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Preventive and Corrective Diagnosis of the Built Infrastructure, Faculty of Engineering of the Universidad Autonoma de Campeche, (Campus V) Second Stage

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Abstract

The present work has as general objective to carry out a deep technical analysis, a pathological diagnosis of the buildings "A", "C", "D", "laboratory of floors and pavements", laboratory of the Center of Training and Technological Development in Refrigeration And Air Conditioning, better known as "CAADETRA", "structures laboratory" and "outdoor areas in general (Field of use, student society, booths, parking and green areas)" Faculty of Engineering (campus V) Of the Autonomous Universidad de Campeche, through a qualitative and quantitative evaluation that allows to determine the deteriorations generated by the continuous use and normal wear and tear of the same, with the purpose of proposing to the university authorities immediate actions of rehabilitation, continuous maintenance, preventive work and Or corrective measures and to carry out them on a regular basis by developing a continuous maintenance program for To preserve and / or protect the infrastructure already installed and in operation, in order to preserve in excellent conditions the spaces for the academic formation of the students who arrive in these spaces year by year, since it is of the utmost importance that the facilities are in Optimal way and thus avoid possible accidents that could arise. In order to ascertain and obtain the expected results, the general methodology used consisted of an eminently field study, detailed visual inspection, field surveys and surveys, field trips, updating of plans, observation and compilation of non-destructive samples of the elements Which constitute the complex, photographic records of the areas, an analysis of the content of the instantaneous taking of samples at a given time that would allow to draw provisional conclusions about the observed phenomena, obtain a documentary record through the evaluation of the current conditions (Plans and catalogs of factories), further investigating and opting for a registry and analysis of the possible causes of deterioration (photographic-descriptive registry of deteriorations), and the general proposal of intervention. The timely implementation of these maintenance actions aims to contribute to create conditions that facilitate the students' school use, this process of identifying the deteriorations found in these buildings and later, the intervention proposal, will allow us to optimize the processes of constant maintenance, with The purpose of increasing its useful life.

Diagnosis, Pathology, Intervention, Deterioration, catalog of factories

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General Introduction

The schools of education are the places where students spend most after their home, therefore, for institutions of higher education, such as Campus V of the Faculty of Engineering of the Autonomous Universidad de Campeche, obtain a detailed study on The current technical conditions in which the built infrastructure is located, allows us to obtain an overview for decision making, in order to elaborate an immediate intervention plan and a periodical maintenance of the building, this will help us to look for the best conditions in Each of the spaces dedicated to it. The main characteristic of making a diagnosis is that, when it is done in a timely manner, it contributes to "... reduce failures and increase the availability and useful life of equipment and facilities, and greater efficiency in the use of resources ..." (preventive maintenance plan and Corrective of the physical infrastructure and equipment, 2016, Universidad Veracruzana), to increase the useful life of the infrastructure, to better support the high impact of the levels of occupancy of the school spaces and, above all, to increase the security of the users ; However, many times this diagnosis is carried out when the state of the infrastructure is already critical and influences "school performance" (IDB, 2012).

This study aims to contribute to the awareness of all members of the community (teachers, administrators, students) to collaborate in proposing the implementation of a permanent and timely maintenance program in order to mitigate and combat the Wear of the infrastructure already installed and in operation, to ensure a continuous, reliable and safe operation and operation of the services provided and, above all, to reduce operating costs.

As the number of users using these facilities is decisive, develop a plan for its maintenance on the grounds that "... the use of infrastructure is proportional to the number of users." (Manual of Procedures, Department of Preservation of Facilities, Government of the State of Mexico, 2010)

With this research, we allowed to present the main hypotheses**:**

- Having classrooms and learning spaces in good condition is decisive in the objective of obtaining students the expected academic results.

- A good school infrastructure, with new spaces, makes it possible for young people who live in the interior of the state mainly to study and, in addition, tend to improve the attendance and interest of students.

- Some elements of physical infrastructure are not linked to the development of students' competences, but to their well-being, as they guarantee their stay in safe and healthy environments**.**

The research is distributed in the following sections:

1) It presents the history and background of the Autonomous Universidad de Campeche and the Faculty of Engineering that allows us to know the importance of this institution and its spaces for students; The general description of the areas to be analyzed: buildings "A", "C", "D", laboratories: "soils", "CAADETRA", "structures" and "outside areas"; As well as a photographic record of them.

