

1- INTRODUCTION

Jennifer Aroca Alarcón, student of Building Engineering at the Polytechnic University of Valencia and as Erasmus student at Silesian University of Technology, Politechnika Śląska is going to be the author of this project of rehabilitation of a building.

To perform a restore a building and know all their deficiencies is requires a prior study in all aspects of construction, structural, functional, etc..This study must be the first part of this project.

The rehabilitation of buildings by recovering its functions through various actions on those elements that have lost their constructive function, or have suffered a deterioration in its entirety or in appearance.

Once we understand the building we can make depth study of the current state of it.

2- AIM OF THE PROJECT

This objective is achieved by developing the points contained in this project. First it will develop solutions adopted in the realization of this building. Secondly, it will be analyzed by a study that contains building deficiencies or pathologies detected. Finally, it will present a proposal for intervention to identified weaknesses possible solutions. This project will also include the location of the building plans, lifting and constructive analysis of the same.

To achieve this aim It has been necessary:

- Collect data and information of the building.
- Perform data collection "in situ"
- Take a photographic data of the building, both inside and outside.
- Description graphically the building by planes.
- Analysis of materials used for construction and building systems.
- Study of existing pathologies
- Establish proposals for intervention for those building deficiencies.

3- PRELIMINARY INVESTIGATION

3.1 SCOPE AND METHODOLOGY.

In order to perform a detailed analysis of the building, the different phases of this study are:

Survey metric descriptive

Is the main phase of data collection, as it allows more direct knowledge of the qualities of the building construction. This is the graphic representation of the constructed reality as precisely as possible.

It has performed the lifting all plants of the building and have traced many transverse and longitudinal sections as deemed necessary.

Photografic Survey

Is a survey conducted by means of photographs. But in this previous study It wasn't necessary photographic lifting. It has been enough a good photographic memory of the entire building.

Study materials and construction

Is necessary to know all the materials that have been made the building and building systems that were used for its construction.

Study pathologies of materials

This study aims to identify the existing pathologies in the building, in order to know it better and to intervene later.

Study of material damage

More detailed study of the damage that have suffered the materials with which it was built initially.

Functional study

Appropriate conduct a study of the historical role of the building that is intended to take account rehabilitate afterwards.

3.2 INFORMATION OF THE BUILDING

3.2.1 Location of the building

The building, object of studio was built in 1973. It is situated in Gliwice, Silesia City, in Poland. It is located within the complex of The Silesian University of Technology "Politechnika Slaska" and specifically is the laboratory of Construction of Civil Engineering Department, situated in B. Krzywoustego 7 Gliwice. It hasn't adjacent buildings, so its 4 sides are relapsers to different streets, one of these Sklodowskiej Marii-Curie.

This building was built on a rectangular solar plant with an area of approximately 2.644m².

It has two pedestrian accesses from the outside by the north facade, and another pedestrian access from the building of the civil engineering faculty. This connection is located on the first floor. It also has a main vehicle access by the east façade with a ramp, as well as others through the west front.

3.2.2 Location of the building

- Building environment

About the state of the building is not well maintained:

- In a perimeter around 4m of the building the pavement is up and is disrepair.
- There are sewers and vents rusted
- In some parts of the perimeter there are earths and stones
- Lack cleaning and maintenance throughout the area



3.2.3 Description

The building consists of basement, ground floor and four heights.

Basement

This plant has access from the two main pedestrian entries situated in the north facade of the building.

This plant has a longitudinal corridor which distributes to the different rooms, one of which is a laboratory building that occupies practically the entire basement.

Ground floor

The ground floor distribution is similar to other plants, because it has a corridor that runs through the building longitudinally leaving aside offices, and classes for teaching and in the other side, a large open space that is used for construction lab, where is the machinery, materials for tests ... etc.. This plant has

access by the two main pedestrian entries, and by the driveway located on the east façade.

First, second, third and fourth floor

Besides having access by the two main entrances mentioned above, has direct access from the building of the civil engineering faculty through a connection between the two. This plant is intended for educational classrooms, laboratories, offices and offices.

