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THE TOWER HOUSE SPACE PLANNING AND ACTIVITIES IN OLD CITY SANA'A YEMEN

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Abstract:

This paper explores the activities of Yemeni people in the Traditional Tower Houses in Old City of Sana'a. Yemen characterized by its unique traditional architecture; it is evident that every region in the country has its architectural character, which influenced by the local context (natural and cultural environments), and has many heritage sites registered with UNESCO heritage areas. The researcher will be focusing on the tower houses type to find the relation between the space planning and the Yemeni people daily activities that affect the space planning of the traditional tower house. Daily activities for Yemeni will be identify to ensure the space planning are designing according to the Yemeni activities as usual in term of the space size and space function. The tower house was design with 4 to 7 storey which is, each storey has a different function and activities. This study will be carried out through two types of data collection started by the observation, interviews, questionnaire's and the measurement by the researcher based on one of the case studies which is Bait Abu Luhum tower house which located in the Old City of Sana'a at Al-Abhar tower house. The conclusion summarizes the Tower House components and its relationship to the lifestyle and activities of Yemeni people the lessons to be learned from this example.

Keywords:

Traditional Architecture; Old City Sana'a; Tower House; Built Environment;
Space Planning

Introduction

In Islamic world, there are several researchers expecting to perform in Islamic environment and culture especially in the urban environment. However it is, the command tradition in Islam also focusing to the social, economic and culture context in Islam religion. Built environment also is part of the demands in Islam to form a glorious Islamic civilisation in the fields of architecture, urban planning and culture (www.muslim heritage.com, Saoud, 2017).

Yemeni traditional tower houses are remarkable with high-rise architectural building construction and attractive decoration characteristic. The tower houses are built more than five stories height, and the largest tower houses usually built with the seven, eight or even nine stories. A view of the old city Sana'a, with many hundreds of these houses rising above the city walls, makes an unforgettable impression. Almost of the relatives of the family were living in the same tower house and the tower house were designing and built for one group family which is, the old houses may have two or even three closely related families living in the same tower houses.

This research emphasises on the layout space planning architectural in Yemen by studying the house designs in old city Sana'a. It highlights the traditional house design, layout plan and the space organisation in the tower house in Sana'a city. The Yemeni traditional tower houses in old city of Sana'a will be identified into related to the routine activities of the Yemeni people and how the spaces were organised according to their needs and space size. Each level of tower houses has a several activities including a social, families and religious activities that have been in the culture and traditions of Yemeni society since long time ago. Additionally, this is to ensure the architecture of Yemeni tower houses are significance affected their daily life.



Figure 1: Main Entrance Old City Sana'a (Left) And Tower Houses in Old City Sana'a (Right).

This research was focused on the spatial organisation activities of Yemeni tower houses in old city Sana'a which influenced by the Yemeni activities. However, this research will not be focusing on the house component and the materials, and it will be narrow down the topic to the space planning and Yemeni activities in each level of the Yemeni tower houses which are related to the space organisation of the tower house in each level within those activities. In Figure 2 shows the relationship between the space planning with the 3 elements activity that influenced the lifestyle of Yemeni in the Old City Sana'a. The space planning of tower house is depending on the activities such as religion, social and culture activity.

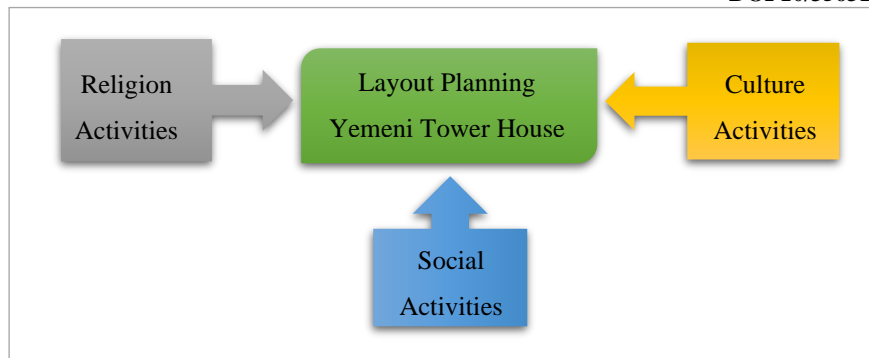


Figure 2: The Types of The Activities Inside the Traditional Tower House

Research Methodology

The study was based on a case study of the Abu Luhum tower houses at Old City Sana'a as private ownership house. Measurements were made with the following instruments: in-depth structured interviews with experts, on-site building observations, building spatial measurements and secondary data from relatives' person in Abu Luhum house.

