

ANNEX 4-B

Case study

**GIRA PRODUCTION HALL
RADEVORMWALD**

Concept and realisation of this architecturally appealing production building allows the integration of the complex services as well as the manufacturing technology under consideration of maximum flexibility.

GIRA PRODUCTION HALL, RADEVORMWALD



As a design-conscious manufacturer of electrical components, the GIRA company makes high demands on technology and design as well as the architecture. In the course of the development plan of their premises they realised the first two of four possible production units with a floor space of approx. 20,000 m² in total.

The new production and office development comprises two virtually identical halls each 71.5 x 22.5 m on plan and linked on their long faces by two staircases. The design of a glazed factory called for a clearly articulated, slenderly dimensioned structure in which complex mechanical services and production plant – including lifting equipment, fork-lift trucks and unmanned transport systems – had to be flexibly integrated. With their curved roofs, raking facades and rounded glazed eaves, the buildings have a distinctive form that makes its own contribution to the firm's strongly advocated concept of corporate identity.

The design of these two of four possible, three-storey halls was based on a comprehensive analysis of production processes, flow of goods and general logistics. The existing production buildings are tied on ground level. The production concept can be successively changed, adapted and expanded.

The basements offer break rooms, energy supply, buildings services, computing department and a storage for tools. The ground floors contain the production unit; open-plan bureaus, single offices, laboratories, tool production as well as technical assets are located in the upper storeys. This concept provides closely linked workplaces of equal quality in all departments.

An ingenious concept for the mechanical services allows natural ventilation via the facades and exploits excess energy from the production process.

Application Benefits

- Column free internal space provides maximum flexibility
- Minimisation of primary energy consumption
- Transparent appearance for high-quality working environment
- Innovative servicing strategy
- Combination of structure and facade
- Service integration opportunities

Project Team

Client:	GIRA Giersiepen GmbH & Co. KG
Architects:	Ingenhoven Architekten, Düsseldorf
Structural Engineer:	Werner Sobek Ing. GmbH & Co. KG KKK Ingenieures. mbH
Steel Construction:	Epesta Stahlbau GmbH Mero GmbH & Co. KG
Services:	PGH Becker-Huke-Hoffmann
Building Physics:	DS-Plan GmbH



Office level under construction



Office level completed



Production level

Construction details

The static and constructive optimisation of the concept led to an inner structure as composite construction with an encasing outer curved structure for the building envelope. The use of two structures has multiple advantages: On the one hand the curved outer structure is kept slender and elegant due to its interaction with the inner one; this is also a benefit for the appearance of the hall in the surrounding landscape. On the other hand the outer structure, besides being a load-bearing element, is façade, roof, ventilation and water-bearing element.

Outer structure in steel

The outer load bearing structure which supports the roof and the façade consists of double-hinged frames with rigidly linked columns and rails. The frames are made of welded hollow sections with overlying purlins as rolled I-sections and roofing made of profiled sheeting. The structure is stiffened by the frames as well as concrete cores.

Inner structure as composite construction

For the inner structure supporting the upper storey a composite construction was chosen, consisting of rocker columns and hinged single-span beams. The ground floor is a slender slimfloor slab; the upper floor is made of partly precast planks as a composite construction in combination with welded I-beams (1060 x 300 mm) and hot-rolled HEB 400 columns. Intermediate floors are attached to the composite

beams by tension rods. Diverse crane tracks are directly connected; for buildings services numerous openings in the beams are provided.

Fire protection

The holistic fire protection concept follows the building's functions: in the basement R120 to protect the precious form-storage; the ground level R90 by applying concrete filled sections; in the upper storey a R30-coating for the steel frames. In addition to that sprinklers are provided for the whole building.

Façade and building services

Maximum transparency, efficient sun-shading, natural ventilation of offices and production units and a highly economical form of construction were the conditions for the façade design. The size of the RHS profiles are kept to a minimum, thereby accentuating the impression of transparency. The central aspect of the design for GIRA was the minimisation of primary energy consumption. The energy recoverable from the production can help to achieve a 60% saving of heating energy costs. All areas are primarily ventilated naturally and a combined heating and cooling system was developed into which the existing thermal potential could be fed.

Pictures: H. G. Esch, Hennef