2010 On Site Review Report

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by Hanif Kara

Ipekyol Textile Factory

Edirne, Turkey

Architect
Emre Arolat Architects (EAA)

Client
Twist Textile

Design
2004 - 2005

Completed
2006

Ipekyol Textile Factory
Edirne, Turkey

I. Introduction

The rise of Turkey as a 'home of production facilities' in the second half of the last century as a consequence of low labour costs, improved production systems (due to innovations in machinery) and better transportation has meant an increase in the construction of 'factory' type industrial buildings on the edge of most major cities in the country.

The quality of the design and construction of such 'utilitarian' buildings, and the impact on the places they reside in, is generally poor the world over, with little or no consideration given to the architecture, and Turkey is no different in that sense.

Ipekyol Factory on the outskirts of the City of Edirne, produces high quality garments. In the conception of the factory, the owner was aware of his responsibility to his employees and to society at large, and even more poignantly, of the substantial influence that architecture can have for the company's image and the quality and quantity of what it produces.

This custom designed facility is situated on a flat site, on a tract of land adjacent to a major trunk road from Istanbul to Kirklareli. Contextually the integration of the building into the surroundings, on what is a constrained site, is well executed by careful form making, orientation, detailing and planning of the site. The building produces a striking silhouette for those driving by, while orientating those driving up to it and confidently conveying by its form and materiality the function of the building.

The building is 150m x 100m on plan and 14m high containing production facilities, a training school, administration areas and catering. A surface car park, an external play area and plantroom are located on the outside.

II. Contextual Information

A. Brief Historical Background

The Client selected the City of Edirne to locate the new factory as it borders Greece and Bulgaria and is easily accessible from Istanbul. The city also has a tradition of such factories making it easier to find skilled fabric workers. The site is on the outskirts of the city and adjacent to a major highway to Istanbul.

The design responds successfully to the physical landscape of a flat site while simultaneously responding to adjacent boundary conditions. The orientation takes advantage of climatic conditions, while addressing access, potential for future expansion, external spaces and aesthetics.

B. Local Architectural Character

It is important to separate the character of the city's architecture from the specific building type of the factory to draw a meaningful appraisal. The city has a rich historical heritage due to its location between the European and Asian Anatolia. The city's architectural treasures include the walls and towers from Edirne Castle built by the Roman emperor Hadrian, the famous Selimiye Mosque from the Ottoman Period, and the recently restored complex of Sultan Bayezid II including a historical hospital dating back to 1484. The centre itself also has a 255m long (73 arches) arasta (souk) used by shopkeepers as a modern shopping centre; it was originally designed to bring revenue to the Selimiye Mosque and town.

The precedence for the Ipekyol Factory on the other hand comes from the scatterings of many 'generic' shed buildings that can be found as one travels from Istanbul to the site. Most examples show ubiquitous non-descript metal clad or precast concrete 'sheds' of large span and single storey, placed almost in a staccato of unlinked urban locations. Most appear uninviting and it is unclear what goes on inside them. They have an air of temporariness from a lack of maintenance and little or no 'stitching' to the context and existing urban fabric.

To explore this further we went on a general reconnaissance survey around Edirne and managed to visit another factory near the Ipekyol Factory to try to understand better the absence of 'design' considerations for such buildings. What we witnessed was a well-designed, two storey-high reception (front of house) and entrance clad in stone to impress the visitors. Once we got beyond the administration, we were able to see (back of house) a large expanse of dark, untidy single storey space, with no connection to the outside through either the walls or the roof. The environment was uncomfortable with lots of artificial lighting, ineffective ventilation and a general lack of orientation.

The owner of this factory boasted that this was probably the largest such factory in the region but when asked was unable to recall if it had been designed by an architect, or indeed the name of the architect.

C. Climatic Conditions

The site lies between 40º 30¹ - 42º 20¹ north latitude and 26º to 27º east longitude. The climate in winter is sometimes influenced by the sea, resulting in mild temperatures with occasional rain and with temperatures dropping to -1.0ºC in January/February, with occasional snowfall at the height of winter. The summers are hot and dry with temperatures rising up to a maximum of 32ºC in July/August, while spring and fall can be rainy. The average annual temperature is 13.5ºC with an annual precipitation of 600mm, average humidity 60ºC. The prevailing winds come from the north but the site is not subject to hurricanes and typhoons. However, all structures have to be designed for the potential of high seismic activity in the region.

D. *Immediate Surroundings of the Site*

The most significant feature of this site is the flatness as one approaches from the highway. A service road on the west site off the highway leads to the site entrance of what is the 'rear' of

the building, which is located at the north end of the site for both pedestrians and vehicles. The site has a depth of approximately 300m in the north-south direction but only 130m width east-west.

It is understood the site was unoccupied so there was no demolition or risk of existing substructure. To the west boundary is a five storey technical college building and playground constructed around 20 years ago. A further constraint was imposed by a precast concrete outbuilding at the front (south) of the site between the highway and the southern site boundary. The eastern boundary is mostly a field with a partially completed precast concrete single storey abandoned development near the highway.

E Topography of the Project Site

The area is characterised by plains and rolling hills with an average elevation of about 40 metres above sea level. The site itself has little change in levels so the form had to account for this and ensure a little necessary cut and fill. As one views the site from the highway (looking north towards Edirne) the land rises through rolling hills in the background upon which the new residential developments will be perched.

III. Programme

A. History of the Inception of the Project; How the Project was initiated?

The client explained that having been engaged in the fabric industry for many years, he had a realisation that to cope with the structural changes in this field of manufacturing, spawned by globalisation and more critical consumer patterns, he would need to produce a higher quality product aimed at both the local and international markets. To achieve this goal he recognised that the first step would require a full understanding of the development of new digital manufacturing technologies that implement higher standards of production encouraged by the design of a bespoke process and modern production line. He toured the globe and developed a process line based on the most advanced machinery, partly from Germany and Italy, combined with local systems. Having sketched a process that loops from design (in design offices in Istanbul and Italy), to patterning in the factory, cutting, manufacturing, packaging and transporting globally, he was able to set himself an annual output target at the birth of the project. He also wanted to put procedures and systems in place that assured the highest quality.

This first step allowed him to develop ‘spatial ideas’ about how many machines and tools would be required, their relationships to each other, and working spaces between and around them, giving a broad idea of a floor space that would be needed for the building and circulation.