In order to obtain a good data, this method was divided into two methods which is the primary data will be obtained from a structured interview with the experts, observation and interviews to get a sufficient data that is related to the topic directly and the second method is from the secondary data based on literature review from the books and articles from websites, magazines or local newspaper and the third method is the case study of an old traditional tower house in old city Sana'a which has been selected for the study. The data obtained have been used for the qualitative and the quantitative analyses.

Traditional House in Yemen

The tower house is the ordinary and predominant house in Old City Sana'a. The houses structural was built with a tall building, multi-storey, and square with an entertaining room on the top floor. Each space in the traditional tower houses has its particular function that based on the types of the activities that were used by family. The construction of each tower house has the different space sizes based on the activities in the house. However, some of the space during the time is no longer covering the needs of the family. In the Figure 3, it shows the main entrance of old city Sana'a with a great of gate (left side) while the cross sectional of tower house shows the activities for each level (right side) which is the space planning depending on the needed and activities of lifestyle Yemeni culture.





Figure 3: View at Old City Sana'a Yemen (Gelbart, 2021) And Cross Sectional of Tower Houses Space Planning.



Source: (Al Sayyed, 2012)

According to Soltanzadeh and Moghaddam (2015), they mentioned three architecture styles with different social hierarchy of people which is located at the eastern part of Sana'a with the largest area of the city. There are a lot of mosques and markets in this area with palace and gardens are located in the central area of the city. The next part is at the western of the city which is for Jewish people which is separated from the other two parts with two special gates. Commonly, there are eight and nine level of floor building in this city but the average building floor is about five level.

The building and the surrounding environmental life and culture, the traditional tower house of Yemen architecture contrasted in different culture from one region to another region, which can be divided based on the activities in space and social economic for construction in different regions, as well as the terrain that varied from one region to another (Muhammad Ali, 2007). In general, the Yemeni houses were classified into four types building and architecture, which is shown in Table 1.

Table 1: The Activities for Each Level in Tower House

No	Classification of Yemeni Houses	Explanation	No	Classification of Yemeni Houses	Explanation
1.	Original house (reed huts) in the Tihama region. 	The one-story house built of reed and clay together form and contains living rooms place for animal breeding and stores, and often do not have windows and ventilated from the top of the ceiling.	3.	The multi-story house (Tower House) 	All the elements in the houses, and it is considered the essential house. Most tower houses are at least five stories high, and some reach as many as eight or nine.

2.	Developed house consists of two floors. 	Built up from stone and blocks with an outside staircase to assist the living area on the upper two floors while, the ground floor used for animal breeding, kitchen, and toilets generally placed outside the home.	4.	The oldest high-rise building of Shibam city. 	The highest cluster of sun-dried mud brick tower houses of the 16th century walled city of Shibam, which rises out of the cliff edge of Wadi Hadramaut. Constructed from clay as high-rise residential houses.
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Source: Tower House, Sana'a City (Ahmed, 2020)

The tower buildings are the unique and iconic in the Old City of Sana'a, and considered one of the principal well-known of the city, where the buildings built as a persistent block established with the opening space in harmony surrounding beige mountainous nature environment, and these buildings were built-in high-rise with 4-9 floors based to the needed (Al-Taher Engineering Consulting Center, 2005).

The vertical elements structure and well layout planning of multi-storied houses represent a dominant transformation from public to private area. Normally, the ground floor and mezzanine are built for animals and the storage of timber, fruit, and grain, besides a small space for the collection of dry excrement from the bathrooms above.

