

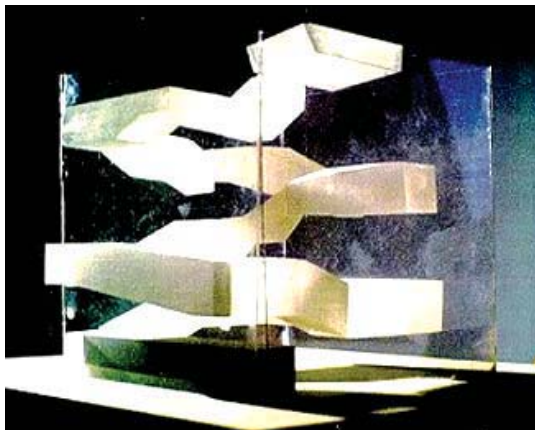
New Royal Netherlands Embassy, Am Rolandufer, Berlin



Architect: Rem Koolhaas/OMA, Rotterdam (Netherlands)
Client: Ministerie van Buitenlandse Zaken, The Hague (Netherlands)
Metalwork and curtain walling: Anders Metallbau, Fritzlar

Mission

In its brief for the new embassy in Berlin, the Dutch Foreign Ministry called for a transparent, forward-looking, landmark building. Compatriot Rem Koolhaas, one of the world's most eminent contemporary architects, responded by developing a spatial creation the like of which has never been seen before.



The meandering "trajectory" passageway runs from main entrance to roof terrace

Public space rather than diplomatic enclave

Among Berlin's foreign representations, none can match the Dutch embassy for its transparency and welcoming allure. On the site between Am Rolandufer and Klosterstraße in the city's "Mitte" district, Dutch architect Rem Koolhaas has spelt out his interpretation of modern-day diplomacy. While exploiting the surrounding cityscape to add verve to his creation, the internationally distinguished architect ensures that the building remains open to the public realm.

The massing adopted by Koolhaas duly observes the dictates of urban design, though without submitting to them. The embassy divides neatly into two sections: the central cube and an L-shaped "paravent" that screens the building from its neighbours on two sides. While the core embassy facilities are located at the heart of the complex, the ancillary blocks house apartments, escape stairs and services installations.

The embassy building may appear unremarkable at first sight. Yet, closer scrutiny soon reveals the paradoxes inherent in the composition. The huge "showcases" on the first floor, a glass skybox hovering at a vertiginous height and a glazed diagonal that cuts obliquely through the cube are key elements in the choreography of openness and secrecy. The interior is no less extraordinary: apart from one core that accommodates the lift, not a single wall or column runs the full height of the building.

A stairway with a mind of its own

Rem Koolhaas relishes experimentation. In the embassy building, he proceeded to replace the conventional stairwell with a so-called "trajectory" – a near-200 m long, aluminium-lined passageway that winds its way up through the eight storeys of the building. On its meandering path, the trajectory adopts a variety of guises, now a stairway, now a ramp, now cutting into the cube, now poking out from its face. The ascent is one of rapidly shifting perspectives: while, at one moment, you are looking out across the River Spree, the next thing you see is a sheer drop to Klosterstraße, before your eye is again caught by the scintillating dome of the "Fernsehturm" television tower.



A projecting glazed ramp with glass flooring offers views of the street below

As if strolling along a street, you skirt past offices, meeting rooms and reception halls with glazing that is reminiscent of a shopfront. The twisting passage runs all the way from the main entrance to the penthouse level, where, in summer, one section of the steel roof can be retracted for open-air dining. A bar located one level higher



Skybox jutting out from building cube



The main block is shielded by an L-shaped stone and concrete "paravent"

on the rooftop affords unobstructed views of Berlin's urban life.

With his architecture, Rem Koolhaas reinterprets the embassy as a place of transparency rather than of diplomatic secrecy. His innovative scheme was duly recognized in December 2003 by the award of the Architekturpreis Berlin.



The ambassador's office sits at the heart of the building while the top levels house a canteen, post room and fitness centre as well as the ambassador's apartment

Structural & Facade Design

Rem Koolhaas's new Royal Netherlands Embassy in Berlin is a unique and seminal building. The fact that the scheme largely dispenses with structural walls and columns necessitated numerous component tests for the facade design. The technically sophisticated curtain wall concept was masterminded by the engineers at Anders Metallbau.

Design work underpinned by component tests

The unconventional loadbearing construction, complete with projecting elements, called for innovative structural solutions. The main facade and many special components thus necessitated intensive development work.

