

Waste disposal given a new facelift




Built in 1968, the building was used by local authority offices and public services belonging to the City of Remscheid. The building was beginning to look very shabby and the facades and roofs were in urgent need of refurbishment since, as part of administrative reforms, it was intended to change the use of the building. Following completion of the rebuilding works on a very tight budget in 2006, the refurbished building now houses the vehicles for the city's waste disposal services on the lower two floors and the administration in the upper two stories. Here it was possible to reduce the overall energy requirement by around 75 per cent (primary energy). These savings are largely due to the new building envelope with its substantially improved thermal insulation. The energy used for heating has also been decisively reduced along with that used for lighting, air ventilation and cooling. Last but not least, the building now looks a lot friendlier after the rebuilding measures.



New entrance area on the west side at night.
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Building summary

Project status	 Optimized
Location	Nordstraße 48, 42853 Remscheid, Nordrhein-Westfalen
Year of construction	1968
Refurbished	2006
Building owner	Remscheider Entsorgungsbetriebe (+ Betreiber und Nutzer)
Gross floor area	5,310 m ²
Heated net floor area	2,544 m ²
Gross volume	20,851 m ³
Usable floor area (according to EnEV)	3,120 m ²
A/V ratio after refurbishment	0.32 m ² /m ³
Key aspects	Heat insulation, Facade systems, Glazing + windows, Daylight planning, Daylight systems, Optimised lighting, Ventilation + heat recovery, Regenerative + passive cooling, Control technology, operational management, building automation, Solar thermal energy

Project description

Until it was refurbished, the building was used by local authority offices and public services belonging to the City of Remscheid. The main user was the Remscheid Waste Disposal Services with their waste management department. The Remscheid Building Department and the street-cleaning services were also housed in the building. Owing to new, centralised administrative structures, all users were moved to other locations with the exception of the Remscheid Waste Disposal Services.

Following the rebuilding and refurbishment, the building now houses the administrative offices for the Waste Disposal Services as well as recreational rooms with washing and shower facilities for the personnel. In addition, the fleet of waste disposal vehicles is now housed on the lower two floors.

The building was constructed at the beginning of the 1960s using a reinforced concrete frame structure with precast concrete panels for the facade, and was later extended upwards by one floor using lightweight construction. It showed considerable deficits in terms of its structure and fittings which were typical for its time. In structural terms, the facade was in a very poor condition and the roof surfaces were leaking and in need of refurbishment. The standard of thermal insulation was poor, which is typical of the period when it was built; in particular there were thermal bridges and leaks in the joint areas. The building's age meant that its technical equipment was also in need of modernisation, the fire protection no longer met the required standards, the building did not offer handicapped access and facilities, and the main staircase, which in some places had less than 2 metres of headroom, no longer accorded with modern needs.

Refurbishment concept

The reinforced concrete frame structure enabled the facade to be completely replaced without any great expenditure. The floor plans were also redesigned to create offices with less depth and better utilisation of daylight. This enabled the newly won space to be used for small service cores with photocopiers, kitchenettes and toilets. The top floor also received various skylights.

Because the previous main entrance was located in an awkward position, it was moved to the rear end on the west side where it is more easily accessible. The vehicle garage behind it is now used as a small foyer that gives access to the customer centre and the new, barrier-free circulation core.

The aim was to considerably reduce the energy consumption to a level of around 100 kWh/m² p.a. (to DIN V 18599), which is about 50 per cent less than the EnEV requirements for comparable new buildings. It was also planned to bring the interior climate and air hygiene up to the latest standards.

By activating the thermal storage mass (generally concrete or PCM on the top floor) and cooling the building in summer with overnight ventilation, a high quality of use is achieved – without relying on active air conditioning.

Energy concept

During the planning phase, a considerable number of variations were analysed. The refurbishment concept that was eventually implemented encompasses the following package of measures:

Thermal insulation

New prefabricated facade using lightweight timber elements with thermal insulation thicknesses between 16 and 24 cm, and with transparent multiwall sheets made of polycarbonate for the external skin.

