

## Temple of the Assumption of Our Lady of Tochimilco, Puebla, Mexico, a convent complex belonging to the 16th-century convent route

### Templo de la Asunción de Nuestra Señora de Tochimilco, Puebla, México, conjunto conventual perteneciente a la ruta de los conventos del siglo XVI

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#### Abstract




The contribution of this research is that it rescues the work of researchers who have disseminated the importance of preserving this convent complex, designated a World Heritage Site since 1999. This complex is part of the Route of the 16th-century Monasteries, attracting tourism to a community with a high degree of economic vulnerability that survives primarily on agriculture and tourism. Furthermore, the convent complex is one of the meeting places that allows for community cohesion and the preservation of its cultural identity. Therefore, disseminating its existence can benefit a community and preserve this heritage. The discussion is divided into three parts: The first establishes the importance of the location of the convent complex; the second outlines the concepts that influenced its construction; and the third describes the most relevant components of the complex.

INVESTIGACIÓN		
Objetivos	Metodología	Contribución
Identifica elementos clave representativos del templo mediante investigación 	Análisis: diagnóstico, programa, problema, forma, diseño, calidad y materialización. 	Divulgación pública de información en difusión del conocimiento. 

Trade route, architecture, and components

#### Resumen

La contribución de esta investigación, es que rescata trabajos de investigadores que han divulgado la importancia de la conservación de este conjunto conventual denominado como patrimonio de la humanidad desde 1999. Este conjunto pertenece a la Ruta de los monasterios del siglo XVI, atrae al turismo hacia una comunidad con un alto grado de vulnerabilidad económica que sobrevive principalmente, de la agricultura y el turismo. Además, el conjunto conventual es uno de los centros de reunión que permiten la cohesión de la comunidad y la conservación de su identidad cultural. Por ello, si se divulga su existencia, se podrá favorecer a una comunidad y se preservará este patrimonio. En la discusión, se forma por 3 partes: En la primera, se establece la importancia de la ubicación del conjunto conventual; en la segunda, se manifiestan los conceptos que influyeron en su construcción y en la tercera se describen los componentes del conjunto, más relevantes.

INVESTIGATION		
Objetivos	Metodología	Contribución
Identify key representative elements of the temple through research. 	Analysis, diagnosis, program, problema, form, design, quality and materialization. 	Public dissemination of information in the diffusion of knowledge. 

Ruta comercial, arquitectura y componentes

Area: Advocacy and attention to national problems

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## Introduction

The conquest of Mexico by expansionist Spain first resulted in a process of subjugation and hybridisation that sought to impose a single identity on the Americas. Subsequently, it led to a lack of understanding of the ways of life of each community, which, despite belonging to the same region, had diverse ways of thinking and acting [Montes de Oca, 2001].

The conquest of Tenochtitlán in 1521 marked the beginning of the construction of what is now Mexico, and was a unique experience at that time, both for the Spanish and for the natives. The armed conflict gave way to cultural and religious confrontation [Artigas, 1999]. The conquest of Mexico is considered a model conquest due to the way it was carried out. It was overwhelming, allowing for a change in ideology of the dominant force in the face of well-organised and defined cultures [Zanetti and Manzoni, 2022].

Between 1523 and 1572, religious orders were tasked with carrying out ‘the spiritual conquest of Mexico’ or ‘the first evangelisation’, which allowed the Spanish to control the territory and its population... This evangelisation was of fundamental importance, and although it was largely incomplete and somewhat syncretic, it allowed Spanish rule to be established through the ideological unity of a common religion of the rulers and the ruled [Martínez and Santos, 2015, p. 244].

It should be noted that the concept of syncretism is an expression used in cultural anthropology and theology as a term that attempts to describe in a single word the struggle between two forces that seek to survive, a process in which cultural hybridisation manifests itself. This is what Villalobos [2006] calls ‘co-participation of cultural forms,’ since coexistence generates mixtures that translate into new forms of behaviour, art, rituals, culture, identity, or architecture, among other areas.

Subsequently, the struggle between two powers gives way to a period of imbalance of forces, in which both sides seek benefits. However, syncretism is not always peaceful, as it is common for the dominant side to impose its ideas or a new order, turning those ideas into a transferable cultural product.

Syncretism or reinterpretation occurs through the confrontation between the two cultural concepts that try to “adjust” and are partially transformed, moving away from the rigorous concept of acculturation and cultural miscegenation [Gussinyer, 1996] ...” There is diverse evidence of religious syncretism, ranging from artistic expressions still preserved in the country's various convent complexes to the religious festivals, prayers, attire, and celebrations that are still practised today [Montes de Oca, 2001, p. 47].