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2) It shows the satellite view and location of the Faculty of Engineering and the architectural plans of the buildings.

3) A detailed description of each space is found; the catalogs of factories that were created from the surveys and the plans that allow the location of each object presented in those catalogs.

4) The catalogs of the normal deterioration process are shown, with the respective drawings.

5) The intervention proposal, with its plans and detailed catalog.

It should be noted that the school infrastructure under study, is relatively new, as it was completed and began to use its facilities in 2012.

Criteria used

The research was developed through a methodological study and mainly based on field work, consisting of: surveys and inventories in a qualitative, quantitative, descriptive, transverse and longitudinal way, through a series of non-destructive tests, which gave rise to obtaining a database, taking representative samples and drawing conclusions from observed phenomena.

Social impact expected

It is hoped to create the optimal conditions of the facilities that facilitate and increase the students' school use, in addition, this infrastructure is a condition for the teaching practice, since this is a basic input for the educational processes.

Theoretical or Conceptual Framework

The actions of adequate maintenance of the buildings and their facilities are carried out with the purpose of guaranteeing or extending the useful life of the public assets that the educational establishment has, they are necessary to improve important aspects of a space such as:

Functionality, safety, productivity, comfort, institutional image, health and hygiene, as well as constantly encouraging among its members the care of the environment (Espejel Rodríguez Adelina and Flores Hernández Aurelia, 2012). A program of maintenance of educational facilities must necessarily begin with the evaluation of the same, to determine what is the situation of which is part and what are the most urgent needs to attend; The maintenance starts from the proper use of equipment and installations that goes through a good periodic cleaning through the use of suitable utensils, to the repair and / or replacement of some element. In order of priority, the proposal should be aimed at gradually solving the following criteria:

- Potential impact on user safety & level of involvement in educational activities.
- Negative impact on the environment (waste of water or electricity) and economic losses.
- Possible aggravation of deterioration if not attended to in a timely manner.
- Affection of the well-being and comfort of students and teachers.
- Impaired appearance of the school

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Adequate maintenance delays investment in corrective maintenance; Therefore, it must be permanent. Also, it is important to carry out a schedule of all maintenance operations with the corresponding periodicities if we want to have a building with minimum levels of quality, safety and comfort, and at the same time save expenses in a medium term, ... to maximize the permanent availability of buildings, equipment and facilities with the highest possible reliability and reasonable cost ... "(NAVAS PORTO, Guillermo, 2010)

We must consider at present, seek to comply with "... the requirements, norms and standards that seek to ensure that new reconditioning projects that are developed, tendered or constructed, comply with the current standards in force, which analysts of different educational levels have considered Must be part of the educational buildings. "(MORALES OREA, Cristina, 2012, p..

Background

Geographical location:

Campus V, building without number by Humberto Lanz Cárdenas Avenue and Environmental Ecological Housing Unit, ex Hacienda Kalá colony. San Francisco de Campeche, municipality of Campeche. Mexico

Figure 1 Macro-location. Faculty of Engineering
Source: Google Earth

Figure 2 Micro-localization. Buildings A, C and D, Laboratories and External Areas. Faculty of Engineering
Source: Google Earth

Figure 3 Architectural Plan. Buildings A, C and D, Laboratories and External Areas. Faculty of Engineering.
Source: Own

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Historical background

The then Southeast University began its existence in 1965, integrating with two middle schools: the High School (now the "Ermilo Sandoval Campos High School" and the School of Nursing and Obstetrics and three higher level schools (Now Faculty of Law Dr. Alberto Trueba Urbina), School of Engineering and Specialized Technicians (ESITE) (Faculty of Engineering), and the School of Commerce (Faculty of Accounting and Administration).

The idea was to establish a university Mixed with both technological and scientific careers.

ESITE has as its first director of the campus, Ing. Humberto Lanz Cardenas, and acting as Secretary the architect Gabriel Baqueiro Rojas. Since its foundation, it had a building located in Ciudad Universitaria.

If we consider as a reference the University Sports Cultural Center (CCDU), a series of buildings can be observed in Ciudad Universitaria in a row to the right of the land; the second of these buildings is with which originally counted the Faculty of Engineering.

In 1986, this building was expanded in an area of 228 m2, since, with the creation of the Masters in Land Roads, and the Computer Center, new facilities became necessary. The extension consists of two rooms on the ground floor, as well as an auditorium on the first level and two classrooms in the second.

