

Inclined Elevator of Rio de la Pila (Santander)

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The global project for the Urban Renovation of *Río de la Pila* and *Prado de San Roque* has endeavored to solve problems of access in the "Integrated Rehabilitation Area" of *Río de la Pila*. Located on a slope with a different height than the city of Santander, the area includes 39 buildings housing 432 dwellings and 42 commercial premises covering a surface area of 13,000 m², where 1,000 people live. Furthermore, the project included activities within the urban environment, with the building of curbs, a small promenade, the replanting of the area and the remodeling of the *Campo del Regimiento*, a sports area adjacent to the *Paseo del General Dávila*, which is used by 29 teams in the area, the Municipal Football School and 44,000 other people.

A fundamental part of the project was the means of elevation, consisting of a Velino Extra outdoor escalator with an incline of 27.3°, a height difference of 5.4 m and a speed of 0.5 mps, which provides access to a 1500-kg inclined elevator (with capacity for 20 persons) to connect the streets *Río de la Pila*, *San Sebastián* and *Prado San Roque*, having a length of 72 m

View of auxiliary escalator



Inclined Elevators

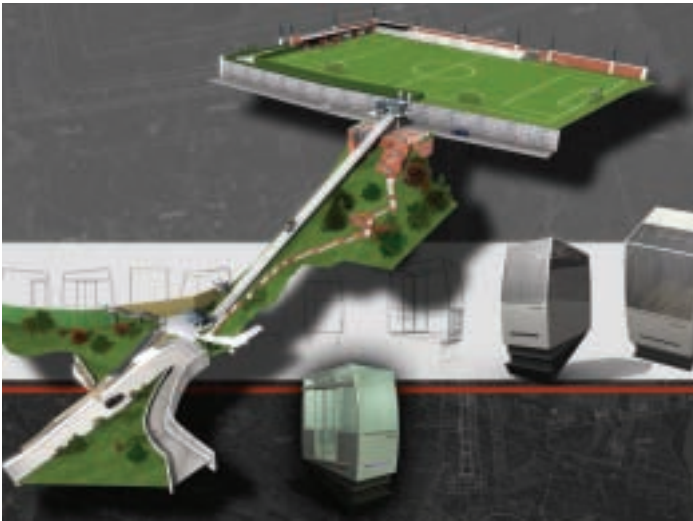
and an inclination of 32°, and traveling a height difference of 38 m at 1 mps.

Located on a peninsula, Santander is a coastal city in the North of Spain, with views over a bay. Steep hills and beaches run from east to west. The maritime port has had connections with France, the U.K. and the Spanish Antilles and been a place of retreat and summer holidays for the aristocracy. It is currently a site for tourism, docks, industry and service. It is both the capital of the province and an autonomous community with a population of 190,000 inhabitants.

The *Río de la Pila* inclined elevator made some 500 journeys per day in its first month of service. A yearly estimate is 2.7 million users in 180,000 free trips. *Continued*

Below (top to bottom):

- Area affected by the renovation of *Río de la Pila* and *Prado San Roque*
- Positioning the counterweight



Installation Characteristics

◆ Load	1500 kg
◆ Number of persons	20
◆ Nominal speed	1 mps
◆ Travel distance	71.74 m
◆ Difference in height	38.06 m
◆ Inclination	32.04° (constant and in a straight line)
◆ Number of stops	Four
◆ Embarkations	Four (on the left side)
◆ Car	Panoramic with an exterior composed of safety glass and stainless-steel finishing, including a main and auxiliary control panel (for the handicapped), rescue door, false fold-down ceiling equipped with air-conditioning and safety chamber and guillotine door for access to the inspection post inside the foot rail. Its useful dimensions are 1,600 mm X 2,100 mm X 2,200 mm
◆ Traction control	Control by frequency and current frequency drive to guarantee smooth starting and stopping
◆ Location of the four engines	In the upper part of the elevator gap adjacent to the upper embarkation.
◆ Car doors	Central-opening automatic doors with two stainless-steel glass doors with the mechanism at the bottom and a dimension of 900 mm X 2,000 mm.
◆ Landing doors	Central-opening automatic doors with two stainless-steel glass doors with the mechanism at the bottom and a dimension of 900 mm X 2,000 mm with an LCD signaling system and loading button panels integrated into the frames

Continued

Components

Guide Rail System

The guide rail system is based on HEA commercial profiles that support and transmit the forces deriving from a great part of the weight of the vehicle (from the counterweight and the users to the anchoring plates). It is made into a compact sandwich structure.

