modelling prediction of likely over-heating in one corner of the old building led to a proposal to change two fixed windows into opening French windows, but equally to the shortening by the design team of the link between the old and new buildings, to increase the flow of air around the building at that point.



Interior junction between old and new buildings ^

## PROCESS

The forms of procurement and construction for this project were essentially traditional but the development of a close working relationship with the main contractor was critical to the success of the project. Detailed discussions took place prior to contract sign-off, so that key construction elements and building sequences were fully understood. This resulted in a realistic programme and generated a sense of 'buy-in' which worked to all parties' benefit as the project progressed.

Haa design spent a considerable amount of time analysing the working patterns of the Arup staff, how teams interacted, how copy points, recycling points and tea points would be used, how incidental meetings could be promoted, what were the detailed storage needs etc. In addition to the input of the directors in the office, a Scotstoun Users Group with one representative from each of the main work areas was brought in to contribute to the on-going brief and development of ideas, and provide feedback after the new office was opened. With a passionate commitment to the project, and a desire for the finished project to be of the same standard as other Arup offices, the board of Arup in London also contributed to the development of the design.

The need for new construction materials was reduced as the main structure and the external walls of the existing building were being retained and re-used. The extension utilised one of the existing garden walls, which was levelled and underpinned, and part of another one which was partly demolished, stored and rebuilt as part of the redevelopment. On site material was stored and crushed, and then used for granular fill across the site and under road bases. Some elements of prefabrication were used to reduce construction waste on site. Conversely, the nature of the old building and the materials that did have to be retained (walls, window format, timber, steelwork etc.) meant that only limited intervention in the old building was possible and close attention had to be paid to solar gain, heat build-up, ventilation paths and so on.

Many low-energy technologies were proposed during the design process but many of these were ruled out as not being cost-efficient for a building of that size, or compatible with the design. Rain water harvesting for example was rejected both on cost grounds and because the parkland surrounding the building provided the opportunity to install a swale to capture and disperse all water run-off, coupled with a sustainable urban drainage system for the external areas.

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^ Main work area

Materials were selected on the basis of a Green Guide A rating. Natural, inert and recyclable materials were used throughout. The tone of the existing building was reflected in the choice of concrete, timber, steel and glass as the primary materials used in the new extension. A new aluminium capping to the old building is mirrored in the extension and in the choice of aluminium for the new windows, creating strong lines in a soft parkland setting. Lead was the one new material introduced, chosen as a softer material to tie in with the blue engineering brick on the exterior fringe to the old building.

## RESULT

In outline, a slender new build extension was added on to the south east side of the 1966 building, with a glazed link section that provides a visual separation between old and new. The new extension continues beyond the former front face of the old building towards the North West, at this point utilising the old garden wall as its easternmost side. The bulk of the relationship between the old building and its parkland setting is therefore retained, as is the relationship between the old building and the setting of the walled garden. Being within the space of the old garden, the extension forms a new right angle to the former entrance façade of the old building, providing a satisfying form of enclosure to the garden, which becomes a new ‘piazza’ serving both the new and the old parts of the building.

While the old access through the walled garden from its north end is retained, the main entrance to the building is now directly into the new build part of the building from the car parking area that always lay behind the walled garden to the east of the building. Historic Scotland stated that the height of the water-tank on the roof of the old building should be a maximum height for any new work: the new entrance gains maximum prominence by taking this as its height, with the rest of the building continuing at a variety of lower levels. The reception area leads into a flexible informal waiting or meeting area, in which Arup intend also to have changing art exhibitions, and which can also be used as a function area, looking out onto the walled garden. This space leads to two meeting rooms and finally at the northernmost end of the new build, to a ‘project room’ which can also seat 100 for a conference. All rooms are equipped with audio visual equipment to support video-conferencing and therefore to cut down on inter-company travel, although the current installation is not as ambitious as was once planned or as could be installed in the future.

Turning left from the reception area leads towards the main work area of the office, within the old building, and to the office area’s back-up facilities, which are located in the remainder of the new build part. This includes staff toilets, administration, communications room, print room, archive area and finally, a generous-sized south-facing staff café with direct access to the parkland. The junction between new and old is a top-lit link section, laid out as a ‘touchdown’ or meeting area with both formal and informal tables and chairs. An additional 16 work stations could be fitted into this area if staff numbers outgrow the main work area in the old building.