He then selected a site in the border town Edirne, a location with six border crossings into Greece/Bulgaria - two by train and four by road. The D100 highway and the TEM motorway both run through the city connecting Edirne to Europe and to Turkey’s largest metropolis, Istanbul, only a two-hour drive away. The city has a population of 120,000 and a further

400,000 in the province providing a good catchment for skilled workers. It also has been a great centre for education and culture historically, as well as more recently since the formation of the Republic - evident from the fast-growing University of Thrace. Having developed the business case and established a location, the next steps were taken.

B. How were the Architects and Specialists chosen?

The client's account is that he had recognised the need to use 'good architecture' even for buildings used mostly for production and distribution. He also wanted to address the responsibility of Ipekyol to its own employees and understood that the architecture of his workplace would have a substantial influence on the image of the company and products. At the same time EAA were embarking on a new chapter of the work by Emre Arolat and Gonca Pasolar by forming an independent design studio, out of the shadow of the first generation of the Arolat family's architectural office. The client therefore commissioned the newly formed EAA for the project, his view being that he had been familiar with the slightly 'edgy' but 'collaborative' modernist approach that Emre had started to explore in his early career, and felt that with this knowledge and a new design studio, the architect would raise the bar and a better product would transpire.

C. General Programme Objectives

The architect and client explored a number of 'form making' solutions hand in hand with the manufacturing process, keeping in mind the constraints of the site footprint and a particular line management process that had been developed by Ipekyol to reach the desired output and goals. This yielded a key set of design objectives set out by the Architect:

- A building that sets a precedence for such factories in general and enhances the image of Ipekyol as a market leader, producing high quality garments for the local and global markets.
- A footprint for the factory that makes full use of the site whilst allowing 30% - 50% expansion of production without expanding the building itself.
- Use local materials in construction.
- Adapt a 'U' shaped production system that flows efficiently from inception through to packaging and dispatch of each garment. This is highly productive and provides small margin for errors with a robust quality assurance system.
- Prioritise an 'internal dynamic' so that the experience of the building and quality of time spent in it is a positive one for those working in it short term or long term, those administering it and those visiting it.
- Well being of all users through consideration of internal and external spaces.

D. Functional Requirements

The key components of the design are defined in the next sections. The brief development was driven mainly by the 'U' shaped process line, size of machinery and its location. The Architect was also asked to respond to the key objectives set out above and customise the design to accommodate the key requirements of manufacture, while accommodating all other supporting functions required by such a facility and its users.

IV. Description

A. Building Data

Ground Floor Area	14,480m²
First Floor	5,520m²
Canteen Circa	350m² (included in ground floor)
Training Area Circa	1,000m² (included in first floor)

B. Evolution of Design Concepts

While a number of forms were developed in the concept stage the site fit and functional spatial strategy that provided the most optimum solution under a single roof was selected, as discussed in the following sections.

Response to Site Constraints

The design process was driven by the requirement of a ground floor area of circa 14,480m², and this dictated a plan form at the production floor of circa 140m x 105m wide. This decision permitted the integration of a surface car park and service road along the eastern boundary, while freeing a triangular space along the western boundary close to the college buildings. This external space is utilised by the architect to accommodate a well-designed plant room outside the building instead of the normal rooftop plant space. At the Northern end then a play area, loading dock and coach park are located.

Response to User Requirements, Spatial Organisation

Having determined the production floor in an efficient plan form, supporting areas including toilets, changing rooms, cafeterias and security offices, were added at this level. Two separate entrances, one for the service entrance at the rear and close to fire access road for ease of loading and unloading, and a second entrance for staff on the eastern edge close to the car and coach park are well located; the security and changing rooms being close to the staff entrance.

A principal entrance is placed on the south glazed facade with an internal circulation ramp (no lifts) leading up to the administration mezzanine above at first floor level. The administration mezzanine turns at either end to provide space for a training facility and design area. A turning circle and drop off area are placed outside the north facade.

The location of the toilets and changing facilities ensures a short distance from the production floor. General sanitary provisions exceed those required by legislation.

Formal Aspects

The Architect’s most effective formal response to the key objectives was to integrate the administration and production facility under a single roof giving birth to a single large form. Conventionally the administrative section of such buildings forms the ‘front of house’ and is visually detached and given much higher quality compared to the ‘back of house’ production

facility. The result is often a two storey front masking a much lower single storey production facility behind. By choosing a single volume the architect was able to remove the hierarchical internal dynamic between the administration staff and the production staff.

As a result he was also able to design a much taller 14m high volume in the production floor, giving a much more pleasant quality to the 140m x 105m plan volume. This height easily affords a mezzanine floor in the administration area where the first floor is in full use.

This drove a desire to develop the potential for all users in such a deep space to have the opportunity to have some glimpse of the outside. A highly successful device of inserting voids that form internal courtyards, gardens and light wells was chosen by the architect. These gardens have glazed walls and are positioned on plan to give each user a glimpse of nature but are also accessible for use as gardens, while encouraging natural ventilation through 'stack' effects. The distribution of natural light, which is the function of the source and height of the building, is extremely effective both to the eye and in reducing the use of artificial lighting. These internal gardens are also accessible by employees.

Landscaping

At the time of the visit the landscaping had not been fully developed. However at the north end a playground with a small football pitch was in full use. The architect had also designed stand alone screen walls along this boundary as a feature of privacy, acoustic protection and as billboards.

The strongest feature is a water pool that runs along the full length of the south gable glazed wall and a tree line (not nurtured) on the southern boundary to mask the existing buildings. This feature provides some cooling effect through evaporation during the summer but was primarily designed to welcome visitors and encourage a mood of calmness while reflecting the glazed wall and overhang on this elevation.

The plant room along the eastern edge is also cleverly camouflaged as an object in the landscape. All exterior paving and tiling is robust with the local precast paviers concrete and tarmac.

C. Structure, Materials, Technology

Structural Systems

A primary structural grid of 20m (N-S) by 7.5m (E-W) was selected for the production areas to accommodate the machinery but also to integrate these columns without affecting the future flexibility of the space. Where possible (for example around the courtyards in the canteen) supplementary columns are added as a secondary system to reduce spans of mezzanines but which provide economic lateral supports to the glazed internal gardens. The 7.5m grid is then adopted around all the elevations again to provide optimal use of conventional 'off the shelf' metal facade systems that can be easily systemised and assembled to span the 7.5m to resist wind loads. This even distribution of columns encourages manageable foundation loads, allowing the use of simple strip and pad foundations. As well as speed and economy this

strategy optimises the cut and fill balance on the site. In the production the columns then provide a regular grid (column free) for traditional steel roof trusses approximately 2.5 metres deep supported at the top of columns. A secondary purlins and metal cladding system then sits over the trusses to support the roof insulation and membrane. Stability is provided by plan cross bracing and vertical bracing systems.