While, the second floor is the first placement level and visitors will be placed in the public sitting room and it is called as *diwan*. This room was designed with rectangular shape and furnished in a custom typical of almost all Yemeni rooms, whether they are used for eating, sitting, sleeping, or includes of all three activities. The walls are attached with a continuous seat of cushions, leaving a narrow-carpeted area in the centre and a space next to the door for the removal of shoes. The windows have low sills, to accommodate a seated position, and consist of two sets of openings. The unique design at the lower window is functional for ventilation aspect and controlled with shutters, and the upper opening is an arched or circular transom window that to ensure the natural light enter even when the shutters are closed. The skylight window is made with different design and shape, called *qamariya* (meaning "of the moon") or coloured glass, called *takhrim*. The luminousness of the *qamariya* produces a soft amber light effect, while the colours and pattern of the *takhrim* escalate a joyful play of light on the interior walls. The walls of the room are demonstrated with characters and high shelves made from reinforced gypsum plaster on which personal space.

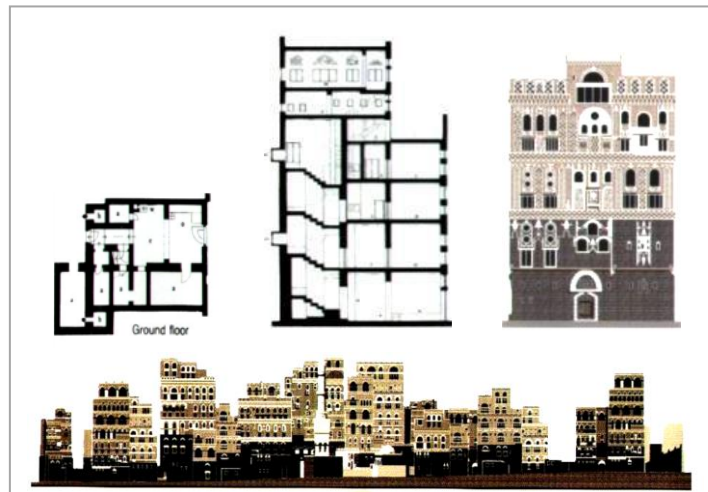


Figure 4: The Traditional Tower Buildings in Old Sana'a

Source: (Al-Taher Engineering Consulting Center, 2005)

While, at the third floor there are the main family called *diwan* engaged for special traditional occasions such as weddings, births, and funerals. In the tower house, the above level is designing with an additional semi-private room and the kitchen. It is usually placed at the one level below the top to accommodate service to both upper and lower levels. Here the women have their primary domain. Even though they are not restricted within any part of the house, it is the level that equipped with the kitchen and an adjacent outside terrace with huge screened walls, from which the women can be seen without being seen from the street or other houses. The kitchen usually built with the smoke-blackened from the bread ovens being fuelled by wood, whose smoke escapes through the vents that pierce the outside wall.

The upper level, it is dominated with one private sitting room, called the *mufraj*, it is reserved for special guests or family members with good decoration. It designed with glorious views as well as the play of coloured shadows of the walls cast by the stained-glass *takhrim* windows above, increasing the delight during the afternoon *qat* session. For the social life, the afternoon the social gatherings are held, usually between men, where they smoke the water pipe and chew *qat* while chatting, reading poetry, or listening to the Yemeni music.

In the interior space, at a central staircase, the rising component throughout the height of the house, come up with the central stability around which the structural engaged of the house is supported. The thermal capacity of the stone and masonry walls produces a thermal lag, which tempers the extreme day and night temperatures. The tower house was designing with the good ventilation by provided throughout the house of projecting masonry cooling boxes (*shubaq*) positioned within the walls of the staircase and lobbies of each floor.

The facade of the house, built with the similarity to textile or jewellery designs, seems to attract a little attention to the adjoining facade, either in alignment or proportion. Until now, the native aesthetic sense of the Yemenis leads to an unerring serenity of spatial relationships. In the others criteria for interior proportion appears to be of importance to Yemeni builders. The significant modules, such as the cross section of the *diwan*, are based on a square shape, with its length being two or three squares in plan. The orientation is also considered important, in that any house facing other than south is said to be less than a full house.

Types of Traditional Houses

The most impressive architectural feature of the tower houses is apparently the height structure. This is due to a lack of space in the walled town as well as to the need to save arable land, but it is also related to the city's historical defencelessness to enemy attack. As the political and geographical situation was unstable, the lower parts of the houses were designed to respond to a potential exterior threat. Ground floors were not therefore used as living areas, and the next level usually served as a generous storage area.