In the case of architecture, intense contradictions arise as a result of the impositions of the dominant culture, and in being subject to this, it displays extraordinary originality. In the case of the Mesoamerican cultures dominated by the conquistadors, an architecture developed that incorporates some pre-Hispanic architectural aspects [Gussinyer, 1996].

## Methodology

The research method involved developing exploratory processes in the community since 2015 to understand the conditions of the space and the community. To this end, qualitative methods were used to disseminate the need for cultural heritage conservation.

Qualitative research is flexible and follows guiding principles. It is an empirical research process on the characteristics of the object of study and its context [Quecedo and Castaño, 2002]. Therefore, the research was carried out by reviewing and analysing documentary sources, visiting the site, and interviewing specialists in the areas of heritage structures and conservation, as well as the inhabitants of the municipalities of Tochimilco.

## Results

The authors of this article began visiting Tochimilco in 2015, and one of the sites they visited was the Temple of the Assumption of Our Lady. During the process, conversations were established with the population, where the traditions and customs of the place could be learned and appreciated.

Sunday mass became an activity where the population gathered to worship Christ. Afterwards, in the atrium, they talked and agreed on their work and family activities, and organised committees for the maintenance of the temple and the festivities.

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Some of the religious festivals include the Feast of the Assumption, which is celebrated on 15 August in the parish of the former convent of the Assumption of Our Lady, and the festival of the indigenous people of the saints or Day of the Dead, celebrated on 1 and 2 November, to give thanks to them for the harvests. After the 2017 earthquake, this community practice was suspended due to the damage caused by the earthquake. Residents of Tochimilco helped to clear the rubble and clean up the spaces, safeguarding furniture, images, and some fractured architectural elements. In addition, scaffolding was erected to support the arches of the convent.

The temple remained open during the first few weeks, but when the National Institute of Anthropology and History [INAH] decided to intervene in the building, it was closed to the public. In 2018, the INAH carried out non-invasive studies with ground-penetrating radar to obtain results on the composition and dimensions of the foundations and walls, as well as fractures in the walls. The damaged elements were the retaining walls, battlements, temple vaults, walls, and subsidence and cracks in the floor.

This allowed the discovery of a mass of water in the subsoil of the temple, which is unknown whether it is natural or artificial, which dampens the walls and may endanger the building. In 2018, a meeting was held with representatives of the INHA, with support from the United Nations Educational, Scientific and Cultural Organisation [UNESCO], Seguro Banorte and the Mexican Natural Disaster Fund [FONDEN], as well as representatives of companies specialising in scaffolding and shoring, using the results of the ground-penetrating radar. This work was halted by the Covid-19 pandemic and restoration work resumed in 2020. The work was slow, as it was considered that there were more damaged temples that needed to be repaired more urgently. The official opening of the temple was set for 13 August 2025, in preparation for the feast of Our Lady of the Assumption on 15 August.

### The route of the monasteries

A trade route is a road where different types of goods circulate. Trade is an activity involving the exchange of goods, for which patterns of behaviour are established, creating networks or routes that subsequently form complex networks.

Trade networks cover large territories, allowing the formation of empires that control trade relations, such as the Aztec Empire. In pre-Hispanic Mesoamerica, a regional system was formed, composed of units that behaved independently and interacted with each other. In these commercial processes, not only are goods and resources exchanged, but moments of cultural and technological hybridisation also occur [Cossens, 2019].

The natives lived scattered across large areas [nuclear families], so the Spanish concentrated the populations into communities, grouping together dispersed families to 'live under police supervision'; that is, monitored, controlled, and indoctrinated in the Catholic faith.

The territory was divided by religious orders as follows: Franciscans [Mexico, Tlaxcala, Texcoco, Huejotzingo, Cuernavaca, Calpan, Huaquechula, and Tochimilco]; Dominicans [Oaxtepec, Tepoztlán, Tetela del Volcán and San Andrés Hueyapa] and Augustinians [Ocuituco, Totolapan, Yecapixtla, Tlayacapan, Atlatlahucan and Zacualpan de Amilpas]. It can be said that evangelisation was not only aimed at indoctrination, but also at territorial expansion [Artigas, 1999].

At first, the Spanish used the same trade routes that existed in Mesoamerica to take advantage of their organisation and control. Spanish convents and pre-Hispanic temples have in common that they were related to trade and its routes.

For this reason, the buildings along the trade routes had similar characteristics, despite belonging to different religious orders [Martínez and Santos, 2015].