Materials

The team made a conscious decision to use locally tried and tested materials throughout. The columns and foundations are of reinforced concrete construction, while the spanning trusses of mild structural steelwork are easily fabricated in Turkey, with the joints and junctions carefully articulated to ensure ease of assembly and robustness. The secondary purlins and sheeting rails are cold formed light gauge steel.

Three elevations are clad in grey metal cladding manufactured in Turkey.

The south elevation on the otherhand is glazed as are all the internal courtyards, with openable tilt windows for ventilation. The double glazed glass units were also manufactured in Turkey.

The roof over the south facade (including the overhang canopy) is a flat reinforced concrete slab, as spans in the administration zone are short. The roof over the main factory is a flat metal deck with insulation and waterproofing overlaid deliberately by a white membrane to the outside. The deliberate avoidance of plant and equipment and the effective use of colour gives pleasing views of the roof from a distance, unlike many other factories in the area.

Construction Technology

The clever choice of systems and materials meant that local skills and methods were used throughout. The innovation lies in the rigour, detailing and quality of the final construction, rather than relying on importing unusual trend setting modern systems and materials.

Building Services and Site Utilities

The designers took great care in recognising that the majority of the energy used in the building would be allocated to the operation of the plant machinery and equipment used on the production line. The decision to concentrate all plant on the ground adjacent to the building in a separate enclosure allowed the gathering of electric powered chillers and heating plant at a central source. The plant rooms are thus isolated, clean and easily maintained without affecting the operations in the factory. The client explained that energy levels have been monitored and reduced recently from 120,000 to 80,000 KW per month (supplied to the building) as they begin to match the energy demand more efficiently with the production targets. The designed integration of installations allows easy access to shafts, and cleanliness contributes to the long-term presentation and optimisation of the energy consumption.

Aside from swimming pools and hospitals this building type is known to consume the most significant amounts of energy. The rainwater is not recycled and currently discharges into the

local system via channels after being collected by a symphonic roof drainage system. The client is considering the potential for recycling the grey water in the future.

D. Origin of Labour Force, Professionals

Labour force

Local labour forces and materials were used throughout.

Professionals

Client:	Deyko, Twist Giyim
Architect:	Emre Arolat Architects
Contractor:	Alfa Çelik
Structural Engineer:	Alfa Çelik
Mechanical Engineer:	Toptas
Electrical Engineer:	Galtek

V. Construction Schedule and Costs

A. History of Project Design and Implementation

The project design was commenced in 2004 to develop a tender package by the beginning of 2005. The building was constructed and fitted out for commissioning over 18 months with an official opening at the end of 2006.

B. Total Costs and Main Sources of Financing

The building costs $875 per square metre and we understood costs of $750 to $850 are typical of costs for buildings of this type in the region.

Costs provided by teams

Building	$ 10,306,000.00
Assets	$ 336,150.00
Fixed Assets	$ 33,000.00
Rentable	$ 3,478,010.00
Machinery	$ 2,400,000.00
Total	$ 16,553,160.00

Despite the high quality of the design the efficiency of the space compensates for 10% premium on the building costs. The client is currently assessing cost in use and adjusting the energy intake accordingly. In addition he is also considering the possibility of recycling the surface water and developing a site wide Sustainable Urban Drainage System as he develops the site further.

VI. Technical Assessment

A. Functional Assessment

The factory is extremely clean and tidy and in conversation with the employees, students and maintenance staff, it became very apparent that they are very pleased and happy to be working in such a wonderful environment and ‘prefer to stay there rather than go home’, according to one.

The production line management, with a rigorous digitised and automated system comprising the most modern machinery, allows an easy inspection of the efficiency and quality control of the production system. All the outputs and inputs are fully digitised to monitor progress, identify trends, measure the success and assess employee rewards such as bonuses.

The arrangements of all plant and ‘lines’ informed and marshalled by the structural grids and internal gardens makes it not only a safe environment, which is easy to understand, but one that encourages communications between different parts of the production systems and in-stills a pride in all the workers.

The single volume also gives a clear sense of community, blurring the hierarchy between administration staff, maintenance staff students and factory workers. This becomes clear during the lunch break and coffee breaks when all the personnel gather in a very light and spatial cafeteria in the north-west corner. Visibility from the design and administration mezzanine into the factory is very successful.

B. Climatic Performance

The increased height of the building and internal courtyards definitely maximises daylight, reducing energy use and thermal performance as well as encouraging natural ventilation. The southern glazed facade, which internally houses the ramp and administration offices, feeds natural light to these areas, while the additional height in the production space is utilised to integrate roof top lights that are 2.5 times more efficient than windows. These roof lights combine with the internal gardens to provide a daylight factor of 5-10% but also 300 Lux illumination.

C. Response to Treatment of Water and Rainfall

The most striking aspect is the collection of water from the large roof. This is concealed to discharge into the system. The drainage channels around the edges of the building are detailed with pebble based collecting gutters rather than discharging in uncontrolled manners.

The ‘long pool’ at the front of the building has considerable capacity to absorb storm water run-off and is directed to the site wide collection system. The ‘open’ gardens are also well treated with controlled drainage systems that collect and direct the rainwater without flooding the gardens.

D. Environmental Response

There is no native flora and fauna to relate to and the natural environment has been maintained by preventing artificially raised levels.

E. Response to, and Planning for, Emergency Situations

Emergency access is provided via the main gate through the service road. Emergency vehicles can access all corners of the building and all entrances and pedestrian exit points. 'Seismic activity' has been the only consideration in terms of the design, whilst flood risks are not an issue.

The ground floor and its relationship to the loading bay and general site levels were chosen carefully with consideration to any potential flood risk and no proactive measure against floods was deemed necessary.

F. Ageing and Maintenance Problems

The selection of materials and the rigorous detailing (both inside and outside) has taken due consideration of longevity, durability and maintenance-free design.