Figura 4 Former Faculty of Engineering
Source: Google Earth

The space needs created by the opening of specialties and new careers, forced this Faculty to extend in the building that is at the limit of the university field with the Juan de la Barrera Avenue. On the ground floor of these facilities was the Materials Testing Laboratory; In the first level, one of the classrooms was assigned to the Electronics Laboratory and, in the second, three classrooms for specialties and masters; Two classrooms for the Degree and a room for the Department of Surveying and Photogrammetry. Following the same line of buildings, at the bottom of the campus comprising the University, there are three workshops: Electromechanical; The Training and Technological Development Program in Refrigeration and Air Conditioning (CADETRAA); and another one for the Workshop of Machines and Tools. Undoubtedly, this first School of Engineering managed to achieve its objectives in full, because it was the determining factor to guide the activities of its students, since its graduates are professionals widely recognized in our state, some currently dedicated to education mainly in the area of Mathematics, And others in the exercise of the profession. In accordance with the requirements of the moment, three intermediate level races are established in the first year of activities:

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Agricultural Technician, Electrical Technician and Technician in Internal Combustion Machines, each of them with a duration of three years. It is in the following year, that is to say, in 1966, when the first top-level race was instituted, that of Engineer Surveyor and Geodesta, immediately received by the means, before the necessity of professionals who will be in charge of the terrestrial measurements and reference positions in the delimitation of land, implementation of irrigation zones and route of communication.

On February 1, 2011 construction of the V campus was started. Due to the uneven topography of the site, the project was modified so that the original design was lost; The first substantial modification to the project that had been carried out was in an integral "T" form; The second modification was designed integrally in the form of a "pendulum"; The last modification was to disintegrate by module buildings all over the complex, remaining as it currently stands.

Campus V (Faculty of Engineering) was inaugurated on July 20, 2011 with its new location on Ex Hacienda Kalá Avenue (which intersects with the old Campeche-Mérida highway) with electrification, street lighting and gardening.

General Descriptions of the study areas: Buildings: "A", "C", "D", "Soil Laboratory", "CAADETRA Laboratory", "Structures Laboratory""

Figure 5 BUILDING "A", Campus V Faculty of Engineering. Southeast side
Source: Own

Building "A"

The building consists of three levels: The ground floor has an area of 300.24 m2 of construction, with a single access that immediately communicates with the waiting area, information and attention to the public, areas for staff access (secretarial area, EXADES area, file, wine cellar, sitting area, women's and men's bath, boardroom and multipurpose area).

In the same way, there are 4 cubicles destined to each one of the coordination of race; is the academic secretariat, which in turn has a kitchenette, bathroom and archiving area. The first level has an area of 336 m2 has a library where students can consult various bibliographies.

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In the second level it contemplates a total of 345.91 m2 where mainly the offices of the direction of the faculty are located; has a double front door that communicates to a waiting area, secretarial staff of the director and graduate. Four cubicles for the postgraduate coordinators, administrative coordination area, warehouse, toilets and kitchenette. The floor is made of porcelain vitreous of 60x60 cm sand colored in the whole building.

Figure 6 "C" BUILDING, Campus V Faculty of Engineering. North side
Source: Own

Building C

The building consists of three levels: the ground floor has an area of 247.28 m2 and consists of a living room, eleven cubicles for teachers and professors for consultancy and research, a library, a kitchenette, a warehouse, A boardroom and toilets. The first level has a total area of 247.28 square meters and contains nine cubicles for professors and professors for consultancy, a waiting area, a meeting room, an area for social services or consulting, a printing area, a Dining room and toilets. The second and final level has a total area of 247.28 m 2 and contains thirteen teacher's cubicles, a waiting room, a tutoring area, and sanitary.

Figure 7 "D" BUILDING, Campus V Faculty of Engineering. North side
Source: Own

Building D

The building is composed of three levels: the ground floor has an area of 249.75 m 2, where the sanitary services, the mechatronics laboratory, the basic and advanced manufacturing laboratory are located. In the first level has a total area of 249.75 m ^ 2, there is the basic science laboratory, mechatronics laboratory, equipped with tools and equipment for the development of software and devices used for simulation and practices focused on the career of Mechatronics, computer systems and energy and the hydraulic laboratory. The second level, with an area of 249.75 m ^ 2, are destined for postgraduate students and three classrooms for undergraduate level. Each level has a hallway of 1.4 m wide, aluminum railings on the second and third level. The floor is of vitropiso of porcelain of 60x60 cm color sand in the whole building. This building has 25 air conditioning units.