However, these points alone do not stringently explain the genesis of an architectural type, and it seems that the real reason for the buildings' heights is a mixture of building tradition, wealth and architectural pride: as though the residents of Sana'a decided to compete with each other, and to invest a large proportion of their riches in the construction and gradual elevation of magnificent houses (Eric and Caroline, 2009).

In Sana'a city, there are three types of vernacular houses:

Tower house.

The core area is the tower house with its entertaining room *mafraj* at the top.

Multi-story house.

The second type is multi-story house which have a few in number within the walled city that mostly found in the new quarter called *Bir-al-Azab*. This type of house has its entertaining room *mafraj* located at the ground level with a reflecting fountain pool in front of it.

Jewish Houses

The third type is known as the Jewish house. This type is mainly found in the Jewish area in the old west old extension in the old city of Sana'a. It has a courtyard on the top level, from which a number of rooms can be accessed up and down short flights of steps.

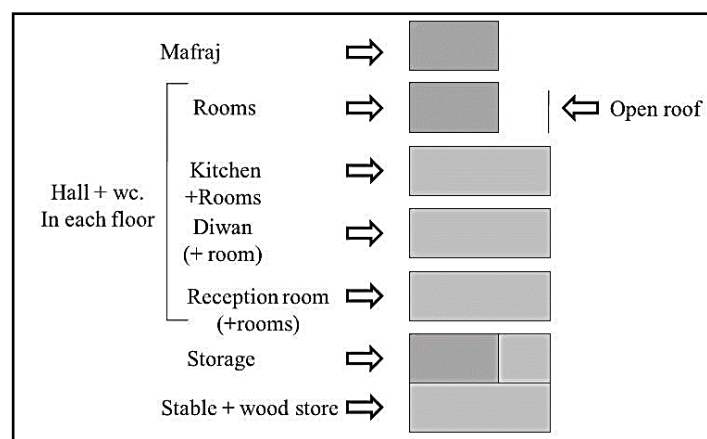


Figure 5: The Activities for Each Level Inside the Yemeni Tower House

Source: Lewcock, 1986

The attractiveness of the traditional tower house Yemeni window comes from five components which are combined with all the functions and elements of view, lighting, ventilation, protection, and privacy. However, these functions would be controlled by the occupants

depending on their social and environmental condition. As previously mentioned, the Yemeni tower houses have a lot of windows. The four (4) main components of the Yemeni windows are subdivided into the lower part (*Taqah*), the fan-light (*Qamariyyah*), the wooden external overhang (*Konnah*) and the small vent (*Shaquos*) in Figure 6. Although the fan-lights provide natural lighting during the day-time, the lower part component can be reduced the heat warmth and exteriors shutters can be closed without using artificial lighting.

Islamic Culture on the Formation of Sana'a Architecture

Yemeni lands has at least three thousands history and because of ancient civilization in trade part was a link ring between India, China, Africa and the Mediterranean and it was one of the richest regions of the Old World (Amirdehi, 1388).

The valuable urban and urban development resources of Sana'a, it is known as a city with a high level of architectural and urban culture, which is published in books and scientific articles. Studies indicate the cultural studies and its relationship with the physical form of the city (Homafar, 1392). It is obvious that the introduction of Islam in the first century AD caused a profound alteration in Sana'a's form, shape, and architecture. All the activities are focused by the mosque, as the other Islamic cities (Soltanzadeh *et. al*, 2015).

A community that is centred on a mosque and has a market and restrooms is said to be a "Islamic City" The separation of religion divided several areas of the Islamic city. The city has specific architecture and is surrounded around the mosque because of security reasons (Fatemi, 1392). With the unique beliefs of Yemenis that are influenced by Islamic culture, the most significant cultural axis is established the fundamental components of Islamic towns such as the big mosque, market, and schools.

The connection between south gate of the city (Yemen Gate) to the main north gate of the city (*Shaub*), and different kinds of activities are done in this route (Soltanzadeh *et. al*, 2015). Sana'a's architectural setting has been preserved throughout several Islamic eras, which contributes to its significance as a piece of world cultural heritage. Furthermore, the ancient palaces constructed earlier to the advent of Islam were destroyed, their restoration in various eras has continued and the original shape and characteristics of the city has been related to the old principles (Soltanzadeh *et. al*, 2015).

