Overcoming the barriers to sustainability

The recent demolition of an office block in the City of London provides tangible evidence that environmental measures can be implemented even in the most difficult of circumstances

Tower House was situated above and adjacent to Tower Hill Underground station

Despite a number of unique challenges, a remarkable 99.75% of waste generated by the recent demolition of Tower House was recycled. The project involved the removal of two adjoining properties in the heart of London's financial district. The five and seven storey buildings, which had been vacant for several years, were demolished to make way for a high quality office complex for London property developers City Offices Real Estate (CORE).

However, their location presented a number of exceptional obstacles for specialist inner-city demolition contractor Clifford Devlin, which made the project particularly demanding.

The south building was situated adjacent to, and directly above, Tower Hill Underground station that had to remain open and operational throughout. The contractors therefore were required to install a weatherproofed lightweight steel protection deck above the first floor slab to prevent possible debris from damaging the station's ticket hall and to ensure the safety of passengers using the main entrance directly below.

The building to be demolished was located in one of London's busiest areas

People presence

The presence of tens of thousands of commuters and tourists (visiting the nearby Tower of London) as well as live offices in close proximity to the site meant strict environmental controls needed to be put in place. A number of measures were implemented to minimise the emission of noise, vibration and dust. Where possible, low impact, non-percussive equipment was used during the structural demolition.

"When working in built-up areas we are obliged to use less intrusive demolition techniques," explained Clifford Devlin's project manager, Rob Unwin, "Typically this involves mini excavators fitted with hydraulic attachments such as crackers and pulverisers to carefully dismantle the structure internally."

This type of work is better described as deconstruction, as it often involves progressive, internal part-dismantling that is very labour intensive. Diamond drilling and saw cutting, techniques that further reduce noise and vibration were also used to fracture and sever the larger concrete structures such as the floor slabs close to the Underground station and a Roman Wall located just a few yards from the rear of the building. The latter had been designated by English Heritage as an ancient monument and had to be preserved.

The release of dust to the immediate environment was suppressed by encapsulating the site in translucent plastic sheeting and spraying the active workface with a fine water mist. Sound, vibration and air monitoring were carried out at regular intervals throughout the project to ensure emissions stayed within acceptable limits.

However, it was the severe limitations on space that made the process of recovering and recycling waste so arduous. "Typically, even in inner city projects, there will be some ground space within the site boundary where arisings can be segregated into different material types and placed into skips awaiting removal," said Mr Unwin, "However, the Tower House site

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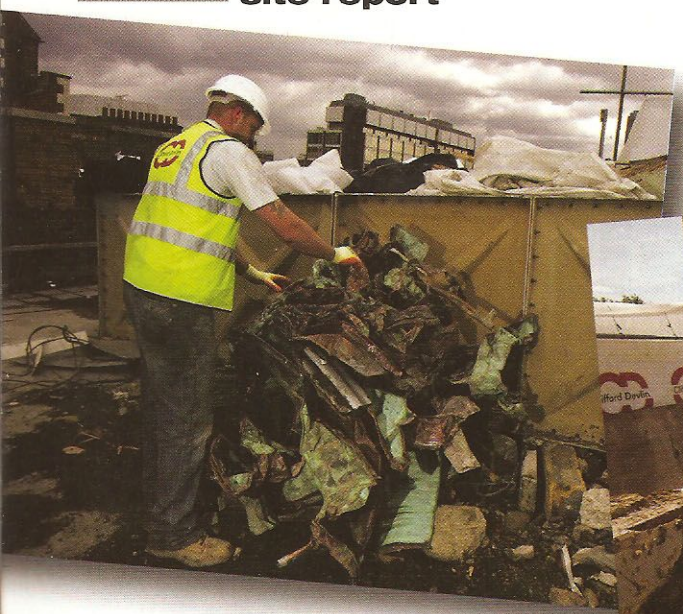
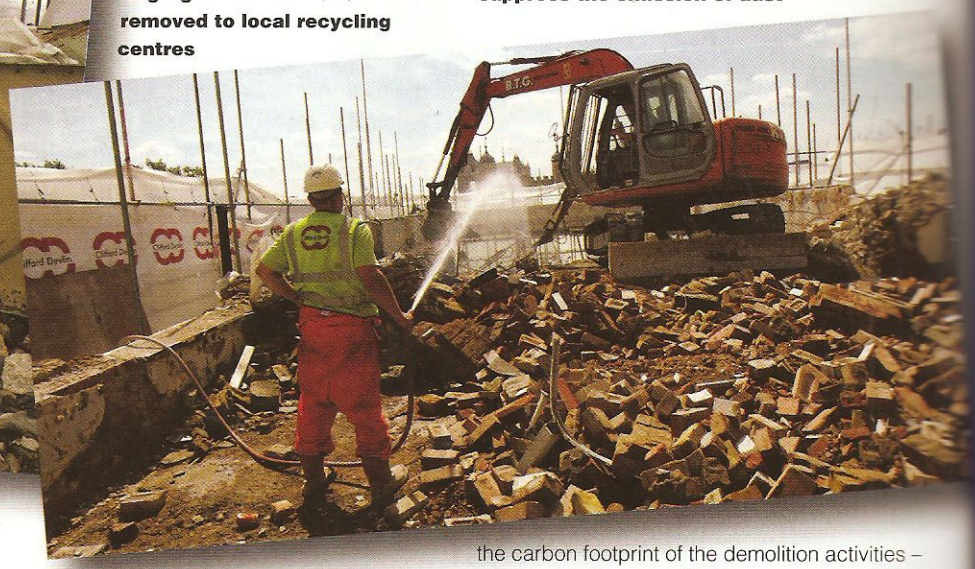


Waste material was segregated on-site and removed to local recycling centres



Water was sprayed onto the workface to suppress the emission of dust

was enclosed on all sides by adjoining properties or public areas which needed to remain fully operational."