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Figure 8 SOIL LABORATORY, Campus V Faculty of Engineering. West Side
Source: Own

Soil laboratory

The total constructed area with the building is 104.50 m2 with a concrete esplanade, has a single level. Each of the areas has specific equipment and necessary for the activities that in this laboratory, are usually carried out.

Figure 9 CAADETRA LABORATORY, Campus V Faculty of Engineering. Northwest side
Source: Own

Caadetra laboratory

(Center for Training and Technological Development in Refrigeration and Air Conditioning)

The total built area of the building is 148.50 m2 including an esplanade, has a single level, which is composed of a laboratory, a warehouse, a tool room, a space for a generating plant, some areas Of machinery or equipment and sanitary equipment

Figure 10 LABORATORY OF STRUCTURES, Campus V Faculty of Engineering. Southwest side
Source: Own

Laboratory of structure

The structure laboratory has a total area of 327.70 m 2. Consists of an advisory area, two offices where the indications are given and the theoretical part of the tests being carried out, a test area with the universal machine and two that serve as cubicles of the professors in charge of the laboratory.

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Outside areas

Figure 11 MULTIPLE USES COURSE, Campus V Faculty of Engineering
Source: Own

Multiple use court. The indoor court has a dimension of 28 x 16.5 mts, is equipped to play soccer ballroom, basketball and volleyball, has 2 goals and 2 basketball nets. The roof is supported by a steel structure of 4.59 m in height, has an arc-shaped sheet covered with a maximum height of 7.03 mts, has 12 luminaires from 400 w to 220 volts.

Student Society. It has a construction area of 53.28 m 2, is a room divided into 3 areas: warehouse, photocopier and student society. It is located in the southern corner of Campus V, next to the parking lot.

Parking Access Booth. It has three tourniquets, guardhouse and surveillance camera

Figure 12 MAIN ACCESS HOUSE. Campus V Faculty of Engineering
Source: Own

Main Access Booth. It has five tourniquets, guardhouse and surveillance camera.

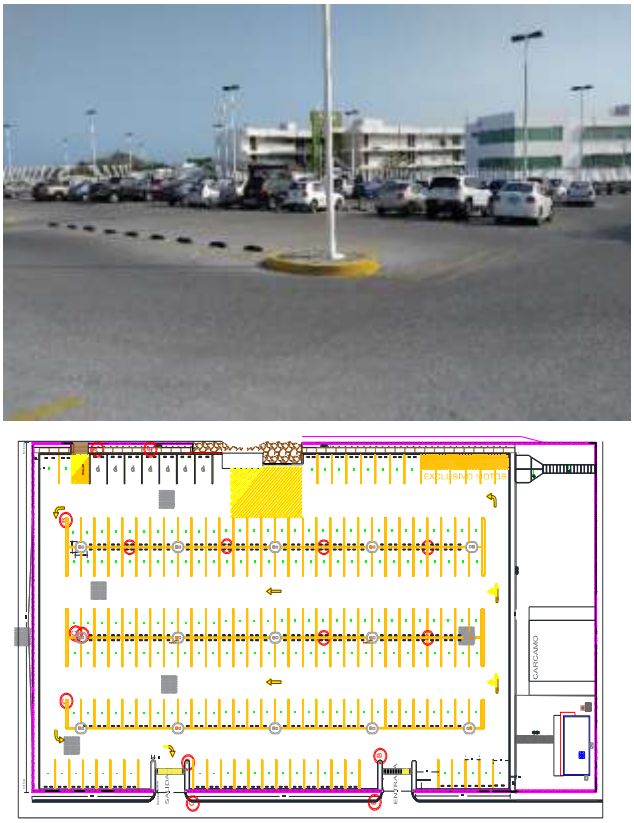

Figure 13 PARKING. Campus V Faculty of Engineering
Source: Own

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Parking lot. It has an area of 5,600 m ^ 2 of hot asphalt folder of 10 cm of thickness, with 15 cm of hydraulic base, has a perimeter of garrison of concrete prefabricated of 1.0 mt, 184 drawers that serve to park the vehicles for personal personnel, Eight drawers for people with different abilities, a motorcycle area and a bicycle area; Has fifteen luminaires, two poles for surveillance camera.