The first monasteries of the 16th century form what is now known as the route of the convents between Morelos and Puebla, comprising 14 monasteries recognised by UNESCO as World Heritage Sites on 17 December 1994... three in the state of Puebla [San Miguel in Huejotzingo, San Andrés in Calpan and San Francisco in Tochimilco] and 11 in the state of Morelos" [Sánchez, 2013, p. 213].

The convents were located in already populated areas with intense trade, which allowed for control of the territory and its inhabitants.

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For this reason, evangelisation and symbols of power had to be established to ensure the stability of New Spain [Martínez and Santos, 2015].

The highest points in each region were sought for the construction of the monasteries, as in the case of the slopes of the Popocatepetl volcano. In Puebla, Santiago Xalitzintla is the closest town to the volcano, at a distance of 12 km; Santa Cruz Cuautomatitla and Tochimilco are 12 km away; Huejotzingo is 46 km away; and Calpan is 12 km away. In the state of Morelos: Cuernavaca 60 km; Tepoztlán 91 km; Oaxtepec 81 km; Tlayacapan 89 km; Yecapixtla 18 km; Ocuituco; Tetela del Volcán 18.2 km; Hueyapan 15 km; Zacualpan de Amilpas 18 km. Approximately.

Almost all the towns where the convents of the mendicant orders of the 'route' were built on the slopes of Popocatepetl were hubs on the regional trade routes and to the lake ports of the Altiplano lakes, but divided into two circuits: one located in the state of Morelos and the other in the state of Puebla [Martínez and Santos, 2015, p. 260].

In addition, the roads and routes represented growing economic development, which changed in line with that progress and became a system of spatial, economic and political organisation [Martínez and Santos, 2015]..." The medieval mass of convents in the middle of villages such as Tlayacapan established an architectural symbolism of power, hence the urgency to build them in the purest European style, without any trace of the pre-Hispanic era [Martínez and Santos, 2015, p. 244].

## Architecture

Spanish religious architecture had a structured and mature design, although in Mexico some elements of the conquered population were allowed to be incorporated into the architecture.

Pre-Hispanic influence was not observed, so one cannot speak of architectural eclecticism [Martínez and Santos, 2015].

Religious sites in Mexico emerged with a fundamental contradiction: the Spanish used covered spaces to impart Christian liturgy, while Mesoamerican culture used open spaces to worship their gods.

These two visions of religious space were applied in the development of new constructions in 16th-century Mexico.

There are different approaches to reinterpreting the religious space of the two worlds, which favoured evangelisation, as it took place rapidly and was less traumatic. However, the influence of pre-Columbian culture on architecture gradually disappeared and was reduced to the application of simple construction techniques and materials and elements in architectural decoration, resurfacing at the end of the 17th century and in the 18th century in viceregal Baroque architecture [Gussinyer, 1996].

The architecture created by the evangelising orders had homogeneous results, that is, similar models of architectural and construction design were used, with differences from European buildings.

As already mentioned, pre-Hispanic communities were located at distant points from each other, and the Spanish concentrated these communities in urban centres for their control.

For this reason, the articulation of the conventual atrium and plaza was very important for the inhabitants, as it united the civic and religious spheres.

Although this relationship existed in Europe and other regions of the world, the atrium and plaza were included in the architectural programme in New Spain to meet the need to group large populations together and to create similarities between pre-Hispanic and Christian religious rituals. Therefore, pre-Hispanic ceremonial centres were revived in the architectural programme of religious centres in New Spain [Reyes, 2016].

As already mentioned, the creation of a new concept of 'Nation' brought with it new circumstances and needs to be resolved, which is why architectural programmes and their solutions were different from what had been established. An example of this is the Catholic ritual that was performed in open spaces in relation to the natural landscape, which became a 'sacred open-air enclosure.'

This was developed through platforms, retaining walls, buildings on ceremonial centres, among other architectural elements of pre-Hispanic origin. On the other hand, buildings were erected at visually significant points to increase their importance within the context. For this reason, psychological reference points from the ancient sites were used, ahead of the concept of spatial continuity, together with atriums. In addition, this concept accelerated the process of evangelisation, as built spaces were not required [Artigas, 1999].

It should be noted that some authors consider the open chapel or 'Indian chapel' and the atrium to be a pre-Hispanic innovation. However, other authors believe that these were the result of the early stages of evangelisation and even that their origin is European in the medieval and Muslim periods, although this is still controversial [García, 2015].

At the same time, they resorted to forms of settlement that were opposed to those traditionally found in the pre-Columbian rural world, but which were nevertheless present in their land in some way. The first section deals with atriums, an ancient early Christian tradition rarely used in late medieval European architecture [Gussinyer, J. 1996, p. 213].