G. Design Features

The majority of these issues have been discussed in other sections. It is clear that the facilities function in a very efficient and pleasant manner as co-ordination of spaces, pedestrians, vehicles, machinery has been approached by the designers in a 'holistic' and 'integrated' fashion. This coordinated and well-thought design has then been followed through in the construction of the facility; testament to this is the general tidiness and a lack of clutter in the facility. Externally the proportions of the building, its relationship to the site and external features, such as the playground, plant room, service road, coach park, have also been carefully located and detailed and constructed.

H. Impact of the Project on the Site

The site is connected to a major route through a tertiary side road and service road on the site.

I. Durability and Long-time Viability of the Project

The durability aspects are covered in other sections. The factory currently employs 500 people and is growing. Ipeykol are also training new staff regularly to integrate them with the current staff. In addition they have developed relationships with local colleges and universities to encourage more education specific to the design, manufacture and production of high quality garments.

I consider this plan as a sustainable strategy in relation to the viability of the project. In addition new marketing drives are underway to establish more international markets.

J. Ease and Appropriateness of Furnishings

The interior design and finishes have been carefully considered to reflect the use of each space, provide a sense of high quality and at the same time with low maintenance needs.

This is achieved by the use of exposed concrete in most areas which is sealed, and the application of highly polished polyurethane sealing lacquer to all walkable finishes with particular consideration to floors. The administration floors are also treated in the same way to avoid the need for carpets.

All wall finishes are exposed and lightly coloured to take advantage of the transparency of the building, whilst exposed concrete and steelwork can be seen in all ceilings.

VII. Users

A. Description of those who use or Benefit from the Project

The main beneficiaries are the employees who work in the building. This ranges from unskilled individuals, skilled machine operators, students who are in training, trained maintenance engineers, administration staff, designers, security and medical staff. The majority of the employees travel from the city by coaches provided by the company. Significantly about 60% of the users are female.

B. Response to Project by Clients, Users, Community

From what I could gauge in the city the project is popular and familiar to most. It is recognisable as a building (and client) that stands apart from the crowd when compared to similar facilities nearby, and indeed in the region as a whole. Journalists and architects that I have spoken to also applaud the design and the quality of construction.

VIII. Persons involved

A. Identification of Project Personnel and their Roles in the Project

Client:	Deyko, Twist Giyim
Architect:	Emre Arolat Architects
Contractor:	Alfa Çelik
Structural Engineer:	Alfa Çelik
Mechanical Engineer:	Toptas
Electrical Engineer:	Galtek

IX. Bibliography

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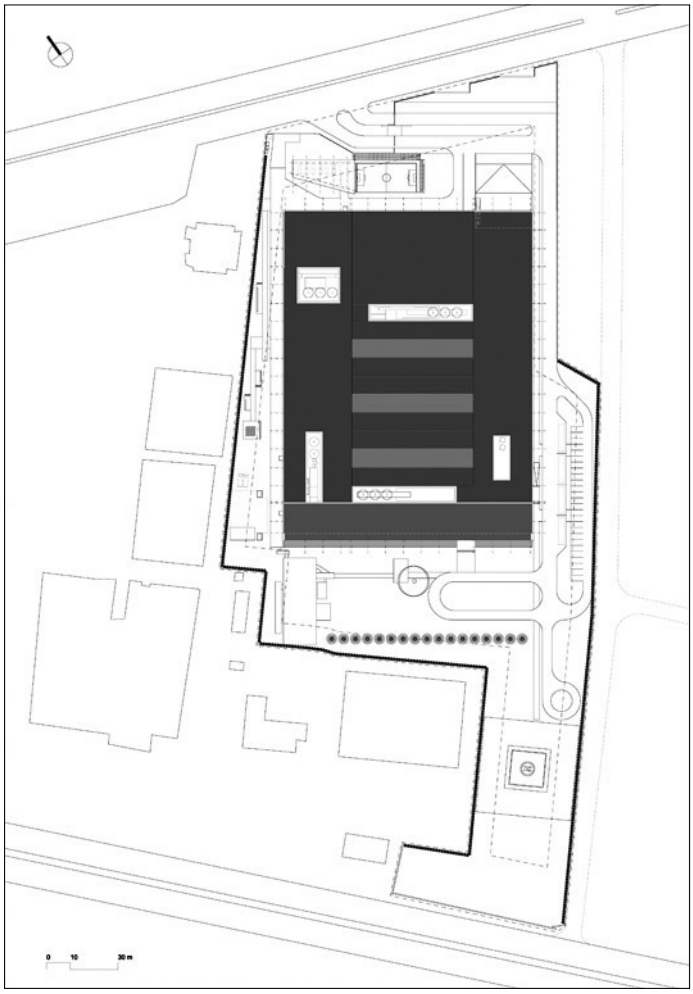
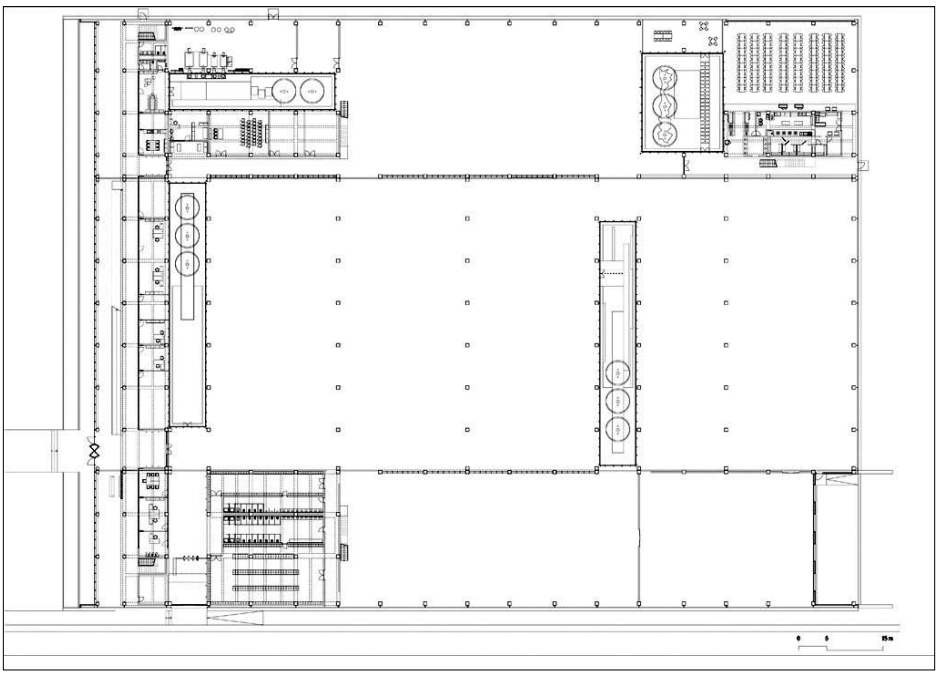
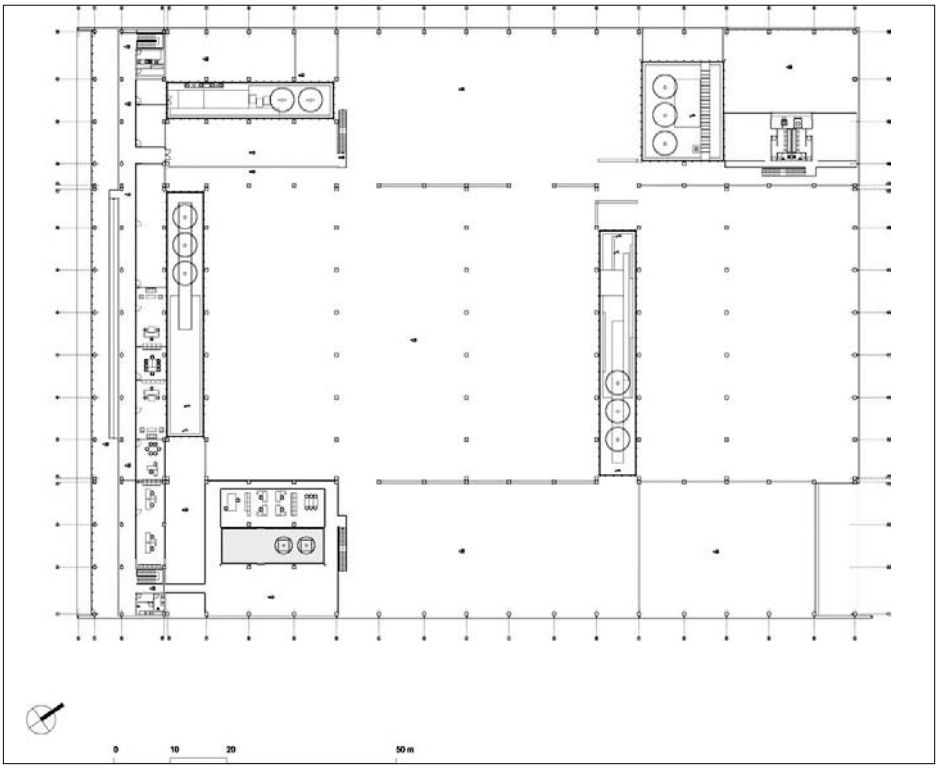
Hanif Kara
April 2010



