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REVIEW

Reconstruction of the Municipal Palace of Acacías: A comprehensive engineering solution

Reconstrucción del Palacio Municipal de Acacías: Una solución integral desde la ingeniería

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ABSTRACT

Introduction: the article addressed the situation in Acacías following the riots of 2 May 2021, which caused serious damage to the Municipal Palace. Due to the partial destruction of the building and its limited space, the administrative offices were scattered throughout different areas of the municipality, making it difficult to provide services to citizens and for the institution to operate.
Development: faced with this problem, the municipal administration decided to relocate the Municipal Palace to a peripheral lot. However, this solution generated community discontent, as it increased the distance people had to travel to carry out procedures. Faced with this scenario, the project proposed redesigning the Palace in its original location, integrating all government offices in a single place. To this end, basic scientific principles and structural engineering principles such as statics, material resistance and current technical standards (NSR-10) were applied. In addition, modern technologies such as the portico system and BIM methodology were used to ensure safety, efficiency, and sustainability in the design.
Conclusion: the proposal represented a comprehensive response to the social and technical problem, seeking to restore equitable access to administrative services, optimise municipal resources, and promote urban and commercial development in the centre of the municipality.

Keywords: Infrastructure; Structural Design; Centralization; Accessibility; BIM.

RESUMEN

Introducción: el artículo abordó la situación ocurrida en Acacías tras los disturbios del 2 de mayo de 2021, los cuales ocasionaron serios daños al Palacio Municipal. Debido a la destrucción parcial del edificio y a su limitada capacidad espacial, las oficinas administrativas fueron dispersadas en distintos sectores del municipio, dificultando la atención ciudadana y la operatividad institucional.
Desarrollo: ante esta problemática, la administración municipal optó por reubicar el Palacio Municipal en un lote periférico. Sin embargo, esta solución generó descontento comunitario, ya que incrementó los desplazamientos necesarios para realizar trámites. Frente a este escenario, el trabajo propuso el rediseño del Palacio en su ubicación original, integrando en un solo lugar todas las dependencias gubernamentales. Para ello, se aplicaron fundamentos de ciencias básicas y principios de ingeniería estructural como la estática, la resistencia de materiales y normas técnicas vigentes (NSR-10). Además, se recurrió al uso de tecnologías modernas como el sistema de pórticos y la metodología BIM para asegurar seguridad, eficiencia y sostenibilidad en el diseño.
Conclusión: la propuesta representó una respuesta integral al problema social y técnico, buscando restaurar el acceso equitativo a los servicios administrativos, optimizar recursos municipales y promover el desarrollo urbano y comercial del centro del municipio.

Palabras clave: Infraestructura; Diseño Estructural; Centralización; Accesibilidad; BIM.

INTRODUCTION

In recent years, the municipality of Acacías has been the scene of significant events, with the infrastructure of the mayor's office severely affected by a social protest that occurred on May 2, 2021. This incident caused damage to several buildings in the municipality, including the Municipal Palace, which suffered a fire that resulted in significant material losses and compromised both the structure and the architectural integrity of the building.[1,2]

It is worth noting that the building did not have enough space to have all the required offices, so that the distribution was scattered in different homes, causing people to have to move quite a bit within the urban area, having to go to the Juan Mellao neighborhood to access the mayor's office (Calle 13 No. 13-08), then to the Centro neighborhood for the planning secretary (Carrera 15 N. 12-50), and finally to the Cooperativo neighborhood for the other offices, from the central park to one location to another to carry out their respective procedures. As mentioned above, the Municipal Palace had a tiny area, so it did not have a parking lot for the officials of the different administrative offices and other personnel. As a result, they were forced to park their vehicles in the nearby streets, causing problems with the flow of cars in the area.[3]

Faced with these problems, the planning secretary, in conjunction with the infrastructure secretary of the municipal mayor's office, has decided to relocate the Municipal Palace to Carrera 41 and Avenida 23 (a property known as "Lot A - Carabineros School"), located on the outskirts of the municipality's urban area.

This has generated discontent in the community of Acacire, since (despite unifying the offices in a single address), they still have to travel a long way from the urban center to the centennial square area to carry out their respective procedures with the different offices of the municipal mayor's office. To provide a definitive solution, it is essential to formulate a new design proposal for the Municipal Palace in the downtown area (in front of the municipal park), which avoids the long trips that the community must make.

The realization of this work was mainly based on recovering the Municipal Palace in its original location, reunifying all the offices of: Mayor's office, ICT office; secretary of promotion and sustainable development; secretary of planning and housing; social secretary of education; culture and sports; contracting office; legal office; secretary of government; secretary of health; internal control office; administrative and financial secretary; secretary of infrastructure; private secretary and public employment service, both those that were forced to move domicile, as well as those that had previously been operating in other addresses.[4]

What is proposed is an alternative proposal to establish the new Municipal Palace in the central area of the urban core (original location), providing easy geographic access to the population. This central location facilitates citizen access to administrative services, promoting the inclusion and participation of the entire community. Additionally, the centralization of offices contributes to strengthening the link between residents and local authorities by enhancing communication and improving service delivery efficiency.