Figure 14 GREEN AREAS. Campus V Faculty of Engineering
Source: Own

Green areas. These are spaces characterized by the presence of vegetation for a total of 5,396.65 m2, with disabled ramps, twenty-seven stainless steel benches.

We must clarify that "... the school green areas are all those spaces within the school or in its surroundings, occupied by trees, shrubs or plants, which can have different uses, whether recreational, ecological, ornamentation, climate regulation, As well as protection and recovery of the environment ... "(Maintenance Manual, INIFED" National Institute of Physical Educational Infrastructure ", 2013)

Deterioration found in the property

Figure 15 Corrosion in metal structures
Source: Own

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Figure 16 General damages in painting
Source: Own

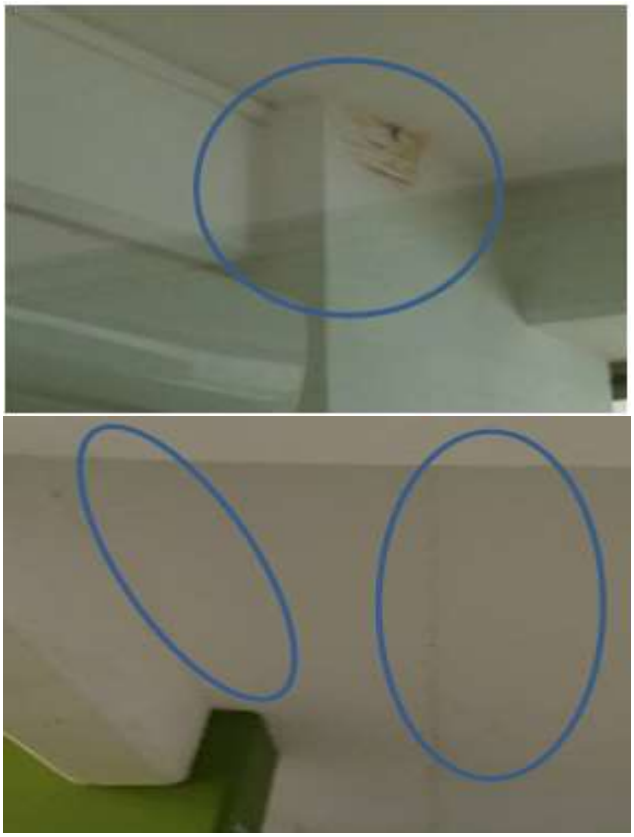

Figure 17 Presence of cracks and dampness
Source: Own

In order to define the intervention process that will be used (either preventive or corrective) in the furniture, equipment or building, it is necessary to know first the causes that caused the deterioration.

The deterioration, is the wear and tear on the component elements of the educational infrastructure, produced by normal use, lack of maintenance, natural wear and tear, accidents, improper use or environmental factors, we can mention that there are different types of deterioration that affect the infrastructure Educational:

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a) Deterioration due to normal wear. It is the one that presents itself in the educational infrastructure by the daily activity of use, due to the aging of the materials, generally it appears in coatings and movable elements, like doors, windows, endowments by change of technologies, fulfillment of cycles of use. (Eg, factory weathering, water leaks due to defects in facilities, presence of water from the outside by leaks, rain, capillarity, evaporation, defects due to lack of timely maintenance) (GARCÍA CASAS, J. Ignacio and YAÑEZ VELASCO , Igor, 2000)

b) Deterioration due to lack of recurrent, preventive and predictive maintenance. It is the one that appears in the educational infrastructure for the lack of actions for the adequate support in an acceptable level of the educational infrastructure; The omission of these procedures regularly leads to corrective maintenance of greater cost and dimension. (For example: lack of preventive revisions of the use and maintenance of facilities, absence or defect of a continuous maintenance program, immediate repair of injuries or faults found and that, over time, degenerating the elements found).

c) Accident impairment. Caused by third parties where in an out of control event damage to the infrastructure is generated.

d) Deterioration due to inadequate use of infrastructure. Within the normal use of the infrastructure there are situations of misuse by the users caused by ignorance of the operation, malicious actions or vandalism.

e) Deterioration by environmental factors. Deterioration due to environmental factors is recurrent due to rainfall, harmful effects of the sun's rays, high humidity and abrasive effects in desert areas or salinity in coastal areas. This deterioration depends specifically on the geographical areas where the educational establishments are located. (Eg, hygrothermal differences, physical processes of inflections and deformations, thermal differences) (RODRÍGUEZ RODRÍGUEZ, Ventura, 2004)

f) Deficiencies contained in the original project or design (for example: inadequate construction solutions, errors in the sizing of structures or installations, absence or defects in construction details).