Second, third and fourth floor have access by the two main entrances. These plants are the 3 smaller than the others plants areas. Its distribution is similar to the rest, because a longitudinal corridor of the building is the one that gives access to the various rooms. And all, consist of offices, lecture theaters and laboratories

3.3 DESCRIPTIVE REPORT ACCORDING CURRENT SITUATION BUILDING.

3.1.1 Building systems and material used.

To know and understand the building is due to perform a study of the materials and construction systems that were used in its construction.

Foundation

Because of absence of information provided and taking into account that it is a final degree project in which we can't do tastings. For this reason It has been impossible to define exactly the condition or type of it.

Enclosure

It has three different types:

- Brick cladding: It is located in the lower part of the facade that surrounds the perimeter of the building. It is made with brick building from 9cm, polyurethane foam, stabilizing role spacer and Facing clinker brick 13cm.



Photography 1

- Enclosure finished with fibre corrugated plates: large part of the façade is made with this kind. It is comprised of Aerated concrete block 24 cm, 10cm mineral wool, fiber cement plates 125 x 250 x 0,6 cm on wood slats with cross section 5 x 6cm. and protective varnish finish



Photography 2

- Enclosure finish with smooth plates bolted: Part of the facade and the facade of the staircase is made with this type. The layers that comprise this kind is the same as above constructive solution but the finish is solved with smooth panels.



Photography 3

Pillars

All the pillars are made with reinforced concrete. Nevertheless in the ground floor and first floor we can found different kind of pillars (*photography 4 and 5*)



Photography 4



Photography 5



Photography 6

Partitions

The partitions are made with bricks. The brick used is hollow brick 9. The brick is received with cement mortar and subsequent with application of lime and finished with painting application of various shades, depending on the plant in question. (*photography 6*)

Partitions of wetlands are solved in the same way but with ceramic tiles finish (*Photography 7*)

In addition the top of the partitions is covered with plasterboard panels for passing installations.



Photography 6. Corridor of second floor.



Photography 7. Ceramic tiles of a wetland

Wrought

Floor slabs are precast hollow core reinforced concrete slabs. It works unidirectionally.

The wrought is composed of reinforced concrete beam where support the alveolar plates. The alveolar plates are prefabricated elements and with them can be made floor slabs with light forged between supports larger. It has the main reinforcement and secondary reinforcement and the top slab is poured "in situ".

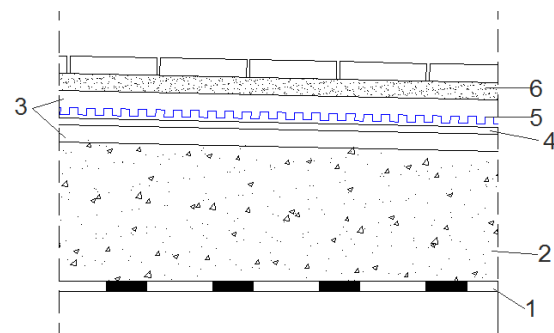
Deck

The building has two cover types:

- Passable cover:

Its sequence constructive consists in:

Steam cut sheet (1) cellular lightening concrete for formation of slope (2) regularization mortar (3), sheet waterproofing (4), geotextile separator layer (5), , gripping mortar for tiles (6) and finish with ceramic tiles.



It has access from the first floor. The evacuation of water in this deck is solved by sinks. One specifically located in the center of the cover with cloths inclined towards the sink.

I don't have access to this part of the building.

- Not passable cover:

Is finish with film anti-UV treatment. And it hasn't direct access, only has the possibility of access for maintenance.

This kind of deck is situated on the second floor and the fourth floor.

It is a sloping roof. Water evacuation is solved by a hidden gutter that runs the entire length (the longer side) of the deck. (Photography 9)



Photography 9. Photo of second floor

Finishes

- Walls:

The coating is excuted with mortar which constitutes the binder is cement or a mixture of cement and lime.

The plastering is executed with lime and cement paste from various applications of successive layers to achieve a uniform and smooth.

The lining of wetlands is solved with rectangular ceramic tiles received with a thick layer of mortar grip.