The proposed location can economically generate an increase in commercial development in the surrounding area by attracting more community to the central region, which could benefit small and medium-sized businesses. Additionally, the centralization of the mayor's office enhances access through public transportation routes, facilitating the movement of citizens, particularly those who rely on public transportation for their daily commute.

DEVELOPMENT

The first step to deepen the structural field is through understanding and learning the basic sciences: first, physics, which provides knowledge of the various phenomena that surround us; and mathematics, as the primary tool for solving problems through equations. However, chemistry is also involved in understanding the properties of materials, determining whether they are suitable or not based on their composition, and also detecting any potential pathologies they may present.[5]

The application of basic sciences has allowed the emergence of other sciences and branches of it, such as statics, which studies bodies at rest and the forces acting on it, this science has allowed the application of Newton's Laws: Law of Inertia (every body remains at rest or in uniform motion unless subjected to external forces); Law of Force (for analysis of bodies in equilibrium, i.e. they stay static despite being subjected to various external forces that cancel each other out); Law of Action and Reaction (for every action a reaction of the same magnitude is generated, but in the opposite direction). Statics has been fundamental for determining support reactions and analyzing reinforcement subjected to axial forces.[6]

Where statics ends, the study of other more specialized branches in the structural field begins, such as resistance of conventional materials and structural analysis, where Hooke's law stands out (the unit deformation of a material is directly proportional to the stress applied within the elastic range of the material; equilibrium

equations (product of Newton's laws) that establish that to achieve static equilibrium, the sum of forces in "x", "y" and moments must be equal to zero.[7,8,9,10]

Once all the topics of moments, shear, axial forces, deformations, stresses, etc. were understood, they were applied to the design of the different elements that make up the structure to be designed (beams, columns, floor slabs, foundations, etc.), in addition to the criteria that the designer must have to verify that such designs comply with current regulations (NSR-10 for Colombia), which establishes guidelines and provides methods for the design of structural elements.[11,12,13,14]

Conceptual Framework

Gantry System

It is a distribution of vertical (columns) and horizontal (beams) structural elements connected in a rigid manner (forming frames) that can resist bending and shear loads.[12,13,14,15] This structural rigidity enables the structure to resist deformations and displacements, ensuring its stability and safety.[16,17,18]

BIM

It represents a work methodology that allows the creation and management of information throughout the entire cycle of a construction project.[19,20,21] Through the use of three-dimensional models, it is possible to obtain detailed information on each element that comprises the structure, which is essential for the design's efficiency.[22,23]

Structural behavior

Structural behavior is the study and understanding of how structures react under the loading and environmental conditions to which they are exposed.[24,25,26] This analysis is crucial to ensure that the structure meets the necessary durability, strength, and safety requirements.[27]

Architectural Design

It encompasses the entire process of creating, designing, and planning a building, from its inception to its completion.[28,29,30] It encompasses the spaces, forms, materials, and styles that make up the structure.[31,32]

Legal framework

Table 1. Legal framework

Standard	Category	Description
ACI (American Concrete Institute) [L1][33]	International	"Establishes international standards for the design, construction, and evaluation of concrete structures; provides detailed technical guidance on design aspects of reinforced concrete elements." [L1]
Colombian Seismic Resistant Construction Regulation - NSR-10 [L2]	National	Establishes in chapter A.1.2.2 the object, which is "To reduce to a minimum the risk of loss of human lives, and to defend as far as possible the patrimony of the State and citizens."[L2]
Law 1523 of 2012 [L3] [34]	National	Describes the concept of Disaster Risk Management as: a social process oriented to the formulation, implementation, monitoring and evaluation of policies, strategies, programs, measures and permanent actions for the knowledge and reduction of risk and for disaster management, with the explicit purpose of contributing to the safety, welfare, quality of life of people and sustainable development. [L3]

CONCLUSIONS

This work highlights a critical need in the municipality of Acacías: the restoration and redesign of the Municipal Palace in its original location. The analysis reveals that the forced decentralization of administrative offices, following the damage caused by the 2021 social protests, has significantly impacted citizens' access to public services and weakened institutional efficiency.

The proposal presented not only seeks to restore the functionality of the damaged building, but also to consolidate all administrative offices in a single space, which would significantly improve citizen service, foster integration between the community and the government, and boost local commerce. Centralization in the urban center would facilitate access to pedestrian and public transportation, thereby reducing the travel burden for the population.

From the technical point of view, the project development is based on solid structural engineering principles and modern methodologies such as the use of gantry systems and the implementation of BIM, which ensures efficiency, structural safety, and quality control. Additionally, current Colombian regulations, such as NSR-10, are adhered to, ensuring that the proposed design meets the highest standards of safety and functionality.

In summary, the approach for reconstructing and redesigning the Municipal Palace in the urban center of Acacías represents an integral and strategic solution, both from a social and technical perspective. It is not only a matter of building a new structure, but also of reestablishing institutional cohesion and facilitating equitable community access to local government services.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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