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THE APLICATION OF URBAN INFILL TECHNIQUE ON BUILDING CONCERVATION METHOD WITH A CASE STUDY OF JAVA TRADITIONAL HOUSE IN YOGYAKARTA

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ABSTRACT

The rapid development of the city tends to create new strategic value in the area so as to encourage changes / shifts in the function of the area and often sacrifice the existence of old buildings in the area. Most of these old buildings were changed/demolish without regard to the historical value and uniqueness of the building/area or genius loci to be converted into new buildings with new functions only because of the reason for the investment value of the new commercial function of the property. Without realizing it, this building change will change the value of the area that has been formed so that the sustainability aspect of the old area stops and loses direction. There are several technical factors of the old building, such as: lay-out / spatial planning, appearance and use of old building materials that do not keep up with the times are often the main causes of this demolition. This demolition problem can actually be reduced in intensity by using the old building revitalization method that applies the urban infill technique of new buildings on the old building site. By using this technique, the existence of the old building can still be maintained while synergizing with the infill building on the new/updated function. However, it is necessary to pay attention to several important factors that determine the application of this urban infill technique, which in this paper tries to reveal what technical factors play an important role through a case study of the application of urban infill in old Javanese traditional houses. The results obtained are several design directions that need to be considered in the application of urban infill building techniques.

Keywords: urban infill techniques, building concervation, java traditional house

1. BACKGROUND

The rapid development of urban areas, especially in the old city area, often results in changes in the function of old buildings that adapt to current conditions, economic factors, especially in strategic areas of the city, these are factors that trigger changes in these functions which indirectly change physical conditions, especially building architecture. so that many changes are found in old buildings from light scale in this case rehabilitation/renovation to heavy scale, namely demolition of old buildings and constructing new buildings.

Yogyakarta as one of the cities with a fairly rapid level of development in line with its predicate as the second tourist destination after the island of Bali is not spared from this phenomenon. new areas, the Sultanate Palace area, the Pakualaman Temple area, the Bintaran area, and the Kotagede area which are quite attractive for property investors to buy old houses/buildings located in these strategic locations, although some of the areas mentioned above are included in the Cultural Conservation Area to be changed/ the

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function is transferred with the aim that the location/building has good commercial value so that it can provide income/passive income for investors.
This fact can be seen in several cases of new buildings in the area mentioned above which when viewed from the aspect of the appearance of the building less/not in accordance with the original area concept, this is very unfortunate because it will damage the structure of the city area as a whole, thereby reducing/even eliminating historical value in the area.

Figure 1. An example of demolition of an old building become new building in a heritage area.

In some areas which are cultural heritage areas, they have been protected by a Cultural Conservation Perda issued by the local government office, with the existence of these regulations, it has actually directed the scale of permitted building physical changes. In various conservation projects of old (historic) buildings, changes in building functions, known as the adaptive re-use concept, often use the urban infill design method (meaning inserting a new building) as one of the methods/methods for completing the design which is considered quite safe (against conservation factors) which aims to change the old function into a new function and is quite efficient from the aspect of the budget for building renovations compared to changing/removing the entire old building.
This research will look at the extent to which the urban infill method can be applied to the conservation of old buildings, especially in traditional Javanese buildings : the limasan house and try to find the determining factors that must be considered in applying the urban infill method to these type of building.

2. RESEARCH DESIGN AND METHODOLOGY

This research will pay attention to the application of urban infill carried out on traditional Javanese buildings (limasan) with the following research questions:

a. What technical/non-technical factors must be considered in applying the urban infill method to the type of building style.
b. The extent to which the scale/magnitude of the function/building to be inserted in the urban infill method is in accordance with the old building conservation rules for that type of building style.

The research method used is a qualitative method, namely by comparing the process / stages of applying the urban infill design method in the case of renovation of traditional Javanese buildings (limasan) . Primary data is obtained from project document archives in the form of building planning drawings and photos of post-construction buildings complete with direct field observations. The technical analysis used is graphical analysis using technical plans for the two buildings to examine several analytical factors that influence the application of the urban infill design method on the project.

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The overall benefit that will be obtained from the results of this research is to obtain design guidelines (design guidelines) that must be considered when applying the urban infill design method, especially in traditional Javanese buildings (limasan) with the aim of changing the function of the old building into a new function. adaptive reuse so as to improve the overall benefits of the building/building performance in accordance with current conditions.