For all the above reasons, it can be said that, although the atrium was known in Europe, at the time of the conquest it was not part of the Spanish architectural programme.

Therefore, there is controversy as to whether the origin of the atrium is European or pre-Hispanic; however, it can be considered that although the atrium was used in Europe, at the time of the establishment of religious complexes in what is now Mexico, it was not part of the architectural programme. Its introduction was the result of the need to evangelise a large number of people, and as there was no building to do so, evangelisation took place in open spaces, which was a pre-Hispanic custom and a functional necessity.

The founding of convents in the Spanish overseas territories could take ten, fifteen or even twenty years, or the negotiations could never be concluded and the project would remain only a pile of correspondence [Zavala, 2025, 164].

With the construction of these buildings, completed just a few decades after the fall of Tenochtitlán, unknown concepts emerged: large atriums, 'posa chapels,' orchards, open chapels, among others, considered the most important American contribution to Western architectural culture [García and Gómez, 2023] ..." The posa chapels, the open chapels, and even the atrium crosses, etc., stand out. These are themes of American origin, despite the fact that there is often a desire to invalidate any initiative with Amerindian roots" [Gussinyer, 1996, p. 214].

**Components of the**].

### Components of the temple

The Temple and former convent of La Asunción de Nuestra Señora in Tochimilco, founded in 1560 by Fray Diego de Olarte, is one of the first monasteries of the 16th century [Ortiz, 2013].

The convent complex is located on the slopes of the Popocatepetl volcano, and these buildings are listed by UNESCO as World Heritage Sites..." These are very unique villages whose origins date back to pre-Hispanic times and where the characteristic dwellings have been made of earth since before the establishment of the convents that led to the declaration [Guerrero, 2008, p. 112].

The Temple and former convent of La Asunción de Nuestra Señora is one of the buildings recognised for its condition and its unique architectural style, designed for evangelisation and as a place where there was a significant exchange of influences between European and American cultures... "It is a typical example of 16th-century fortress architecture. It has an open chapel, tower and belfry. Antonio de Ciudad Real wrote: 'The convent is finished, with its church, upper and lower cloisters, dormitories and cells, and vegetable garden' [Vergara and Jackson, 2022, p. 337].

At the time of the conquest and evangelisation, buildings were beginning to be constructed in Europe according to Renaissance criteria; in Spain, the process of change towards the new architectural trend was slower, as late Gothic criteria persisted. Some of these are: the design of the structure around the cloister and with a very compact typology.

The complex presents architectural uniformity, with a spatial pattern according to the conditions or characteristics of the site where they were erected, with constructive homogeneity, as the building process was controlled by the Spanish, ‘moderate’ or standardised layout, without sumptuousness in the convents [with the exception of the Augustinians], using moderate resources, freedom in design, and the layout had to be approved by the viceregal master builder [Reyes, 2016].

It should be remembered that Franciscans, Dominicans and Augustinians built enormous open buildings for worship and catechesis. They generally consist of a single-nave church with a convent and cloister, plus atrium[s], four chapels, an open chapel with an altar and a monumental cross located in the geometric centre of the atrium or in line with the chapel altar [Lara, 1996, p.8].

**Façade.** The components of the façade are as follows: in the centre is the door with a semicircular arch, which is framed by an alfiz or arch of Mudejar architecture, crowned by a pediment. At the top of the pediment is the choir with a mullioned window or window divided into two parts. The tower is located to the right of the gate with an embrasure, which is topped with a bell tower. On the left side, there is a 45-degree buttress. To the right in the background is the open chapel, which has a lowered arch on the upper floor and is framed by a simple alfiz or moulding. [Ortiz, 2013]. [Figure 1].

### Box 1



**Figure 1**

Entrance to the church of the former Franciscan convent of the Assumption of Our Lady, founded by Friar Diego de Olarte and built in 1650.

*Source: own*

**Atrio.** The word ‘atrium’ means ‘portico or entrance to a large house.’ The atrium is a space for gathering, instruction, and spatial distribution, located between the temple and the street [Catechesis of the Good Shepherd, 2014].

The atrium is also defined as a dynamic architectural space whose function was to be the social, religious, and cultural centre of the convent. The atrium was an educational and professional training centre for the community.

This space is delimited by one or two masonry walls and was associated with the adjacent town square, thus increasing its power as an urban landmark. Pre-Hispanic rites favoured the relationship between man and nature, so it can be assumed that people felt more comfortable in outdoor spaces. This was taken into account by the friars who, in their evangelising activities, had to understand the mentality of the natives and consider open spaces [Reyes, 2016].