Pavement

- Terrazzo

The majority of the pavement in this building is terrazzo. (concrete mixture with marble grits). This pavement gets executed in situ. The advantage

is that It can be made on site and it doesn't have a factory preset shape. It Can be adapted to any area. (Photography 9)



Photography 10.
Photo corridor of
first floor

- Ceramic Pavement

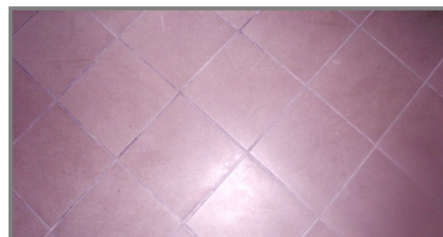
This kind of pavement is situated in wetlands. Ceramic tile is squared, but it isn't equal in all wet areas of the building, since the color is different. Photography 11,12

- Parquet flooring

It can be found in specific areas of the building very reduced, like the building reception or some offices. Photography 13



Photography 13



Photography 11



Photography 12

Window frames

- Indoor: the doors are made of wood, but we can classify into several types:
 - Wooden brown door, photography 14
 - Wooden door with glazed, photography 15
 - Wooden white door, photography 16
 - Metal door, photography 17
 - Glass door, photography 18
 - Elevator door, photography 19



Photography 14



Photography 15



Photography 16



Photography 17



Photography 18



Photography 19

- Outdoor: The windows are mostly wood, except for the stairwell, that are large single glazed steel windows. Photography 20
The doors in technology areas and garage are of stainless. Photography 21



Photography 20



Photography 21

3.4 BUILDING COMMUNICATION

Exterior

The building has two main pedestrian entrances located on the north elevation. Is an access by stairs leading to a reception hall, located on the mezzanine floor (between basement and ground floor). *Photography 22.*

The building also has access from the building of civil engineering faculty on the first floor. is a connection between both to create a shortcut. *Photography 23,24*

Vehicle access is located on the west elevation ascending a ramp, leading to the ground floor. *Photography 25.*

The building has also several steel doors located in the north and east elevation providing direct access to the basement. *Photography 26, 27, 28.*

Interior

All floors of the building are connected by two stairways that run full height and two lifts for the transport of materials. *Photography 29.*



Photography 22



Photography 23



Photography 24



Photography 25. Ramp.



Photography 26. North elevation.



Photography 27. East elevation.



Photography 28. North elevation



Photography 29. Interior stairs.

4- DETAILED INVESTIGATION

4.1 INTRODUCTION

The purpose of this separated is to give a glimpse of the current building condition, as well as the study of deficiencies found in it. Overall the condition of the building is a little flawed. It presents several pathologies that affect functional and constructive terms.

4.2 DOCUMENTATION AND LOCATION OF THE PATHOLOGIES.

Enclosure

Humidity the outside wall

Observed wet stains on the bottom of the facade, as well as loss of tone color face bricks. (*Pathology 3*)

This deficiency can be detected in the north elevation of the building. This kind of moistures are due to rising moisture, as the water rises from the found through the building foundation which are in contact with the ground and transmitted through the pores of the material to reach to areas above grade. It can manifests as spots, chipping, fading in the color finish.. The severity of moisture depends on:

- The amount of water contained in the subsoil water level effects.
- Saturation of rainwater field is not as evacuate.
- By breaking conveying water underground installations.
- The material which transmits moisture.
- Moisture from building.
- Thickness of the wall, as the wider is its most high amounts water

Also it can be observed humidity caused by water leakage caused by downpipes that are poorly executed and water flowing directly from the vertical face of the façade. (*Pathology 4*)

Breakage façade

In some areas of the facade shows the absence of the final finish, as well as in other areas where the finish is bad condition. (*Pathology 5*)

In one of the pedestrian access can be seen breaking a partition formed by exposed bricks. This is due to anchorage of the banister on the wall, since the wall thickness is not sufficient for anchoring. Therefore, there has been a handover of the anchoring element. (*Pathology 16*)

Failure to comply with the thermal conditions

The facade, according Polish regulations (5) (6) does not comply with the thermal conditions. (*Pathology 5*)
The constructive section of the facade not comply with the thermal conditions of b because it leads to excessive global warming front.

The thermal transmittance data are reflected in the relevant tab of pathology 5.
The solution has been performed to comply with the regulations is the increased thickness of the insulation.
In the case of the facade finished with fibre corrugated plates (*photography 2*) and with smooth plates bolted (*photography 3*), increase the thickness of rockwool.