Comprehensive component tests were needed for the wide range of purpose-designed systems. To guarantee adequate human impact safety and residual strength, we commissioned the Steelwork Faculty of the University of Kassel to conduct the necessary tests on the following components:

- Shaft-box double-skin facade: glazing cleaning vents
- Trajectory: glass fin facade
- Glass ramp: laminated-safety glazing and walkable glass floor
- Multi-purpose space: laminated-safety glazing
- Skybox: laminated-safety glazing
- Roof edge: glass balustrade

Some of the above components were subject to approval by Berlin's Senate Department for Urban Development.

The individual solutions for the shaft-box facade were developed in collaboration with the system supplier, Schüco International KG, in Bielefeld. The shaft-box facade design was based on component tests carried out on a 4,000 x 8,000 mm facade mock-up.



Shaft-box facade detail



Skybox glazing



Glass ramp glazing

Anders Metallbau: an expert in glass facade construction

In mid-2001, Anders Metallbau was contracted by the Joint Venture Neubau Botschaft (Klosterstraße 50, Berlin) to fabricate and install the main facade plus numerous custom-designed components. Our in-house design team started work on the structural calculations and technical analyses for the curtain wall units and other elements immediately upon contract award.

Special sections were developed by our engineers for the aluminium system to the main (shaft-box) facade. While the SHE vents incorporate extruded sections with structurally continuous seals for load transmission, special sections with bonded glass were used for the cleaning vents. The exhaust-shaft walls were built using special coupled sections. The insulation glazing to the south-facing curtain wall areas comprises solar-control glass with embedded expanded-metal inlays to enhance sunshading performance.

A key design requirement for the trajectory was to find a method of stiffening the structural facade system.

Our solution entailed the use of 36 mm thick external glass fins housed in a

purpose-built, steel construction. A special steel/glass system with large-format, laminated-safety glazing was developed for the glass ramp. The floor



Connection of glass fin to reinforced-concrete slab



Glass fins used to stiffen facade assembly

glazing is designed as a walkable floor.

Steel/glass curtain walls with an add-on construction were installed in the embassy's first-floor multi-purpose venue. These are carried by 100 x 50 mm solid steel mullions with adjustable base brackets.

The focal point on the building's western elevation is the skybox, which takes the form of an aluminium facade with laminated-safety glazing.

In addition to the above components, our engineers were also entrusted with the technical design of the following:

- Steel/glass system for the sliding glass facade, including revolving door
- Bullet-proof aluminium window system for ground-floor glass facades
- Steel frame with sheet-metal cladding and electrically operated sliding door at main entrance
- Sheet-metal cladding to ceilings
- Glass balustrade at penthouse level
- Steel frame for sliding glass roof

The embassy has been open for viewing since March 2004. Guided tours are available for members of the press and the general public subject to prior registration.



Fabrication

The successful delivery of this challenging project relied on a combination of supreme engineering solutions and specialist in-house production facilities. The curtain wall and the customized components were fabricated by the specialist staff at our own workshops in Fritzlar.

■ Main facade/shaft-box facade

The curtain wall units, including glazing, for the main facade were fully prefabricated at our Fritzlar plant. The modules were mounted to the structural shell using three-dimensionally adjustable fixing brackets.

The elaborate processing of the steel and aluminium sections, as required for the project-specific assemblies, was one of the key processes during fabrication. Four machining centres were used to perform the necessary mechanical operations. Although the many special constructions placed high demands on the flow production system adopted for the contract, the client's stringent quality requirements were entirely reached.

Metalwork production was meticulously organized and tailored to the needs of the project. As part of its quality control system, the client conducted several checks on the manufacturing process at our Fritzlar plant. All works were carried out to the client's full satisfaction.

To ensure full compliance of the fabricated components with performance criteria, a 4 m wide, 8 m tall mock-up was built and tested on the facade test stand. The assembly was thoroughly checked for compliance with the requirements placed on driving rain resistance, airtightness, windproofing and behaviour under wind loads. All results were positive and fully met the specified criteria. The mock-up also served as an evaluation model for the client. The surface finish features were likewise specified as part of the inspections.



Makes footsteps resonate like a tuning fork: aluminium-lined trajectory



View of main facade

To meet quality requirements, the design process also included isothermal and heat flow computations. One of the aims here was to eliminate the risk of condensation in the system.

required here were exceptionally high. Machining centres were used to process the individual sections so as to ensure compliance with specified length tolerances of ± 1 mm.