3. LITERATURE REVIEW

3.1 BUILDING REGULATIONS

Conservation as a method in maintaining the preservation of culture / objects of past relics is a necessity in the effort to preserve cultural heritage as stipulated in:

1. Regional Regulation Of Yogyakarta Special Region Province Number 6 Year 2012 Concerning
   Conservation Of Cultural Heritage And Cultural Heritage
2. Regulation Of The Governor Of The Special Region Of Yogyakarta Number 62 Year 2013
   Concerning Conservation Of Cultural Conservations
3. Regulation Of The Governor Of The Special Region Of Yogyakarta Number 40 Of 2014
   Concerning Guidelines For New Building Architecture With Regional Culture.
4. Regulation Of The Governor Of The Special Region Of Yogyakarta Number 55 Year 2014
   Concerning Cultural Conservation Management
5. Regulation Of The Governor Of The Special Region Of Yogyakarta Number 56 Year 2014
   Concerning Awards For Conservation Of Cultural Heritage And Cultural Heritage.

In the above regulations, it can be seen that the government's efforts to direct and control efforts to preserve culture/cultural heritage objects are in accordance with conservation principles without leaving the characteristics and uniqueness of local culture and aspects of its sustainability into the future (sustainability) so that it can always be accepted in the future. the development of the times both in function and appearance of cultural heritage objects.

3.2 URBAN INFILL

By paying attention to the strict conservation regulations above, the gap / opportunity to apply the concept of adaptive reuse and revitalization can still be carried out as long as it continues to comply with the above rules, namely by applying the Urban Infill Design method where the application of the concept of adaptive reuse / revitalization does not have to change / demolish existing buildings. old building.

The real meaning of the Urban Infill Design method is: an effort to insert new buildings on vacant land in an environment that has a strong character and has certain characteristics, for example in historical areas. (Milla Ardiani, 2009)

Due to the need for new capacities and/or functions, new buildings can be inserted, so what is meant by Infill buildings are: if a new building is placed/built by itself between old buildings/cultural heritage in a certain position within the existing site.

Inna Garuda Malioboro Hotel Yogyakarta		Phoenix Heritage Hotel Yogyakarta	
			
Before (exisiting condition)	After (Urban Infill)	Before (exisiting condition)	After (Urban Infill)

Figure 2. Aplication of urban infill technique

From the example of the building above, it can be understood that the existence of the old/original building is maintained according to its original appearance while the infill building is located around it according to the condition of the existing site so that it can still fulfill the concept of building conservation/cultural heritage and the addition of new buildings aims to strengthen the character of the old building so that the overall remains intact. Pay attention to harmony with the main building and the surrounding environment. In order for the purpose of applying the method to be successful, it is necessary to look for influencing factors, especially those related to visual factors, including the following:

Tabel 1. Visual element

Façade proportion	**Building mass composition**	**Others**
Openning proportion	Building height	Architecture style
Building material	Border line	Landscape
Colour	Mass shape	

(Milla Ardiani, 2009)

By examining the visual elements in the reference above and paying attention to examples of buildings that have applied the urban infill design method, it can be concluded that several determining factors for the application of the urban infill design method are as follows:

1. Existing Site Factor
   a. Shape size and area of the existing site
   b. Local building codes (BC , Borderline)

   The existing site factor here is very important because it is a determining factor whether or not the application of the urban infill design method is possible.
2. Infill Building Period
   a. Location and composition of the building mass on the site
   b. Shape and proportion (scale of the infill building mass to the main building.)
   c. Building style/style
3. Infill Building Facade
   a. The proportion of wall and roof height ratio (facade anatomy)
   b. Proportion of openings: the location of the entrance, the shape and size of the doors, windows and their composition which governs the articulation of the ratio and ratio of solids and voids (openings in the wall plane).
   c. Building Finishing Materials: materials and textures/colors
4. Structural Factors / building construction

a. Structural system type
b. Building construction materials used.

5. Landscape factor.
   Those are the five determining factors in the application of the urban infill design method that will be used as an analysis factor for the object of this research case.

4. RESULT AND DISCUSSION

4.1 LIMASAN JAVANESE TRADITIONAL HOUSE

Discussion of observational case data : initial building data, adaptive reuse development concepts, and building planning concepts on the observed object and continued with an analysis of the determinants factors of the urban infill design technique and then will be studied/observed in order for facts/findings in each factor analysis.