^ Outside social space



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Reception area

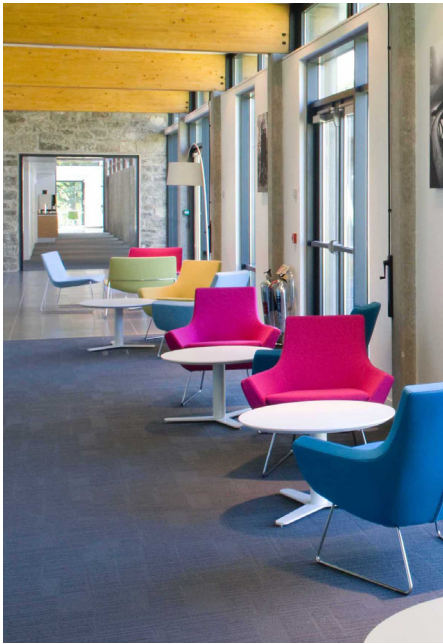


Three connections from the new extension and link area into the old building have been created by negotiating the removal of the glazing from windows in the old building. Within the old building all of the partitions have been removed and what was the external courtyard at the core of the building has been roofed over to create additional space in the centre of the building. Originally envisaged for administration personnel this is now dedicated to work areas for the senior management, containing 6 desks and two small meeting areas. Although this area has a small degree of separation from the main work areas, it remains connected and is in a sense at the heart of the business. Circulation into this area has again been created by the removing the glass from former windows; this higher central area, with a clerestory screen of glass around all four sides, introduces a new variety to the total work area.

A small glass-walled, informal meeting room or pod is located at each inner corner of the main work area. Each of these spaces can be ventilated by a solar-powered 'wind-catcher' located on the roof above it. Coat lockers, tea-points, recycling and copying stations are tucked in alongside these areas.

The remainder of the space in the old building is open-plan, with workstations for 120 staff. All the existing structural steel-work in the old building was retained, and the pine tongue and groove ceiling, punctured too badly over time to be retained, was replaced on a like for like basis as part of the replacement of the entire roof. Historic Scotland insisted that the timber shelving recessed into the concrete wall sections of the old building was retained, together with the wooden cable-trunking that runs round the perimeter. A new 95mm raised floor replaces the former solid floor. Service

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^ Breakout office spaces

boxes are embedded into the floor to enable the location of 20 additional workstations. With desking kept away from the perimeter walls, everyone has access to the views to the windows and to the parkland outside.

The whole building is separated into 10 zones for heating and fresh air control, with a target temperature of 21°C. Hot water, from a tank, heated by the biomass boiler in the plant room is pumped through pipes that run around the perimeter of the old building. Ventilation is entirely natural throughout the whole building, with new manual winding handles fitted to the 'hoppers' at the top of the old windows, and the louvers in the clerestory of the central core and in the link area designed to open automatically when temperatures exceed settings by 2°C. The only mechanical air-cooling in the building is in the print room and communications room.

An integrated control system monitors the energy performance of the entire building. This system can identify leaks, highlight wastage, and provide detailed performance analysis. The internal and external environments are comprehensively monitored for temperature, relative humidity, carbon dioxide and light levels. The system includes a weather station, the output of which is used to validate the original modelling of the daylighting against measured values.

Insulation has been increased in the old building through replacing all the old Crittall single-glazed windows with like for like double-glazed alternatives. Due to height and load restrictions above the ceiling in the old building (which received a completely new roof) thermal mass has been added to this part of the building through the installation on the upper surface of the tongue and groove boarding of a 5mm layer of Phase Change Material (PCM). When the room temperature increases the PCM melts and absorbs and stores heat. It releases the heat when the temperature drops in the evening and overnight and the material returns to solid. Not used before in an office situation, this provides additional thermal mass that is purportedly equivalent to 150mm of concrete. In addition to the light coming into the building through the new clerestory windows around the new core, over 70 solar tubes (sun pipes) are fitted into the new roof to bring natural light directly into the working areas. Suspended low-energy fluorescent lighting is triggered to come on when natural light levels fall below 400 lux.

In the walled garden, fruit trees and climbing plants have been retained, and benches installed so the space can be used as an outdoor room and informal meeting space. The space has been levelled to create easy access from the whole of the building – old and new.

The cottage building was refurbished to provide showers, drying racks and lockers for the use of those cycling to work, and the existing meeting room upgraded. The new biomass boiler (a mandatory requirement from the City of Edinburgh Council) and a storage unit for the biomass pellets were inserted in the old plant room, along with a back-up gas boiler. The pipes from the boiler to the office building use the same trench as the 1960s boiler. As an extra to the main contract a new cycle shed was built adjacent to the cottage buildings. A survey of staff revealed that an average of 10% of staff might cycle to work (a 1 hour journey from Edinburgh, with some coming from Fife). The shed accommodates 20





cycles, leaving space for staff based elsewhere attending conferences or meetings at Scotstoun House. The installation of the cycle shed was the final step that ensured the whole building gained its BREEAM Excellent rating. Although a public bus service does pass near Scotstoun House, public transport to the location is not good. One Edinburgh City Car Club car is located at the building (as required by the City of Edinburgh Council) for use by Arup staff.