The atrium is an outdoor space, used during the 16th century, whose predominant shape was quadrangular. It was used as a strategy to bring together large groups of people, reviving the concept of open space or ceremonial square, which became impressive spaces alongside the compact volumes represented in the temples and convent areas of monasteries, fitting together in the same architectural structure.

The atrium is considered to contain the open chapel, the posas chapels, and the processional path. In the case of the Tochimilco complex, there are three symmetrical entrances that give access to the central corridor [López and Frausto, 2019] ... ‘The complex has a large rectangular atrium with two entrances and crenellated walls’ [Ortiz, 2013, p. 35].

In the constructions of the first religious centres, the atrial courtyard was a connecting element between the open chapel and the posas chapels. These sites were important in the early days of evangelisation, until the temples were completed.

This contrasts with the idea that the atriums and posas chapels were used because of the indigenous population's fear of enclosed spaces. This is because pre-Hispanic religious rituals were celebrated outdoors and they were unfamiliar with the architectural forms of the semicircular arch and the vault; however, these construction elements must have been added long after the early stages of evangelisation [García, 2015].

**The atrium cross.** At the beginning of the Spanish conquest of Mexico [1521], the crosses were made of wood, but from 1539 onwards, under Church ordinance, they were replaced by stone crosses. The cross contains iconographic elements at the top relating to the passion and crucifixion of Christ [López and Frausto, 2019] ... ‘The most common form is a cross without a corpus; rather, the instruments of the Passion are carved into the shaft and arms’ [Lara, 1996, p.8]. The atrium cross within the religious complex in Tochimilco is located in the centre of the atrium on the longitudinal axis from the entrance to the atrium to the entrance to the temple. The stone cross stands on pedestals or bases [López and Frausto, 2019] and had an educational function with pre-Hispanic reliefs and Christian symbols [Reyes, 2016]. [Figure 2]

### Box 2



**Figure 2**

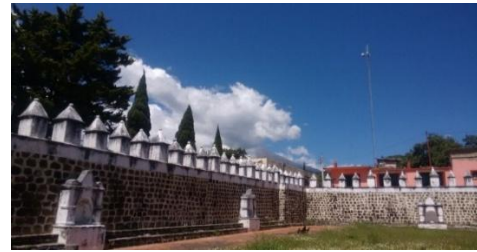
Central aisle, atrium cross, the temple in the centre and the Indian chapel on the right.

*Source: own*

**Procession route.** This is the name given to the path or route that parishioners take within the temple courtyard, praying, singing and even remaining silent as an act or celebration of their religious faith [López and Frausto, 2019]...“In 16th-century courtyards, it is usually perimeter-based and separated from the centre of the courtyard by a row of trees or a wall; the procession would stop at each of its four corners, in buildings that were made specifically for this purpose and were called ‘posas’ chapels [Mengual, n.d.].”

**Pilgrims' gate:** Located to the west of the former convent, it is in keeping with the proportions of the rest of the convent. It is believed that the portal served as an open chapel, as there are elements indicating that there are two early mud-brick arches [provisional sacristy] on the site [López and Frausto, 2019]. In the case of the Temple and former convent of La Asunción, there is a perimeter walkway with niches [Figure 3].

### Box 3



**Figure 3**

Processional route and niches attached to the wall.

*Source: own*

**Chapel.** ‘The origin of the word chapel comes from the Latin *cappella*, diminutive of *cappa*, meaning cloak, so the architectural construction could correspond to the formal representation of a cloak that shelters and protects’ [García, 2015, p. 17].

**Chapel posa.** Chapels posas were placed in the corners of the atrium, which was a square or rectangular building protected by a vault. These chapels were used as part of the rites in processions, where the Blessed Sacrament was ‘rested’. The posa chapel was a religious, social and political space, which was erected at the corners of the atrium with vaulted or false vaulted roofs. They were used as stations or stops for processions, with each posa chapel belonging to a different social group of indigenous people [Reyes, 2016].

**Open chapel.** Outdoor worship originated in the early days of the Christian religion, although in the pagan tradition it was also practised in open spaces. There were ceremonies at certain times of the year that were held outside the temple, but in the Christian religion it has a reduced value within the celebrations [Gussinyer, 1996].

The ‘courtyard chapel’ or ‘Indian chapel’ in the New Spain era was considered a space where the conquered were evangelised. The courtyard was later identified as an ‘atrium’. Confusion may arise between the ‘courtyard chapel’ and the courtyard, which is also called an ‘atrium,’ as the latter was often part of the courtyard chapel [García, 2015]. Open chapels were considered isolated buildings, as they are independent of the temple and occasionally had an annex that served as a dwelling for the friars. Almost all 16th-century monasteries in Mexico have an open chapel, except for Anenecuilco in Cautla, Morelos, and Temimilcingo in Tlaltizapán de Zapata, Morelos [Reyes, 2016].