It is important to mention that, if we detect any of these deteriorations, we must proceed to its immediate correction, otherwise failure to do so will lead to its aggravation, turning a small fault into a major damage that will require a considerable investment for your attention. (Maintenance Manual, INIFED "National Institute of Physical Educational Infrastructure", 2013). The deterioration in the structure of an element can be caused because the service limit has been met, ie the structure does not present an imminent risk, but there has been loss in its functionality for which it was designed. Another probable element is because the fault limit has been reached, that is, the element has yielded structurally because it is subjected to loads greater than its resistance. However, the definition of two specific situations does not imply that interventions are defined; Since from each one of them different cases are derived, as they are: deformations, cracks, damages in the finishings, corrosion, oxidation, dryness of the materials, etcetera.

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Which require a certain methodology to be taken care of. In this investigation the reasons that caused the deterioration probably were probably determined by the deficiency in the design, constructive processes adhering to the norms for the case, maintenance and atmospheric factors such as the weathering and the preponderant humidity in this region, They acquire those that are directly related to the constant maintenance that must receive the buildings and outer areas. The main deteriorations found in the facilities were mainly:

I. Cast luminaires and detached cabinet covers, for constant use.

II. Corrosion in metallic structures of the building.

III. Air Conditioners, without constant maintenance.

IV. Worn and hinged wooden doors in hinges and locks.

V. Water leaks in toilets.

VI. General damages in the painting, by the environment, mainly.

VII. Light cracking.

VIII. Presence of humidity in various parts of the infrastructure.

IX. Floating of floors, probably by settlements.

X. Doors and handles of cancellation, deteriorated.

Methodology selected for the proposed intervention of buildings and laboratories.

The proposed methodology was based mainly on the evaluation of quality and educational spaces (MORALES, OREA, María C., 2012) and is the following:

a) Field Research Stage.

b) A detailed visual inspection of each of the areas was initiated by a series of non-destructive tests of the real estate under study and the content analysis of the instantaneous taking of samples detailed at a given time to obtain the expected results.

c) Record of Evidence.

d) Next, we proceed from the evidences found, such as: photographs, operating manuals, guarantees, climatological records, interviews of experts and witnesses, among others, to record all the data.

e) Stage of Analysis and Diagnosis. Factories Survey.

f) Subsequently the catalog of factories was made to know through an inventory of each space the design and composition of the building and its equipment.

g) Stage of Analysis and Diagnosis. Deterioration.

h) Once detailed, we proceeded to analyze and describe the deteriorations caused over time and concentrated on the so-called "deterioration catalog" to know its pathology, are reflected in plans and the catalog of concepts by items.

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i) Stage of Intervention. Releases, Consolidations, integrations and reintegrations. Each one of these concepts was evaluated until obtaining a proposal of intervention, where, it is detailed a series of preventive or corrective measures by each work item, with the purpose of that they are conserved in optimum form and with a greater time.

j) In the detailed photographic record of intervention are grouped the elements to be conserved by concept, according to the heading that belong, as well as the symbology according to the case of intervention, which are reflected in the plans.

Hypotheses

With this research, we allow the following hypotheses:

1) One of the hypotheses was that the condition of being a young building means that it has an acceptable state in its infrastructure but that it requires permanent attention in all its areas.

2) Another hypothesis argues that the more use is given to the property by the students is more subject to constant deterioration that arise in the spaces intended for it.

3) Another hypothesis tells us that it seems that the indiscriminate use of the equipment in the salons is the main cause of the deterioration of the same.

4) Another hypothesis is that a good school infrastructure, with new spaces, makes it possible for children and young people living in remote areas to get to study, in addition to tending to improve student attendance and interest.

5) A final hypothesis indicates that some elements of the physical infrastructure are not linked to the development of students' competences, but to their well-being, as they guarantee their stay in safe and healthy environments.