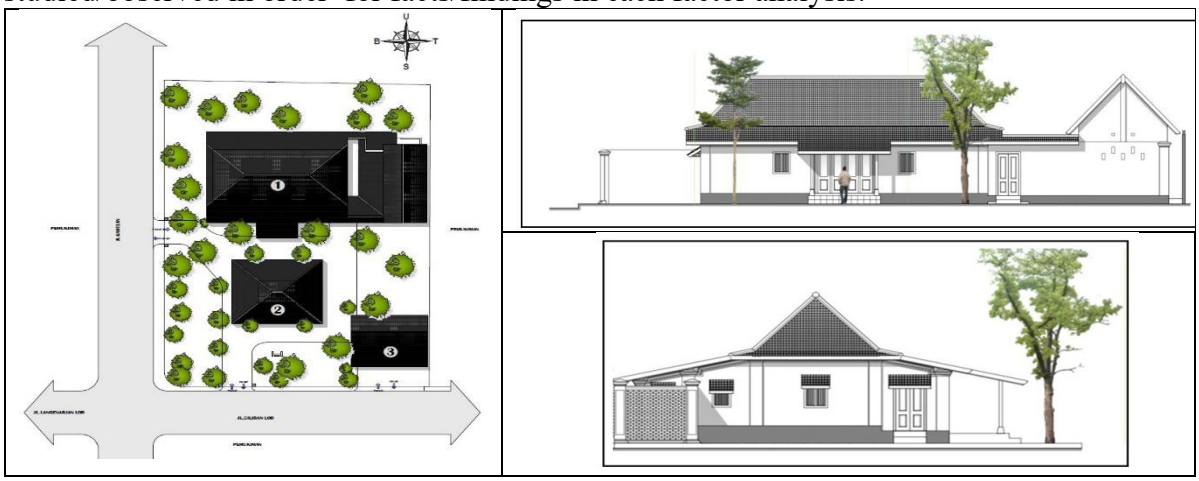


Figure 3. Site dan building exisiting limasan house ex KRT Kusumo Budhoyo.

Limasan house ex KRT Kusumo Budhoyo which is located on Jl. Siliran no.1 Kalurahan Panembahan, Kraton District, Yogyakarta Municipality consists of three buildings, namely:

1. Limasan house and service building (old building / cultural heritage): 254 m2
2. Pendopo Joglo (New Building Post-earthquake reconstruction): 60 m2
3. Car Garage (New building): 36 m2

These buildings stand on a land area of 1,190 m2 on HGB land and are predicated as recipients of the Cultural Heritage Preservation Award in the Special Province of Yogyakarta in 2002 in accordance with decree of the Governor of Yogyakarta Special Region number 186 of 2002.

4.2 DEVELOPMENT CONCEPT OF ADAPTIVE REUSE

The building with its initial function only as a simple traditional residence after undergoing a change of ownership will be developed as a rest house (Villa) which has complete accommodation facilities in accordance with today's residential standards so that it is necessary to add a new building that functions as a residential unit. In accordance with its predicate as a Cultural Heritage, the Limasan Building will still be maintained as will the Joglo Building so that it is necessary to add a new building (infill) on the vacant land.

Table 2. existing room and development.

No.	Old building	Early function	New function	New building
1	Rumah Limasan Pringgitan Sentong	Living room Bedroom	Living room Office & mushola	**North Vila** Bedroom (2) Pantry & dinning room
2	Rumah Kampung	Kitchen Bathroom	Bed room (2) Living room	**South Vila** Bedroom (4) Living room Pantry & dinning room
3	Pendopo Joglo	Meeting room	Meeting room	ME room Warehouse
4	Garage	Car parking warehouse	car port	Security pos (2)

Initial site (before infill) | Development site (after infill)

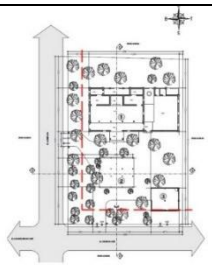
Figure 4. Before and after urban in fill proses.

At this stage, a study/analysis of factors that play a role in the process of applying the urban infill design method as the results of the development concept carried out in this development project, will be carried out using technical drawing data in accordance with the factors to be discussed. These factors are :

4.2.1 EXISTING SITE FACTOR

Table 3. Existing site factor

a. Size and Existing Site Area	b. Local Building Regulations

	Site shape: rectangle Site size: 28 m x 42 m Site area : 1,190 m2 Site has 2 faces (hook) orientation of the building to the south and west .		BC max 80% Max building base coefficient 0.7 Border line 3m, Building height max12 m Green area coefficient min 10%

Discussion :

From the data above, it can be seen that from an area of 1,190 m2, the Limasan building covering an area of 245 m2 has been built along with a joglo pavilion covering an area of 60 m2 so that the total built area is 305 m2 (both of these buildings will be maintained while the garage is demolished). aka yard fence covering an area of 201 m2 so that the available site for urban infil design is only 744 m2.