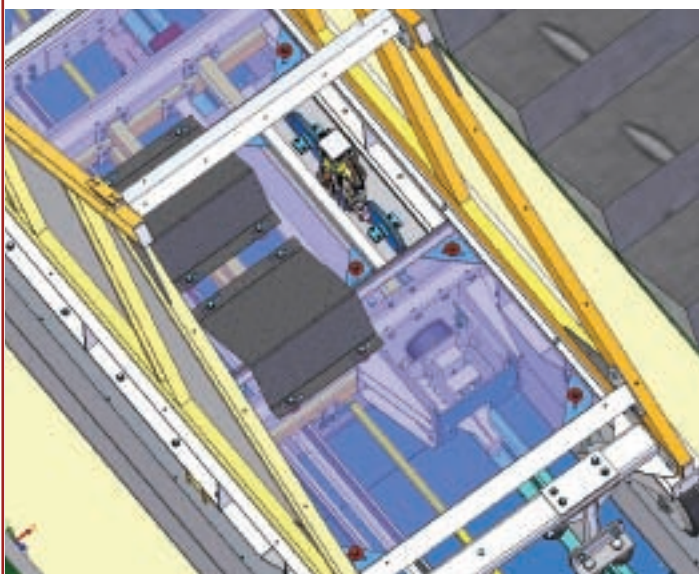
Foot Rail

This is a robust structure based on previous models that was adapted and modified for this installation. It consists of an inner space for inspection, from where it is possible to access the safety systems (limiter, wedging, remote-alarm device, etc.) as well as the operator control, load-weighing exchange or the well occupation system.

The access to this area is new and performed via a

Below (top to bottom):

- Machine room, access and upper loading area
- Progressive wedging system with buffered return moved by an overspeed governor on a sliding tray



counterweighted guillotine trapdoor integrated into the aesthetics of the car. The door opens and folds within a space specially designed for this purpose, remaining open during the inspection maneuvers. Thus, the maintenance operator sits in the pilot's seat from where the inspection controls are accessible, enabling him or her to see the area while in movement.

A rolling system with four trains with two wheels is provided for heavy loads. For long durations, another safety wheel is provided on each train to act as an anti-capsizing device. Another two trains with four wheels each guide the vehicle using the wedging guide rail as a reference point.

Counterweight

The importance of the design of the counterweight lies in the fact that it had to have a low profile to be able to be displaced within the HEA profiles, making the set of elements in the well a very compact system. Displacement is performed via the rolling system described above. The space for the weights is thus used advantageously so as to avoid excessive length of this component.

Traction Set

The traction set consists of a new design for inclined traction in a machine room adjacent to the upper embarkation point. It consists of a robust structure of beams and a set of shock absorbers installed in the three axes of the space, which both permit the engine to be fixed adequately and permit the dynamic forces received by the machine and the structure to be softened. The machine is equipped with a reducer controlled by a current-frequency drive. This is the first time this machine has been used in designs by ThyssenKrupp Elevator Manufacturing Spain.

The panoramic cabin and rescue escalator



Door Operator

The regulated-speed door operator includes a bottom mechanism for lateral embarkation specifically designed for this installation. The design consists of a modification of an existing mechanism with a cinematic function to which a new, inclined, retractable runner was installed. This allows the landing doors to open gently and precisely. It has a blocking system integrated for when the elevator is between floors.

Safety Systems

As in other elevators, the main safety elements consist of the speed limiter and the wedging. However, this system includes new aspects. First, a limiter standardized for vertical elevators is used. It is mounted on a sliding tray within the foot rail, along with two diversion pulleys. By means of a single pull on the cable, when the speed goes past a pre-established regulation value, the limiter is blocked, the tray slides over the guide rails while the vehicle continues to advance, and it acts on a small lever. This, in turn, acts on the progressive wedging of a single wedge.

Furthermore, the wedging slides over low-friction guide rails with respect to the foot rail, thus compressing a rubber shock absorber that makes the slowing movement more gradual without jeopardizing the reliability of the braking process. Upon un-wedging, a recovery spring takes the tray to its standby position and the wedge shock absorber to its place of origin.

Other noticeable elements of the safety system are: a tensor, which keeps the cable of the limiter tense in the direction of the trajectory by means of a small vertical counterweight and plastic deviation pulleys for changing

Inclined traction set



direction, a safety brake on the axis of the machine and integrated into the same to avoid excess speed when going up, and a safety stop rope along the entire length of the well for an immediate electric stoppage in the event of danger.

Electric Cabling

The flexible power, signaling/communications and video cables are guided between the maneuver cupboard and the car by means of a cable-carrying chain (like those in automatic warehouses) for an inclined sliding application, which is displaced over a stainless-steel channel silently. The cabling in the well is installed in tubes. Both have been prepared for marine outdoor conditions.

Car

The panoramic car is illuminated by the light from outside it. With outside and inside finishing in stainless steel, it has two button control panels, one of which has been especially adapted for people using wheelchairs. The front part of the car is curved. The inside finishing is inclined so that it is possible to lean against the side of the car to enjoy the view.

Rescue Design

The rescue of passengers trapped in the elevator is carried out via an evacuation stairway which runs parallel to the entire length of the well. Access to the stairway is via the car rescue door, and a support and climbing platform system to cover the height difference between both elements.



Credits

Sponsor: Santander City Council

Works Management: UTE Bartolomé, Peralta, SILGA, S.L.

Builder: Teconsa

Designer/manufacturer:
ThyssenKrupp Elevator
Manufacturing Spain, S.L.

**Project manager, installer
and maintainer:**
ThyssenKrupp Elevadores, S.L.