The general proposal of intervention of the educational infrastructure.

Since the general objective is to carry out a detailed pathological diagnosis to evaluate the current conditions of the installations by means of specific techniques and to make a proposal of intervention of the existing spaces, the general methodology used consisted of an eminently field study, a detailed visual inspection, Field surveys, updating of plans, observation and compilation of non-destructive samples of the elements that constitute the complex, photographic records of the areas, an analysis of the content of the instantaneous sampling at a given moment that would allow To draw up provisional conclusions about observed phenomena, to obtain a documentary record through the evaluation of the current conditions (plans and catalogs of factories), to investigate further and to register and analyze the possible causes of deterioration Fo Descriptive analysis of impairments), and the general intervention proposal.

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Findings and Analysis of Results

Analysis of the Results Found for the Effects Caused by the Normal Impairment of the Property

We can analyze several things:

1. That the Faculty of Engineering, is seated in a type of limestone rock hardness type "B".

2. The structure of the building has been designed and built taking into account the type of regional, socio-cultural and anthropic dynamics, to which it will be constantly subjected.

3. The area where the infrastructure is located is subject to strong winds and hurricanes during the year, which must resist the onslaught of nature. There is no need to repeat it: the design of a school must be thought to have the optimum environmental conditions of the place where it will be located, not only in front of the "exceptional" events that can cause a disaster, but also against the normal dynamics of the environment.

4. The school is located outside the floodplain areas, as it is located in high areas.

5. Within the pathological analysis, we find in several areas problems for the physical actions: physical erosion, condensations; Effects by capillarity; Leaks in some ceilings and walls and spills of tinacos by lack of maintenance, this by effect of the rains; Lack of continuous maintenance in the installations and probably some filtration of humidities by the type of terrain "sascab" that absorbs much humidity in times of rains, weathering of the elements and dirt by the presence of animals.

6. Other generic causes of "injuries" found in the installations produced by the mechanical actions: cracks and fissures usually provoked by the differential settlements in the structure to the terrain, loads and overloads; Dilatation cracks; Thermal differences; Hygrothermal differences.

7. We also find that there are physical, chemical and biological processes that influence the pathologies of buildings, such as: discoloration, decapitation or decomposition of coating materials (paints, mortars); Begins to be seen in some areas, processes of corrosion in the reinforcement and degradation of the concrete; There are exfoliations, efflorescences and gradual degradations of the materials caused mainly by the presence of salts, this, very recurrent throughout the peninsula and more because of its proximity to the sea.

8. The elements of wood have degenerative processes by biological actions, still brief, by the lack of continuous maintenance, the deformation and rot of some elements, due to the presence of xylophages, fungi, etc. Which deplete its useful life.

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Conclusions and recommendations

1.- Based on the first hypothesis, it is concluded that despite being a young building, it does not have a totally acceptable state in terms of its infrastructure, due to the years it has been in service (6 years) presents fault conditions And normal deterioration in some of its elements (structure, equipment and facilities).

2.- Based on another hypothesis, it is concluded that in addition to the constant use of the property and equipment found in the faculty rooms by the students, is more subject to deterioration due to their lack of skills in the management of These elements, which is one of the main causes of its deterioration.

3.- A hypothesis that tells us that a good school infrastructure with renovated spaces, tends to improve the attendance of young people, we can say that the engineering faculty has maintenance, but continuous, yes they have an administrative maintenance plan, which allows Have infrastructure in good condition, but is exceeded by the constant demand of students who come from all over the state to prepare professionally in each of the careers offered by the faculty.

4.- Although the development of skills by the students is not linked to the facilities that they offer, in a comfortable, modern and safe environment, will result in a better school use, which is the Rationale of the built infrastructure.

5.-Recommendation to improve the useful life of the parking pavement.

It is recommended to improve the parking area, consisting of a thin layer applying a uniform asphalt emulsion irrigation that has the purpose of waterproofing the surface rejuvenating it and allows to cover small fissures that prevent rainwater from seeping as well as wrapping or sealing material On the surface, preventing it from being detached, in order to extend the useful life of the existing asphalt layer, increasing the coefficient of friction of the rolling layer, having to be eventually rehabilitated so that the parking lot offers the appropriate conditions of service .