The first temporary constructions, built by religious orders, had a transcultural meaning in simple thatched buildings [reeds and a simple shed] of the indigenous population and the reuse of the foundations or platforms of existing civil buildings. Although simple arbours were initially built, more complex constructions known as arbourised chapels were later erected, where Christian worship was consolidated.

These temporary constructions already had a roof or nave and the layout of a Christian temple built with wattle and daub walls and a cane roof. However, the hot climate and the insufficient space in these constructions to accommodate the parishioners opened up the interior space to the courtyard, giving way to the open chapel. In these constructions, the atrium is delimited by a roof for protection from the environment, and the integration of the analogies of the pre-Hispanic temple and the Christian temple can be observed: presbytery-teocalli, courtyard-plaza. By 1530, these temporary constructions were replaced by permanent ones, either attached to the convent temple or as balconies [Reyes, 2016].

Within the field of colonial religious architecture, the importance of the chapel lies in the fact that it was the basis for the construction of convent complexes, churches, or abbeys. It can be said that the first chapels in Mexico were temporary structures which, once they had served their purpose, were replaced by chapels made of durable materials. For this reason, chapels were sometimes integrated into the nave of temples as side chapels, into the apse or as independent structures [García, 2015].

Chapel of the Third Order. The Chapel of the Third Order, so called because it corresponds to the Franciscan tertiary community. Located to the west of the former convent and to the east of this chapel is a cistern [water tank] [López and Frausto, 2019].

The temple. The Catholic temple is a building where God is worshipped and has different components such as the presbytery, seat, altar, ambo, tabernacle, parish, confessional, holy oils, choir, baptismal font, collection boxes, credence table and sacred images. The temple is a spatial unit for the community that is designed in relation to liturgical functions and becomes a supernatural symbol.

In addition, the temple is a meeting place that should convey trust and closeness between the faithful and the clergy in large spaces [Mollor, 2019].

The temple has a flat nave with a rectangular presbytery, covered with ribbed vaults. The convent has two levels and a two-level cloister covered by coffered ceilings in the Mudejar style, supported by columns with lowered arches. The upper part of the columns has mural paintings and a Franciscan cord surrounds the entire cloister [Ortiz, 2013].

The roofs are called 'par y nudillo' [pair and knuckle], which consists of sloping beams supported by the ridge or upper vertex.

The beams are arranged in pairs or rafters [Asociación Almerón, n.d.]. Mudejar architecture [Hispanic-Muslim architecture] in Mexico was adapted to other needs, climatic and topographical conditions; therefore, it is not possible for a building to be properly Mudejar. There is historical evidence that Mudejar wooden structures [Ortiz, 2013]

One of these important structural contributions is the wooden roofing system.

There is evidence in historical sources that there was already precise knowledge of how to build this type of roof in New Spain, but unfortunately few have survived. 'Some are found in the state of Puebla, where there is also one of the truss and knuckle structures which, together with the one in Tlaxcala in Nuestra Señora de la Asunción, are the best examples we have in our territory' [Ortiz, 2013, p.21].

Presbytery. The presbytery is a space that is integrated into the temple, and its importance is emphasised by means of platforms. The priest's seat is the seat of the priest and should not be confused with a throne. The design of presbyteries is almost uniform: polygonal with variations. The most common shape is trapezoidal, in which the depth of the polygonal presbytery measures more than half the width of the nave from the arch that connects it to the nave. In the case of Tochimilco, the presbytery is like a box that has been added on [Mollor, 2019].

**Seat.** The seat is the space that allows communication between the priest and his parishioners. It is the seat reserved for the priest, who presides over the celebration in the name of Christ, where religious ceremonies are presided over and the prayers of the people of God are guided [Parroquia NSR, n.d.].

**Altar.** The altar is the table of Christ, where the sacrifice of the cross is represented according to the sacramental signs and the Eucharist. The altar should occupy the centre of the space, so that the attention of the faithful is on the celebration of Mass, and the temple should not have two or more altars [Mollor, 2019].

**The apse.** The apse is the element that covers the altar and represents  $\frac{3}{4}$  of the width of the module. The buttresses represent  $\frac{1}{4}$  of the module and the walls represent  $\frac{1}{8}$  [López and Frausto, 2019].