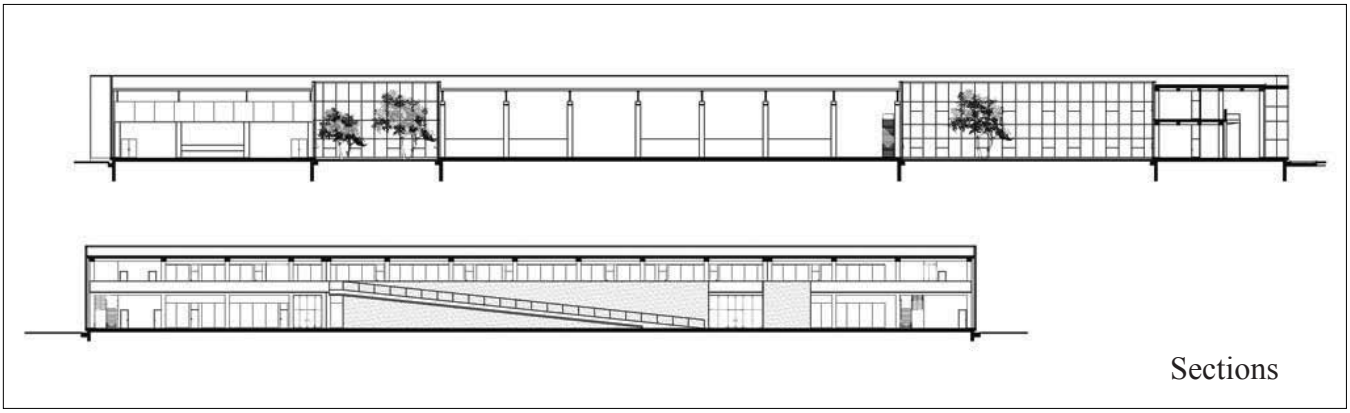
SIte Plan



Ground Floor Plan



First Floor Plan



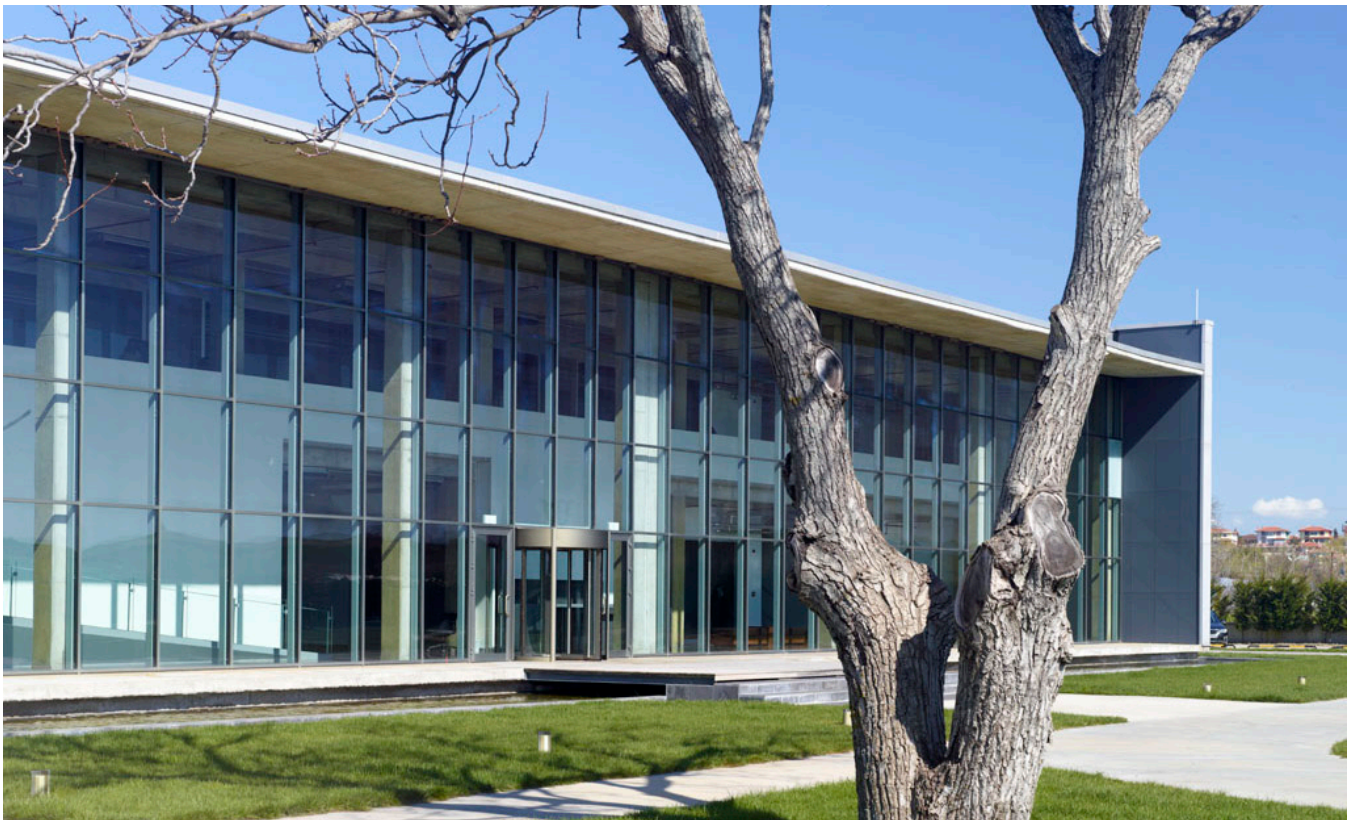