The only space available was a small inner courtyard, which, for the majority of the project, was occupied by an excavator used to load each lorry as it arrived. With no room for skips on-site, waste was filtered down through well-holes created in the structure to ground or first floors where it was sorted and piles of each waste stream left in-situ within the building. Only when enough of each material had been collected could a tipper lorry be summoned and loaded within the courtyard and the waste removed from site.

The only access route to the site cut across a 'live' pavement frequented by thousands of pedestrians on their way to/from the tube station. Vehicle movements were agreed in advance with the Local Authority and limited to certain times of the day (after 10am and before 4pm) and required a full-time dedicated Banksman to coordinate them. This further complicated the process of removing waste from site and required considerable planning to sequence removal operations.

Waste handling

The overwhelming majority (88%) of the 7,700 tonnes of waste generated by the project was hardcore – brick and concrete aggregate. Typically this would be crushed on-site and employed to fill voids or left in-situ for use in the construction phase. However, there was no available space to locate a concrete crusher at Tower House. Apart from a very small quantity, which was used to create piling mats, all of the 6,800 tonnes of hardcore was loaded onto skips using an excavator fitted with a bucket attachment and removed for crushing at local recycling sites in Essex and Kent.

In compliance with the Site Waste Management Plan Regulations, all of the waste was calculated and recorded using waste transfer notes and consignments. The only waste stream that could not be recycled was 500 kg (1,100 lb) of asbestos insulating board that was found in ceiling voids, the lift shaft and during excavation. Due to its toxic nature this was transferred to Clifford Devlin's own Hazardous Waste Transfer Station and eventually landfilled.

Part of the environmental data submitted on completion to the client was a calculation of the consumption of materials and energy used during the demolition phase and expressed in terms of CO_2 production i.e. the carbon footprint. This discipline is increasingly being applied to building projects, as sustainability targets are required. Many Planning Consents now demand adherence to the UK's Building Research Establishment's Environmental Assessment Method (BREEAM) and require a 'score' for sustainability to be achieved. Several points are available for following best practice in on-site activities that include waste management, pollution control and the preparing of targets and monitoring CO_2 production.

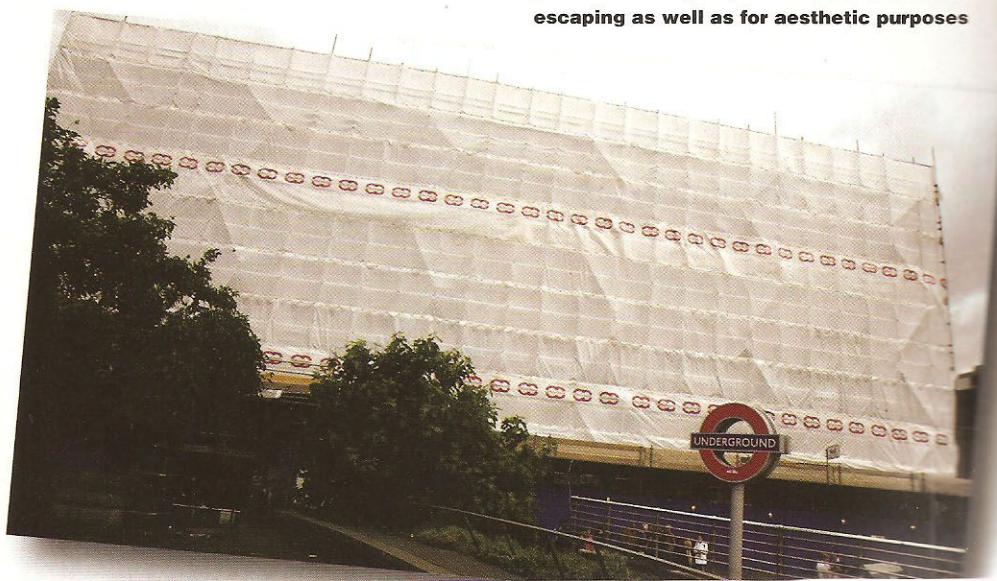
"We have been routinely calculating the carbon footprint of large demolition projects for several years," said Clifford Devlin's environmental manager, Paul Clarke-Scholes, "Our experience is that the overwhelming majority of carbon 'emissions' are related to energy consumption and in particular fuel used to power on-site equipment and transport."

Receipts for gas-oil deliveries to site, electricity consumption and vehicle movements were recorded throughout the project's duration to determine the total amount of energy consumed. Using standard conversion rates Mr Clarke-Scholes was able to calculate the carbon footprint of the demolition activities – a total of 104 tonnes of CO_2.

"Since each demolition project differs in size and complexity we have chosen to publish the score in terms of volume of waste generated and publish the result as CO_2 per tonne of waste," says Clarke-Scholes, "This enables us to compare energy consumption across different projects, discover the activities which have greater environmental impact and identify where improvements can be made."

Tower House's carbon footprint was calculated as 13.5 kg of CO_2 per tonne of waste – a score that compares favourably with similar demolition projects carried out by the company. The target set was to improve on recent project figures of 15 kg per tonne – an improvement achieved largely by the careful selection of disposal points.

"Quite apart from the feel-good factor we receive from the knowledge that we are 'doing our bit' to conserve and sustain natural resources and the associated PR benefits that come from it, the initiatives we have put in place to measure and reduce our carbon footprint provide a number of immediate, tangible benefits for us and our customers," said Mr Clarke-Scholes, "It has enabled us to reduce our overheads and deliver real, bottom-line savings that has ultimately made us more competitive." d&ri



The building was covered in a tough plastic sheeting to prevent dust and debris escaping as well as for aesthetic purposes