With the well built identity, belonging and cultural meaning and considers socio-cultural needs such as privacy and sociability. It is environmentally sustainable and resilient, integrated with natural resources of energy, vegetation, and water. The design and conceptual of built-form configurations, placement of interior areas, facade design, and window design are examples of socio-cultural influences on Sana'a tower houses. With a focus on privacy and safety, visual connection, solar design, and ventilation, the socio-cultural and environmental values included in the Sana'a tower house's design are examined.

There are has three different social classes correspond to three different architectural styles. The majority of Sana'a's public spaces are located in the eastern section of the city, where there are also several mosques and markets. The core area of the city is where the palace and gardens are. Yemenese architecture is shaped and influenced by social and culture aspects. In addition to the fundamental components of Islamic towns, such as the big mosque, the market, and the schools, one significant cultural axis is established as a result of Yemenis' unique beliefs, which

are influenced by Islamic culture. It links the city's most significant south gate (Yemen gate) to its most important north gate (Shaub), and various activities take place along this route.

Building Orientation and Form

The traditional Yemeni architectural has their own identity and character since along time ago in Arab region. They have a unique building development especially in Old Sana'a city in Yemen. The form of tower houses was designed with huge areas to ensure increasing of the thermal functionally in winter and reduce solar use. While, in the interior space, its design based on primary and secondary requirement (Abdallah *et. al.*, 2022).

The idea design of multi-story has integrate from the guard towers that made from stone, clay and mudbrick with the combination materials to built high-rise structure and building. The tower houses was built others component to ensure the lighting and ventilation functionally with provided by windows and wall openings (Attia, 2020).

The high rise tower were built in Sana'a city with the Islamic influence characteristics and culture. The tower house was design with spatial organisation according to the needed and use. The house basically was built with solid foundation by using stone (Attia, 2022). While the decoration of Yemeni house has their own character especially of arch and opening space.

Case Study

Background of Sinan Abu Luhum House

The well-known building house, Sinan Abu Luhum house is located on the eastern of Aserar. (Al-abhar neighbourhood), and faced the major Middle Eastern side, overlooking the Square (sarha) and faced a large southern side, which is separated from the Al-abhar mosque through a road by (19.40m) width. While the northern and western side of the building are adjacent or joined to the neighbouring buildings. The date of the construction of the building was on (15AD/9H) which was belonged to one of the imams, and then transferred to the belonging of *Muhsn Ma'aedh*. The building has been going through lots of renovation and maintenance. The last one has been done by the latest ownership of this properties. The first renovation was done under the ownership of *Muhsn Ma'aedh* before it was transferred to Abu Luhum's family.

The building has been going through lots of renovation and maintenance proves the last one has been done by this ownership of this properties as moved since its first construction many times, it was first under the ownership of *Muhsn Ma'aedh* before 11 last transformation to Abu luhoum family 1962-1382.

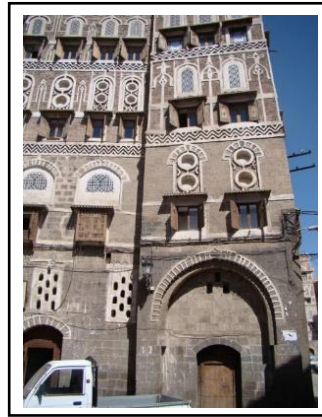


Figure 6: Façade of Sinan Abu Luhum

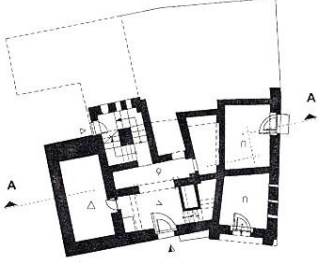
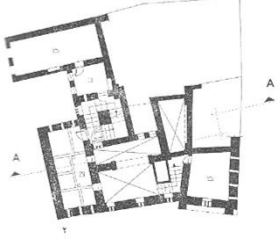
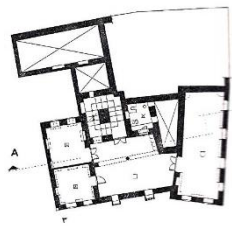
Source: Author, 2023

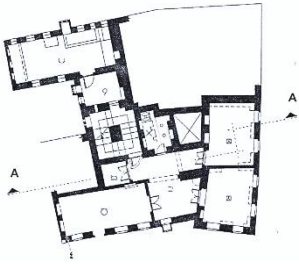
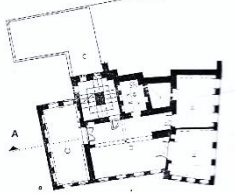
The building is classified in terms of the size of a large residential building which consists of six floors, including the mezzanine. It is one of the important residential buildings in Sana'a due to its historical architecture and the ornamented values.