^ Social space created inbetween old and new building

## IN USE

The move to an open-plan working situation was a big change for the staff at Scotstoun House, as well as the changed location of administrative staff, filing, etc., and the new ways in which teams were able to or expected to connect. Feedback confirms that staff find the new Scotstoun House a much more pleasant place to work in, with comfortable temperature levels, much fresher air, more space and more day-light: Staff particularly appreciate the variety of spaces in the building, and the ability to walk away from main work spaces and work or take a break in a different part of the building. The extra meeting rooms are also valued. The cycle storage facilities and showers and changing rooms are also appreciated. In 2011 Arup's Dundee office closed and staff and filing were successfully accommodated in the new office at Scotstoun.

The building makes the most of its location, with everyone able to feel part of the green setting, and the wildlife that comes with it in the form of birds, deer, and rabbits.

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Additional comments have been that the desking arrangement, levels of lighting, acoustics, heating and cooling provide a working environment conducive to much greater productivity. The building has been through two summers with temperature remaining steady and comfortable, confirming that the advance modelling was accurate. The continued monitoring that takes place confirms that the PCM in the ceiling of the old building is functioning as designed. There is some feeling that the clerestory louvers in the central core of the old building were over-designed, i.e. have more ventilation capacity than is required.

Arup's service engineer working on the project noted that they had omitted to model the heating and ventilation requirements of the reception area – traditionally difficult to serve with natural ventilation due to its propensity to be either too hot or too cold. The reception staff open a window to provide ventilation for this area.

Arup have validated the accuracy of the original model that predicted yearly energy usage and demonstrated that the daylighting scheme is saving 60% of the electrical energy for lighting annually compared with the previous building. Modelling also predicts that heating costs will be reduced by 30%.

The project was subject to the 2008 Scottish Technical standards for energy usage, which were not only achieved but significantly exceeded. The refurbished building achieved a BREEAM Excellent rating and EPC A-rating, an outstanding achievement considering the restrictions imposed by the original building.

The operation of the biomass is managed by Arup themselves, and they have taken time to optimise its operation, turning it on at night so as to fill up the buffer vessel of hot water ready for distribution in the morning. The client also acknowledges that Scotstoun House has re-established its place within the Arup oeuvre of quality architecture.

## KEY LESSONS

Haa design's previous relationship with Arup and the shared vision between haa, the Arup team in Edinburgh (as client and engineers and as BREEAM facilitators) clearly put the project on a good path from the outset. This particularly applied to the overall vision of sustainability that was shared between the Arup offices in Edinburgh and London, and the depth of Arup's knowledge about sustainability and their commitment to it at a fundamental analytical level. haa design have also been designing sustainable buildings for over 15 years, and have detailed knowledge of the BREEAM process, having used it as it has developed over the years. Their approach is also to create sustainable buildings designed around first principles, and then integrate appropriate technology. The development of a close working relationship with the contractor and the detailed discussions that took place to understand key construction elements and building sequences played a significant part in the completion of the project on time and on budget.



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The extent to which Arup were able to model the new building prior to proposing solutions for heating, lighting, ventilation, etc., contributed greatly to the design of those solutions, which has attested by the monitoring of the building's performance once it was in operation. The particular attention at that time being focused on sustainability by the planners at City of Edinburgh Council and the standards they were asking of developers reinforced what the team themselves already felt, and the proposals that addressed sustainability became integrated into the development and became part of the planning consent.

Historic Scotland's listing of the building clearly reinforced the retention and renovation of the old building as part of the ultimate solution for meeting the client's needs on that site and avoiding a 100% new build option, together with the retention of much of the existing fabric. This starting-point also acted as a major driver to the solutions ultimately developed in reaching the BREEAM Excellent rating and the EPC A-rating, in that the limitations imposed by the old building demanded more innovation in developing insulation, ventilation, heating and lighting solutions, and ultimately the design for the total new building.



Exterior of building



## Project Information

Location: South Queensferry, Edinburgh, West Lothian, EH30 9SE  
Client: Arup  
Date Completed: June 2010  
Project Value: £.3.56m  
Internal Floor area: 1682m2 (Existing Building – 930m2, New Build – 625m2, Stable Block 100m2)

Architect: haa design Ltd  
Structural Engineer: Arup Scotland  
Services Engineer: Arup Scotland  
Quantity Surveyor: Neilson Binnie McKenzie  
Main Contractor: Ashwood Scotland Ltd

### Awards:

- British Council for Offices Refurbished / Recycled Workplace Regional Award and National Award 2011
- Edinburgh Architectural Association Award 2011
- 2011 Scottish Design Awards - Sustainable Design category
- RIBA Award 2011
- Roses Design Award 2011– sustainable design

Image Credit: Alan McAteer Photography

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