In the façade of the basement finished with brick cladding (*photography 1*) increase the thickness of polyurethane foam.

Lack of coating

The parapet in some areas doesn't have the finished, like the rest of the façade. (*Pathology 8*).

Disaggregation of the concrete

At some concrete elements of the façade there are humidity and peeling, rust problems, disaggregation of concrete and efflorescences.

Is the case of the access ramp to the building (*Pathology 12*) or stairs located on the north elevation of the building to give pedestrian access to it

(Pathology 7) .

Moreover the outgoing located in the south elevation (Pathology 10).

All these pathologies are resolved with similar way according to Concrete Repair and Protection Sopros(8).

cracks in the brick facing

There is a vertical crack in the lower part of the facade in the south. The crack has broken the finishing material, in this case the brick. This type of crack probably not significantly affected the building as it is usual in this type of pathology finished facades with brickwork. (pathology 17)

Window frames

Interiors

The interior woodwork, in this case the interior doors are in perfect condition,

Exteriors

The main problem is that the windows are in poor condition and its metal anchoring elements are oxidized. (Pathology 2)

The exit doors of the garage and technology rooms are steel gates and have some small minor rust. But the problem is overheating by them. (pathology 19)

Deck

Heating in the deck

Both the passable cover as not passable cover doesn't comply with thermal conditions according Polish regulations. The main cause is it hasn't enough thickness isolation.

Leaks in the deck

The problem lies in the passable cover there is insufficient sinks. It doesn't complies with the regulations (1). In the not passable cover the meetings with

skylights are poorly resolved so water can filter through these areas. In some areas there is no cover minimum elevation vertical waterproofing membrane on the upstream. (1) (pathology 1)

Installations

Downpipes

Poor execution of water pipes. The connections are not suitable and when it rains the water flows directly from the front of the facade. The clamps are rusted and some are loose. (Pathology 4)

Water evacuation floor level

In some areas of the perimeter of the building there are accumulation of lands which are causing this problem. When it rains the water is absorbed for land, making this wet and causing moisture in the enclosure. For the evacuation water there is a roof garden sump type, but it isn't enough. When it rains the entire width of the street is water logged. (Pathology 11)

Installations

Some installations ducts are not protected suitably. They have been viewed, and haven't a protection coating(2). (Pathology 18)
Observed spots on the face of the wall in the basement, and Grommets break installations.

Interior coatings

Partitions

Partitions are generally in good condition, except for some small crack that can be seen in the finish.

In some wet areas the ceramic tiles have fallen and have left the mortar seen. (Pathology 6)

Pavement

In many areas of high pedestrian traffic, like corridors, there are cracks and fissures in several directions in the terrazzo floor. (Pathology 15)

Also on the stairs that connect all the building look finish material detachment. This may be due to the intensive foot traffic or the finishing material which have suffered strokes. (Pathology 14)

Expansion joint

Is dirty and has moisture around. It has also lost the sealant in most of its entire length, so it is exposed to the weather. Inside the building in the basement is also seen without sealant. It has irregularities in placement rockwool. (Pathology 9)

Expansion joint is an element very important in the buildings, because It allows relative movements between two parts of a structure or between structure and others with which it works, so it has to be in perfect condition and be well maintained to prevent deterioration.

Oxidized elements

Inside the building, specifically the ground floor where the materials laboratory, there is a lane beam to transport materials around the room. All elements are of steel, and in particular has one entire surface oxidation. However it has been chosen to carry out a repair method and healthy since no decrease in their section. (Pathology 13)

5- STUDY BUILDING. FLOORPLANS

5.1 LIFTING METRIC-DESCRIPTIVE

5.1.1 Site plan

5.1.2 Floor plants

- Basement
- Ground floor
- First floor
- Second floor
- Third floor
- Fourth floor
- Deck

5.1.3 Elevations

- North
- South
- East
- West

5.1.4 Sections

- Section A-A´
- Section B-B´
- Section C-C´

5.1.5 Structure plans

- Basement
- Ground floor
- First floor
- Second floor
- Third floor
- Fourth floor
- Detail structure