**Ambo.** The ambo or pulpit is the fixed, well-lit space where the word of God is proclaimed [Mollor, 2019].

**Choir.** The choir can be located in various places, but it is integrated into the community [Mollor, 2019]. [Figure 4]

#### Box 4



**Figure 4**

Choir covers

*Source: own*

**Chapel of Reconciliation.** The reconciliation chapel may be located near the entrance or in relation to the baptistery [Mollor, 2019].

**Baptismal font.** The baptistery is the area where the baptismal font or fountain is located, which must be illuminated as the person is reborn of water and the Holy Spirit as a Christian. This place can be located inside the temple or in a chapel [Mollor, 2019].

**Sacristy.** It has  $\frac{1}{2}$  module to the west of the apse [López and Frausto, 2019].

**Nave.** The width of the nave is established as the governing module, which is repeated 12 times in the west-east direction and 15 times in the north-south direction. The length is 4.5 modules [López and Frausto, 2019]. After the 2017 earthquakes, studies were carried out in different areas of the former convent in Tochimilco to identify its structural conditions, and a mass of water was found in the subsoil of the nave

**Flat nave.** A nave rasa is known as a nave with two horizontal friezes, or continuous space, with a central axis from the entrance to the presbytery [preceding the high altar]; sotocoro [under the choir, usually with an arch], choir [space for choristers or singers], the nave for the congregation, baptismal fonts, access to the cloister and, in the opposite direction, a door to the atrium, another door to the presbytery and the ante-sacristy [access space to the sacristy] and from there to the sacristy [where ornaments are kept and priests are dressed] [Artigas, 1999].

The flat nave refers to a smooth nave without interruptions, which has no side chapels. The single-nave temple is the dominant architectural form of the temples along the 16th-century route. Kubler relied on the research of the Augustinian friar Gerónimo Román, and therefore maintains that the temple is a Mexican model with primitive simplicity; although there are variations, such as the temples of the Dominican order, where there is a transept and side chapels [Kubler, 1992].

The temples along the route are characterised by a vaulted nave with a large interior capacity, which at the time of construction was not part of the medieval Spanish architectural programme, but did exist in Occitania and the Catalan-Aragonese Confederation. The solution for the churches was to use the basilica type with three naves and a wooden roof, which was replaced by a vaulted nave, the length of which would be greater than that of churches from the same period and later periods in what is now Mexico [Gussinyer, 1996]. [Figure 5].

**Box 5****Figure 5**

Interior of the temple showing the altar

**Claustral.** The cloister is generally two storeys high, with three aisles and rarely three aisles around a central courtyard with a portico [columns and arches supporting a roof], communal services such as a porter's lodge, kitchen, refectory [dining room], field portal, profundis room [prayer area before meals], access to the ante-sacristy and sacristy; the friars' rooms [cells] were located on the upper floor, and finally, the latrines and bathrooms were located towards the garden [Artigas, 1999]. The cloister in Tochimilco is located on one side of the temple, facing east-west. It is a prism that protrudes but does not reach the height of the temple. It is 1/2 module wide and its walls are 1/8 thick [repeated in the floor plan]. Two construction stages of the convent have been identified: 1540-1550 and 1560-1570. The first stage is believed to have been built with materials from the region, although some chroniclers mention that the construction of religious buildings was due to the use of sites where pre-Hispanic religious sites already existed. In this way, the evangelisers observed the religious tradition and replaced it with the Catholic faith. In addition, they took advantage of the foundations and even the construction materials of buildings that predated this period. The second stage is when the lime and stone construction was carried out, by order of Viceroy Antonio de Mendoza [López y Frausto, 2019].

**Refectory [dining room].** Located to the south of the cloister, there is an element that for a long time was believed to function as a refrigerator; however, studies in 2018 determined that its function was structural [López and Frausto, 2019].

**Additions [annexes].** Located to the east of the convent, modifications were made in the 19th and 20th centuries to meet specific needs, which is why they are not related to the complex in terms of their architectural planning with geometric foundations [López and Frausto, 2019].

**Garden.** There are ruins of walls that delimit the space.

In terms of construction elements, 16th-century monasteries are characterised by foundations with a depth of up to 1.70 m [2 Castilian varas], in rectangular or quadrangular prisms to support the foundation. The foundations were wider than the walls [load], as they protruded 20 centimetres on each side.

It should be noted that, in the case of soft or unstable ground, the dimensions were variable. However, the walls [1.60 m to 2.40 m thick] are not very efficient at withstanding forces perpendicular to their plane [thrust from vaults or earthquakes]. Buttresses, abutments or reinforcements are located on the outside of the walls, supporting the thrust produced by the vaulted roof. Vaults or domes correspond to a symbolic scheme and a structural scheme that allows large spans to be covered. It is common to use groin vaults or barrel vaults, which transmit the thrust to the foundation by means of pilasters [Martínez, 2020].