Airtight construction with low thermal bridging.

Double-glazed insulated glass and solar protection glass with thermally insulated spacers and timber frames.

U-values for the glazing: 1.1 W/m²K. U-value for the windows: 1.4 W/m²K

Additional thermal insulation from the flat roof and ceiling to the vehicle garage.

Ventilation

A ventilator in the office spaces supplements the air exhaust system. The air flows decentrally via acoustically dampened outdoor air inlets with automatically adjustable and closable vents. The usual single air renewal is automatically reduced when there are very low outdoor temperatures.

All vehicle garages are kept frost-free by blowing in exhaust air from the office area into the garages as required. This utilisation of the waste heat means that the entire heating installation can be dispensed with and thus the associated energy consumption.

There is a single air ventilation system with heat recovery for the entire recreational area.

Heat supply

Around 60 per cent of the domestic water heating is achieved using a 30 m² flat-plate collector system. The shower area alone requires around 1000 litres of hot water each day.

A gas condensing boiler supplements the domestic water heating and provides the room heating.

Daylight and lighting

Optimised daylight utilisation via specially contoured and finished Venetian blinds that redirect light (=> Retrolux system where the tilt angle of the slats changes in accordance with the viewing angle).

Integrated into the office lighting is a daylight-dependent artificial lighting control system with presence detection.

Summer interior climate

Solar protection glass (60/40) on all facades without movable sun protection.

Overnight ventilation via controllable vents in the outdoor air inlets installed in the facades. A double air renewal is achieved with a ventilator.

On the top floor, which was built using lightweight construction, PCM materials have been integrated into the ceiling cladding. These increase the thermal capacity of the spaces and restrict heating during summer. Here Micronal (BASF) has been used with a phase change at 24 °C.

Building control technology

The building is integrated within a central building control technology system. All building services are automated and networked using LON technology.

Performance

An initial evaluation of the summer interior climate for 20 office spaces showed that from May to July 2007, the interior climate remained within the comfort zone also in the south-facing offices. Even the requirements of Comfort Class I were maintained (to DIN EN 15251). These comfort classes are based on extensive user surveys and take into account how temperature is perceived with increasing outdoor temperatures.

Further information on the performance will be provided during the course of the project.

Optimisation measures and possibilities

The good interior climate was achieved in summer 2007, although it has not yet been possible to exploit the overnight ventilation to its full potential. The planned volume flows were not yet achieved because there are still leaks which have to be remedied. Rectifications still need to be made to the air-tightness of the overall channel network and the connecting doors between the areas with and without regular overnight ventilation. Further information on optimisation measures will be provided during the course of the project.

Construction cost and profitability

At the beginning, the option of refurbishment and rebuilding had to be weighed up against the alternative of constructing an entirely new building (including demolishing the old building). A feasibility study showed, however, that a new building with the same standard of execution would have cost around 40 per cent more. Detailed information on the construction costs and cost effectiveness will be provided during the further course of the project.

Key energy data

Energy indices according to German regulation EnEV (in kWh/m ² a)	before refurbishment	after refurbishment
Heating energy demand	343.00	46.00
Overall primary energy requirement according to DIN 18599, Data after refurbishment exclusive of vehicle garage	440.00	108.00
Measured energy consumption data (in kWh/m ² a)	before refurbishment	after refurbishment
Site energy for heating and domestic hot water (dhw)	340.00	
Source energy for heating and domestic hot water (dhw)	373.00	
Total source energy	448.00	

Implementation costs

Implementation costs in €/m ²	
Construction (KG 300)	480
Technical system (KG 400)	201

These figures represent established costs

Net construction costs (according to German DIN 276) relating to gross floor area (BGF, according to German DIN 277)

 **Projektinfo by BINE Information Service**

This project is funded within the framework »Energy Optimized Building« (EnOB) by the German Federal Ministry of Economics and Technology, on the basis of a decision by the German Bundestag. Get further information at www.enob.info.