Sections

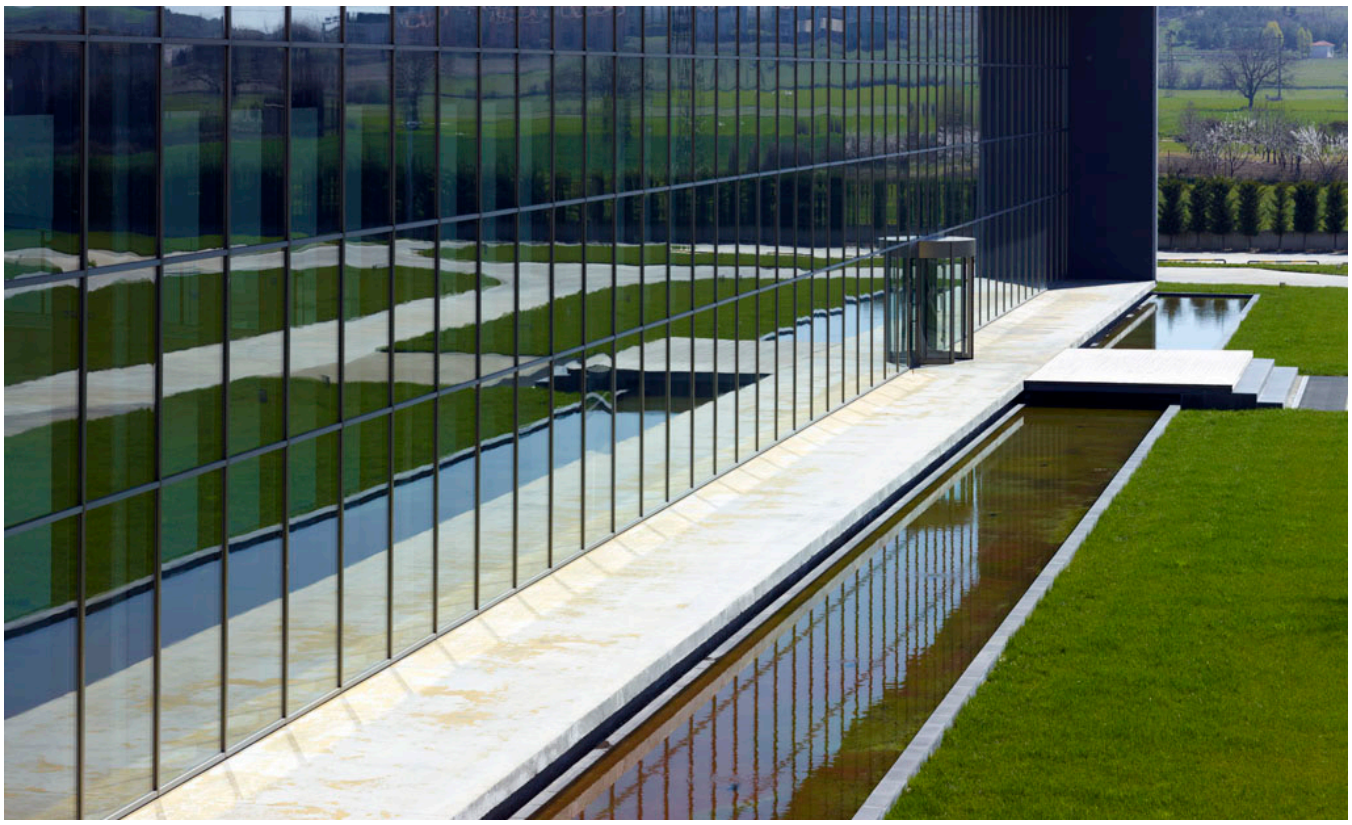
General view of the site.

Entrance of the complex.

North-West façade.