Tower House Layout Plan

The Abu Luhum tower house consist of 6 storeys building at Old City Sana'a, Yemen.

Table 3: The Activities for Each Level in Tower House

Level	Drawing	Measurement (unit: meter)																					
Ground Floor		<table> <tr> <th>Level / Space</th><th>L</th><th>W</th></tr> <tr> <td>A</td><td>5.50m</td><td>4.50m</td></tr> <tr> <td>B</td><td>4.70m</td><td>1.80m</td></tr> <tr> <td>C</td><td>4.50m</td><td>4.30m</td></tr> <tr> <td>D</td><td>5m</td><td>4.30m</td></tr> <tr> <td>E</td><td></td><td>-</td></tr> <tr> <td>F</td><td>8m</td><td>3m</td></tr> </table>	Level / Space	L	W	A	5.50m	4.50m	B	4.70m	1.80m	C	4.50m	4.30m	D	5m	4.30m	E		-	F	8m	3m
Level / Space	L	W																					
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D	5m	4.30m																					
E		-																					
F	8m	3m																					
First Floor		<table> <tr> <th>Level/Space</th><th>L</th><th>W</th></tr> <tr> <td>A</td><td>8m</td><td>3m</td></tr> <tr> <td>B</td><td>4.50m</td><td>4.30m</td></tr> <tr> <td>C</td><td>-</td><td>-</td></tr> </table>	Level/Space	L	W	A	8m	3m	B	4.50m	4.30m	C	-	-									
Level/Space	L	W																					
A	8m	3m																					
B	4.50m	4.30m																					
C	-	-																					
Second Floor		<table> <tr> <th>Level / Space</th><th>L</th><th>W</th></tr> <tr> <td>A</td><td>9.5m</td><td>6.5m</td></tr> <tr> <td>B</td><td>6.5m</td><td>7m</td></tr> <tr> <td>C</td><td>3.50m</td><td>3.30m</td></tr> <tr> <td>D</td><td>3.50m</td><td>3.30m</td></tr> <tr> <td>E</td><td>-</td><td>-</td></tr> <tr> <td>F</td><td>-</td><td>-</td></tr> </table>	Level / Space	L	W	A	9.5m	6.5m	B	6.5m	7m	C	3.50m	3.30m	D	3.50m	3.30m	E	-	-	F	-	-
Level / Space	L	W																					
A	9.5m	6.5m																					
B	6.5m	7m																					
C	3.50m	3.30m																					
D	3.50m	3.30m																					
E	-	-																					
F	-	-																					

Third Floor		Level / Space	L	W
		A	9.20m	3.40m
		B	3m	3.60m
		C	3m	7m
		D	7.50m	1.80m
		E	3m	2.40m
		F	4m	3m
Fourth Floor		Level / Space	L	W
		A	9.60m	3.40m
		B	5.50m	3.60m
		C	7.90m	3.20m
		D	6.40m	1.80m
		E	4m	3m

Source: Lewcock, 1986

Conclusion

This study determines the activities of Yemeni people which influenced the layout plan of the traditional tower houses in old city Sana'a and the relationship of the activities to the layout plan and the spatial organization. Additionally, the study also determines to justify the social, cultural and religious activities of the Yemeni occupants. The tower house spaces also changed the functions of the level of the tower houses according to the need of the space. As for example, the Al- Kurs room where the (animals stable) was located, most of the tower houses has changed the previous function to storage. Likewise, the same spaces also can be changed to a complete apartment whenever it suits their needs, especially when there is more than one family live in the same house. Nevertheless, the size and the quantity of spaces in the tower house are also different from one house to another depending on the family economic situation.

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