This treatment is relatively inexpensive non-structural, and for its previous application it is necessary to remove the neoprene stops, an energetic sweep to remove the powder and the detached stone material and a watering of impregnation to ensure that the seal irrigation of adhering to The existing asphalt emulsion.

When applying the watering of the seal, the neoprene stops will be replaced and the strips of the vehicle drawers will be painted with yellow retroreflective paint developed with resins of chlorinated rubber and alquidálica resin of high durability to the weather and the wear meets the specifications Of Painting of Traffic of Secretary of Communications and Transportation SCT, as a painting for signaling in streets, roads, urban traffic and road axes. (FT-157 TRAFFIC PAINT, STANDARD SCT 8009, STANDARD 17_NOM-034-SCT-2-2003_01)

To make the quality of the materials, consult N-CTM-4-04 / 08 regarding Asphalt Mixing Stone Materials, N-CTR-CAR-1-04-005 / 00 N-CSV -CAR-3-02-002 / 09 Layers of Rolling of an Irrigation, of the SCT Regulation. (GUIDE OF PROCEDURES AND TECHNIQUES FOR THE CONSERVATION OF ROADS IN MEXICO).

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6. Recommendation for maintenance in green areas.

The gardens are provided with grass known as Bermuda grass has the peculiarity of not having great height up to a maximum of 16 cm, is a lawn grass of vigorous consistency, very resistant and rapid propagation for this tropical region but very warm, however, Looks pale probably because the grass has not rooted in its entirety, the grass does not die at least for extreme dryness, and stores carbohydrate reserves at its roots waiting for spring, so it is recommended an average irrigation is between 2 and 3 Times a week and the provision of some common fertilizer less frequently (it may be a 24-5-11 fertilizer containing 24% nitrogen, 5% phosphorus and 11% potassium) and a 2.5 cm Have a green and healthy appearance.

"Modern gardening and its great complexity, in which the old concept of" gardener "has no place, since it is essential technical qualifications of the highest level to be able to create and maintain spaces of this type with sufficient guarantees" (Technical Manual Of gardening I Establishment of gardens, parks and green spaces, FERNANDO GIL-ALBERT VELARDE

Finally, it is concluded that although the Faculty of Engineering of the Autonomous Universidad de Campeche, was built six years ago, due to the movement and normal use of the property, the deteriorations have been made visible.

After the analysis of causes and intervention of the faults presented therein, it is established that it is essential to develop a program of continuous, preventive and corrective maintenance on the facilities, in this way it would give an explicit solution on the appearance and existence Of faults.

Also, the elaboration of this program allows savings in the economy destined to the rehabilitation of diverse equipment, furniture and areas of the property. An annual maintenance plan is necessary to summarize the operations and the time at which preventions must be carried out in the facilities in order to achieve a control of the tasks carried out.

The maintenance plan must contain the predestined times To carry out corrective and preventive maintenance work, allowing its control and execution in the established periods. (Norms ISO 9001 - 2015 infrastructures and equipment). In order to comply with the General Law of Physical Educational Infrastructure regarding quality, safety, functionality, timeliness, equity, sustainability and relevance, this standard establishes requirements that supervision must perform in the construction, equipment, Maintenance, rehabilitation, reinforcement, reconstruction and habilitation of buildings and facilities of the physical educational infrastructure of the country. (MEXICAN STANDARD NMX-R-024-SCFI-2015 SCHOOLS - WORK SUPERVISION OF THE EDUCATIONAL PHYSICAL INFRASTRUCTURE - REQUIREMENTS)

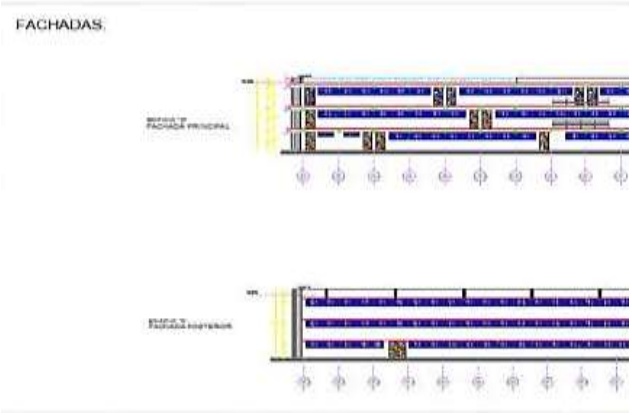

Figure 18 Architectural facades
Source: Own

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