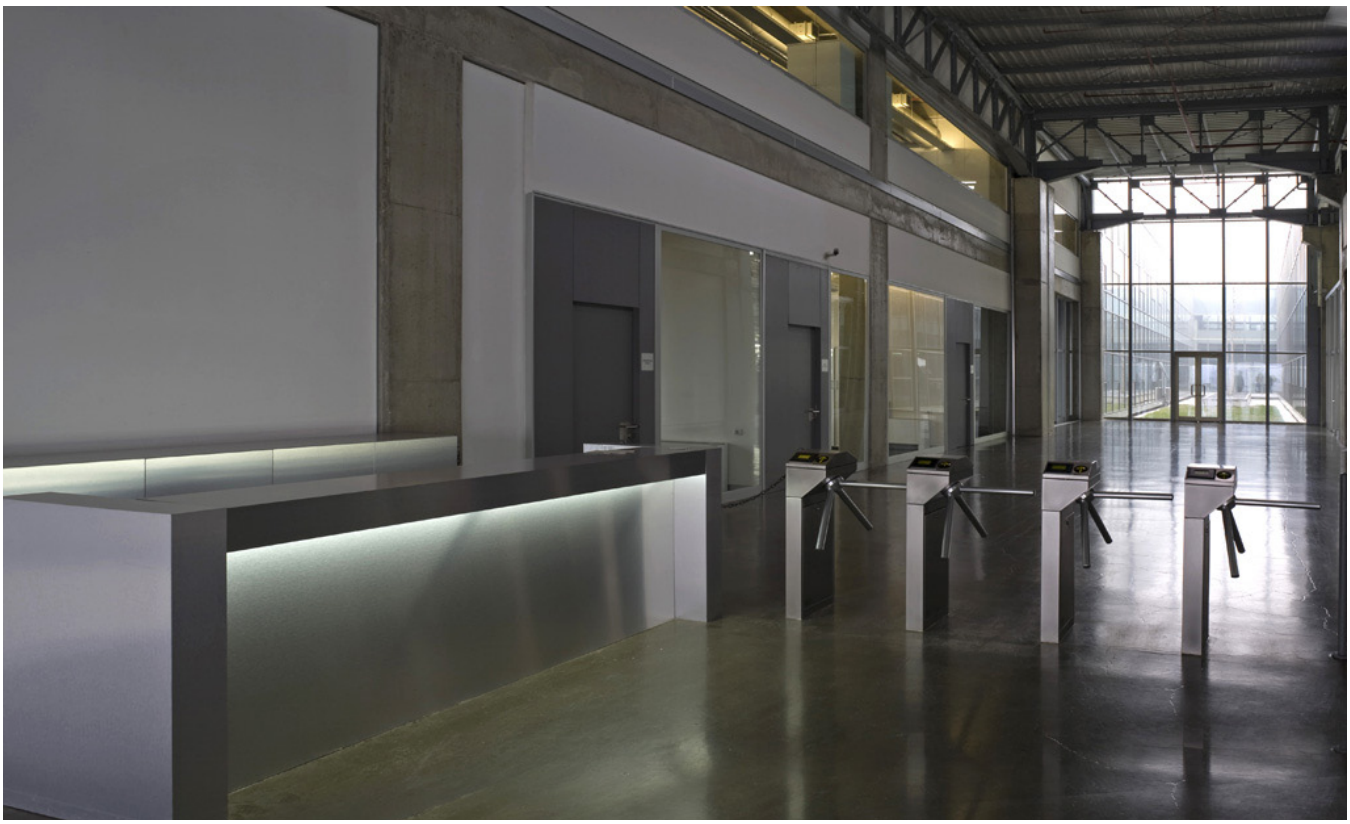
North view of the façade.





Detail of the North-West façade.

Football playground for the staff.



Staff entrance.

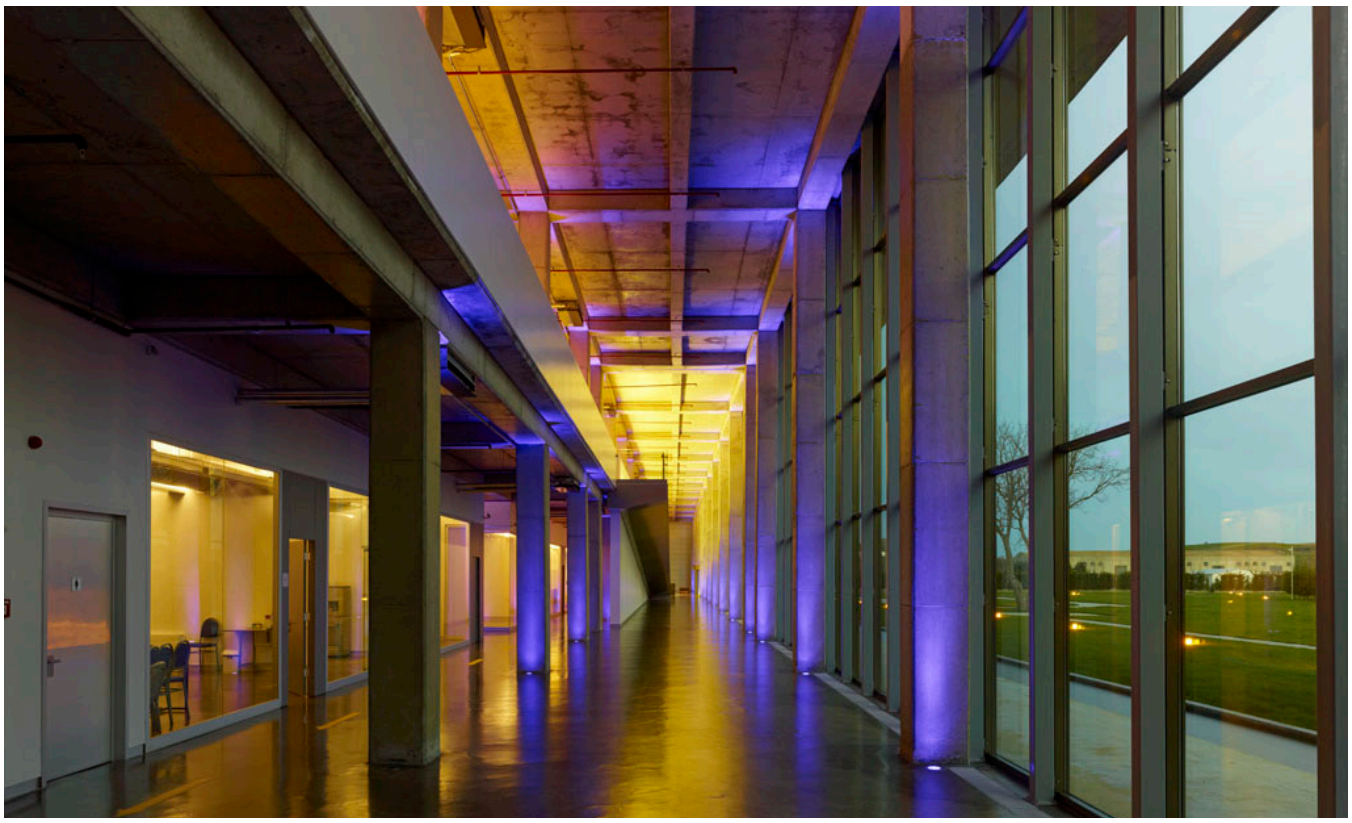
Inner Gallery.