In the buildings belonging to the Route of the Convents, construction elements such as medieval barrel vaults and Roman technology were mixed. However, the earthquakes of September 2017 damaged all the convents, nine of which suffered serious damage. The lack of resources for their restoration has left them in a state of total abandonment or 'in progress.' The INAH, National Institute of Anthropology and History, shored up the damaged elements of the buildings, but the rescue work was abandoned [García and Gómez, 2023].

The nine buildings that the various experts reported as having significant structural damage were classified as 'severe damage' [Figure 6]: Former Convent of Nuestra Señora de la Asunción, Cuernavaca Cathedral, Morelos; Temple and former Convent of San Miguel Arcángel, Huejotzingo, Puebla; Temple and former Convent of Santiago Apóstol, Ocuilco, Morelos; Temple and former Convent of San Juan Bautista, Tetela del Volcán, Morelos; Temple and former Convent of San Guillermo, Totolapan, Morelos; Temple and former Convent of San Juan Bautista, Yecapixtla, Morelos; Temple and former Convent of San Juan Bautista.

Tlayacapan, Morelos; Temple and former Convent of the Immaculate Conception. Zacualpan de Amilpas, Morelos and Temple and former Convent of the Assumption of Our Lady, Tochimilco, Puebla. Of these 15 temples and former convents in New Spain, nine were severely damaged.

These are the ones that require the most intervention and investment. In the temple and former convent of the Assumption of Our Lady, Tochimilco, Puebla, there are longitudinal fractures and cracks in the vaults, as well as detached ribs.

Other damaged architectural elements include the vault and façade of the open chapel and the cloister. Architect Francisco Pérez de Salazar was responsible for conducting the first analysis of the former convent and temple in Tochimilco. In that initial assessment, the architect observed that a huge crack ran across the bell tower and that 75 per cent of the temple's vaults, walls and arches were fractured. The temple's current problems are the result of previous work.

However, the damage to the complex is not due to the way the building was designed and constructed. The origin of the damage is the way in which the restoration work on the building was carried out in 1999 [García and Gómez, 2023].

In 2018, the Mexico office of the United Nations Educational, Scientific and Cultural Organisation [UNESCO] allocated resources for the reconstruction of the walls surrounding the atrium because it was considered a “living place” that maintains the social cohesion of the Tochimilco community. After the 2017 earthquake, some pinnacles were affected in the middle by cracking in the middle of the element due to high shear forces and damage from bending or flexural compression.

### Box 6



**Figure 6**

Damage to the roof caused by the 2017 earthquake.

Source: own

## Conclusions

The commercial importance of trade routes in the development of cities and communities has led to the construction of important buildings, as these trade routes not only transport goods, but also generate heritage and culture. One such route is the circuit between the states of Morelos and Puebla, which gave rise to the 16th-century Monastery Route.

The 16th-century convent complexes became symbolic landmarks of power, which is why the different centres share common characteristics. One common feature is that the buildings are fortress-like, with uniform architecture and construction. The atrium stands out in these buildings. Some say it has Mesoamerican origins, others say it is European, and still others say it is a coincidence. Regardless of its origin, it is the community centre in many towns in Mexico.

The atrial cross became the centre of the atrium, surrounded by the processional path and the pilgrims' portals as the ‘vestibule’ of the complex. Unfortunately, the 2017 earthquake affected the temple, keeping it closed until now, but the atrium is still in use as a community centre. Although the earthquake severely affected the building, the damage was accentuated by the 1999 intervention.

## Declarations

### Conflict of interest

The authors declare that they have no conflict of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

### Contribution of the authors

*Morales-Ortega, Alejandro*: Contributed to the conception of the project idea, document review, methodology, analysis of results and conclusions.

*Vázquez-Torres, María del Rayo*: Contributed to the conception of the project idea, document review, theoretical framework, conclusions and as corresponding author.

*Navarrete-García, Mónica*: Contributed to the introduction, methodology, preparation of the graphic summary, and analysis of results.

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### Availability of data and materials

The articles analysed in this research can be found in the UNAM Journal Catalogue, INHA Journal, Dialnet, Clacso, Radalyc, and Google Scholar databases.

### Abbreviations

COVID-19	Pandemic caused by the SARS-CoV-2 coronavirus
FONDEN	Mexico Natural Disaster Fund
INAH	National Institute of Anthropology and History
UNESCO	United Nations Educational, Scientific and Cultural Organisation

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