■ Trajectory/glass fin facade

The trajectory is a composite construction made from aluminium and steel sections. The high level of prefabrication achieved in the workshop ensured economical installation. A mock-up was built during production to allow performance of the necessary impact tests.



View of glass ramp from interior

■ Glass ramp and steel/glass facade

A further component, also designed with a high level of prefabrication, was the glass ramp. The accuracy margins

■ Multi-purpose space

The multi-purpose space features a steel facade incorporating 100 x 50 mm solid steel sections to achieve the required filigree look. The curtain wall units were shop-preassembled into larger segments.

■ Skybox

This component was built using a system bound aluminium stick system, which were in large parts pre-assembled into finished modules.



A room with a view: cantilevered skybox, used as a meeting room

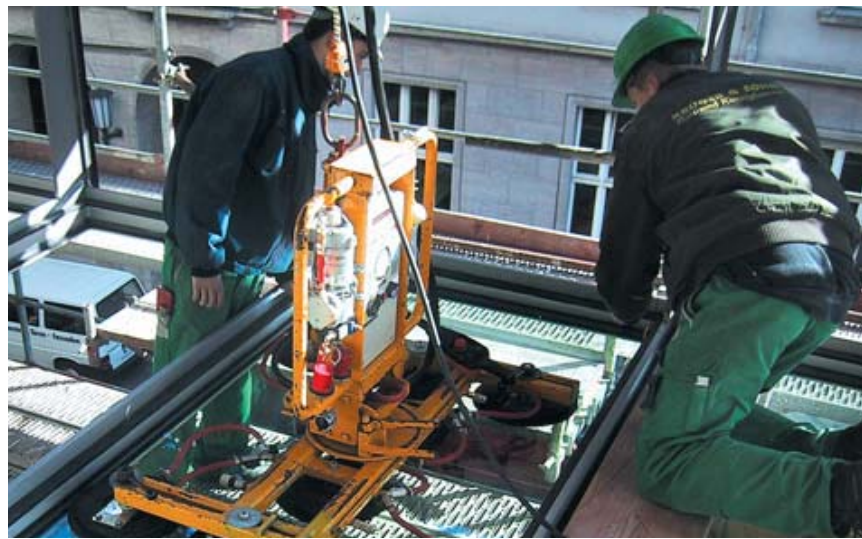
Installation

Perfectly organized site procedures and professional teamwork allow us to deliver even the most demanding projects within extremely tight deadlines. Our designers, planners, technicians and installers are past masters at making the impossible possible.

■ Main facade/shaft-box facade

Erection of the shaft-box facade commenced in mid-2003. Our installers mounted the cleaning vents and exhaust-shaft walls to the steel columns with fixed and loose supports. The three-dimensionally adjustable brackets purpose-developed by us for fixing at the slab edges and base allowed subsequent vertical alignment of the curtain wall units.

Horizontal and vertical coupling joints were installed to accommodate move-



Installation of glazing to glass ramp

Skybox (below)



■ Skybox

The aluminium/glass facade was fixed to the existing structural steelwork. The soffit and upper face are clad in plain and perforated sheet metal.

■ Multi-purpose space

The multi-purpose space is enclosed by a steel curtain wall with add-on construction. All mullions were provided with an adjustable base.

■ Sliding ground-floor glass facade

The steel/glass system comprises two sliding door leaves and one revolving door as an emergency exit. The sliding doors measure 5 m by 4 m.

■ Miscellaneous items

Anders Metallbau's installers also constructed the (ground-floor) bullet-proof glass facades, sheet-steel-pannelled steelwork assembly (at the main entrance), metal-sheet cladding, glass balustrade and 6 m by 15 m open able sliding roof.

ment from the shell. Structurally continuous connections were provided at the corners between the glazing and exhaust-shaft walls. Special filigree sections with bonded glass were used for the cleaning vents.

■ Trajectory/glass fin facade

The aluminium windows were mounted as integral units with glass fin mullions and add-on steel construction. Metal cladding and ventilation ducts

were incorporated at the lower junction with the shaft-box facade. Special brackets were used for the upper connection to the reinforced-concrete slab.

■ Glass ramp and steel/glass facade

The steel/glass system was prefabricated in segments and bolted in place on site. The fixing brackets used for the slab edge connections provided for three-dimensional adjustment.