Inner garden used by the staff.

Inner garden.

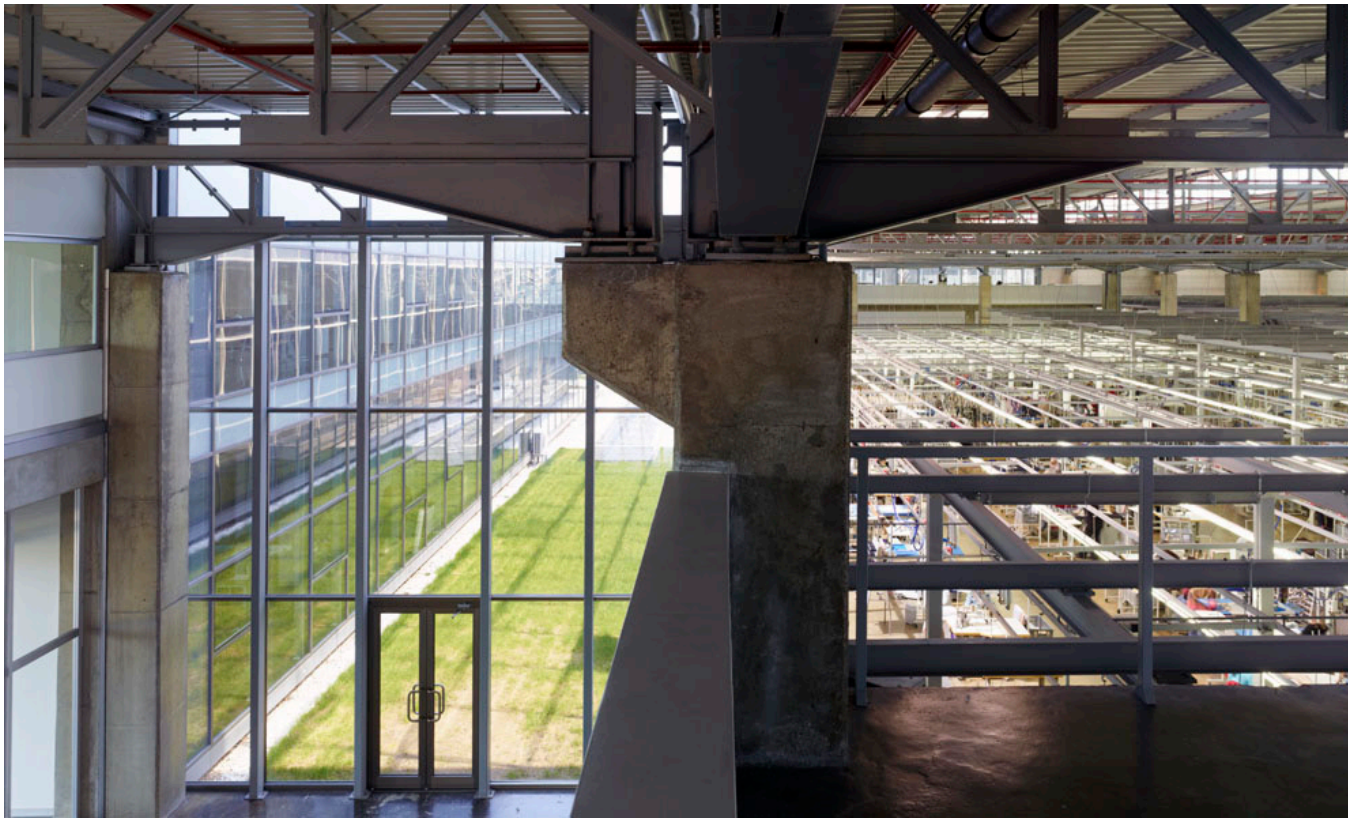
Production hall.

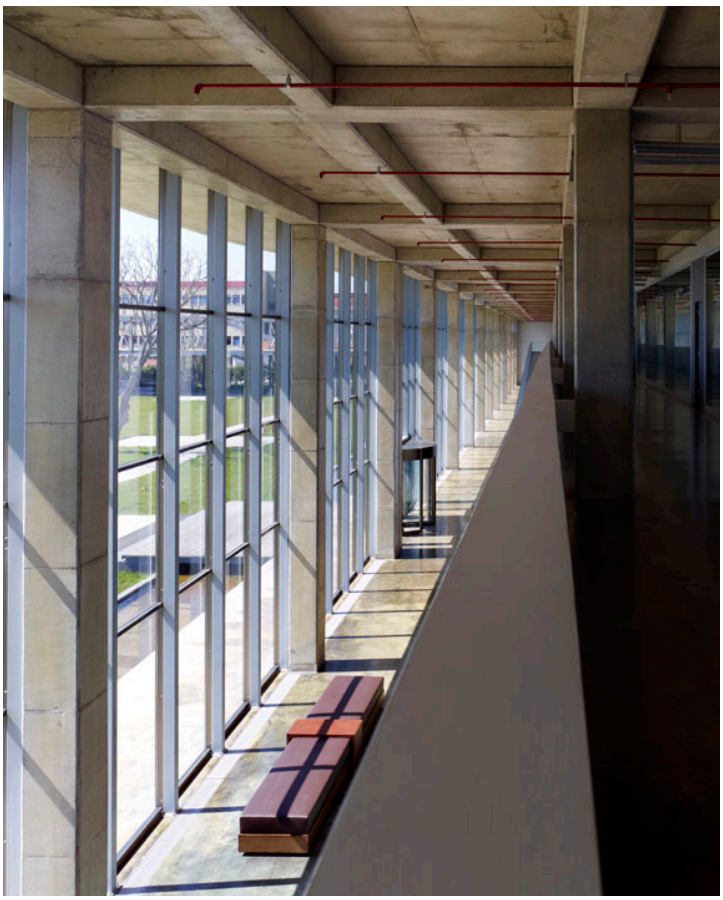
Cafeteria.



Inner gallery.

View of the production hall from the first floor.





Inner gallery.

Inner ramp.