Sealing of horizontal coupling sections in shaft-box facade



Coupling joint in shaft-box facade (above); fixing brackets at slab edges (below)



Installation of glass windows in first-floor multi-purpose space

Interiors

The trajectory offers a clear view of the office areas: only a glass screen separates visitors from the day-to-day routine of Dutch diplomats. The building is almost completely devoid of cellular office spaces. Only the ambassador is allowed to go about his work in a secluded environment.

Architecture of diplomacy

Generous glass fronts on the first floor, a sky-box meeting room and the bizarre-looking "glass snake" in the external envelope allow magnificent views of the cityscape. Visual links with the River Spree and the Fernsehturm

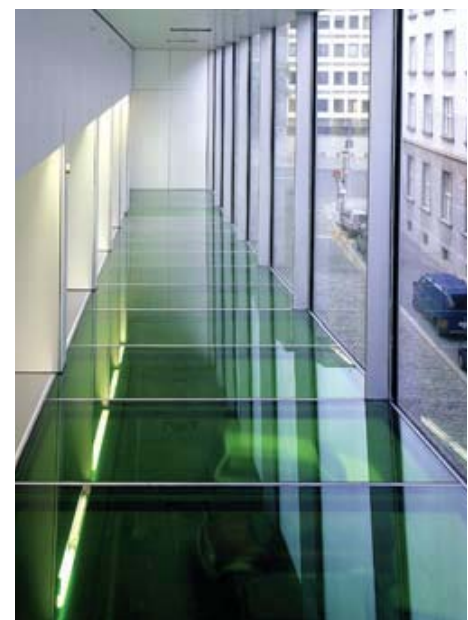


With its expansive windows, the first-floor multi-purpose space offers views of the Stadthaus and River Spree

dome are provided by the trajectory, a passageway with steps and ramps that runs up the facade. It constantly shifts its position in the exterior, now projecting like an oriel, now recessed as it carves its way into the structure, and finally culminating in a stairway that leads to the restaurant on the northern front. Here, one section of the roof can be retracted to provide access to the roof terrace, where Berlin can be experienced in its full vibrancy and splendour – a real treat, not only for diplomats.



Glass fin facade of trajectory



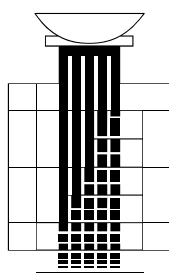
Glass ramp: green glass floor with view of ground 4 m below

Facts and figures: the essentials in brief

Architect/designer:	Rem Koolhaas/Office for Metropolitan Architecture (OMA), Rotterdam (Netherlands)	Patio:	Approx. 55 sqm glass facade with sliding doors
Client:	Ministerie van Buitenlandse Zaken, Dienst Gebouwen Buitenland, The Hague (Netherlands)	Skybox:	Approx. 60 sqm glass facade/approx. 40 sqm sheet-metal cladding
Employer:	Joint Venture Neubau Botschaft, Klosterstraße 50, Berlin; Kondor Wessels Berlin GmbH	Stone wall:	Approx. 91 sqm stone wall (sheet-steel cladding) with industrial-size door
Facade:		Sliding glass facade:	Approx. 92 sqm sliding glass facade with door installation
Complete package:	Anders Metallbau, Fritzlar	Multi-purpose space:	Approx. 91 sqm steel/glass facade
Structural concept:	Anders Metallbau, Fritzlar, in collaboration with Steelwork Faculty of University of Kassel	Glass balustrade at roof edge:	Approx. 96 m glass balustrade
		Sliding glass roof:	Approx. 180 sqm roof construction, partly electrically controlled
Works completed by Anders Metallbau:		Project data:	
Main/shaft-box facade:	Approx. 1,500 sqm double-skin facade with exhaust shaft; approx. 100 sqm cold facade	Number of customized sections:	21
Trajectory/glass fin facade:	Approx. 125 sqm glass facade; approx. 82 m glass stiffeners	Weight of fabricated aluminium sections:	55 t
Glass ramp and steel/glass facade:	Approx. 137 sqm glass facade; approx. 60 sqm walkable glass floor	Number of main facade units:	369
Plain metal cladding:	Approx. 570 sqm wall and ceiling linings	Number of main facade unit variants:	Approx. 200
Copings:	Approx. 280 sqm 4 mm aluminium-sheet copings	Glass/facade systems:	
Ground-floor glass facades:	Approx. 130 sqm bullet-proof glass facade	Glass:	Products supplied by Interpane, Lauenförde
		Aluminium systems:	supplied by Schüco International KG, Bielefeld

Interior and exterior photos of completed embassy building: Christian Richter (on behalf of Royal Netherlands Embassy)

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