Facts related to Existing Site factors:

1. The influence of the road face (has 2 faces) on the orientation of the infill building
2. The permitted area of land is limited to the infill building area. (building regulations)
3. The shape of the site and the size of the ideal site / square

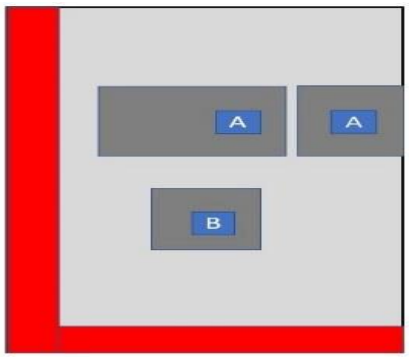
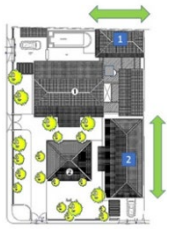
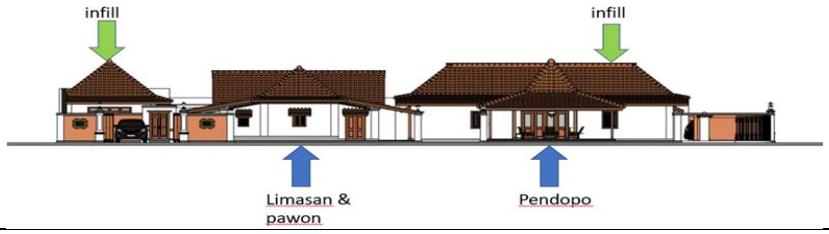


Figure 5. Site factor

4.2.2 INFILL BUILDING MASS FACTOR

Table 4. Infill Building Mass Factor

a.Location and composition of the building on the site		b. Shape and Mass Proportion of the new building	
	The composition of the mass composition of the infill 1 building is parallel to the limasan bang, located on the north side of the limasan building, on the other hand, the infill 2 building is perpendicular to the limasan building located on the south east side, this is adjusted to the available vacant land and the proximity of the hub between the limasan building and the pavilion as one unity .		The shape of the mass of the infill buildings 1 and 2 are: the cube follows the shape of the original building (the Limasan and Pendopo buildings) with the roof adjusting. The proportion and dimensions of the infill 2 building are almost the same as the pyramid building, while the mass proportion for the infill 1 building is smaller than the limasan building.
c. Building style			



The style of the new building / infill adapts to the old limasan building, namely: a traditional Javanese building with a pyramid roof.

Discussion :

From the analysis of the building mass factor above, it can be seen that the location and composition of the infill buildings are in accordance with the shape of the vacant land. Between the core building of the pyramid and the pavilion there is a close relationship in function and philosophy of the Javanese house so that it cannot be separated. This forms an imaginary axis of the Javanese house, namely: limasan house – pedopo – background (front yard).

Meanwhile, in terms of shape and proportion, apart from being limited by the available vacant land, the infill building also adapts to the core building/Javanese pyramid which has a lower height. All infill buildings use traditional Javanese building styles with pyramid roofs, in addition to adapting to the core/limasan building. It is located in the cultural heritage area of the Yogyakarta Palace.

Facts related to the infill Building Mass factor:

1. The composition of the mass and the location of the infill building follows the shape of the site and the linkage of the pyramid - pavilion - background axis (area 2)
2. The proportion and dimensions of the infill building follow the available land and are not too large from the core building/limasan which proportionately has a lower height (area3)
3. The building style adapts to the core building and the surrounding area (palace area)

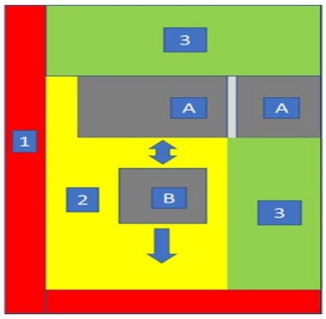
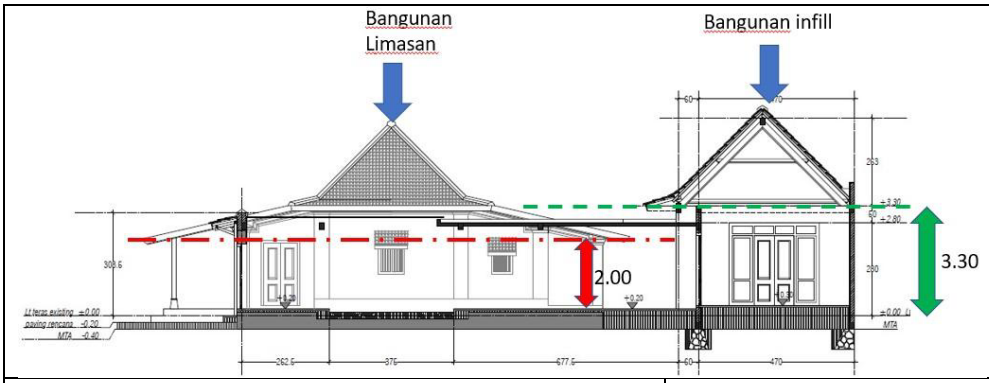


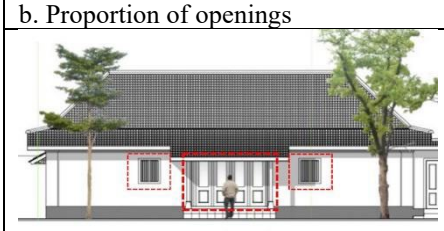
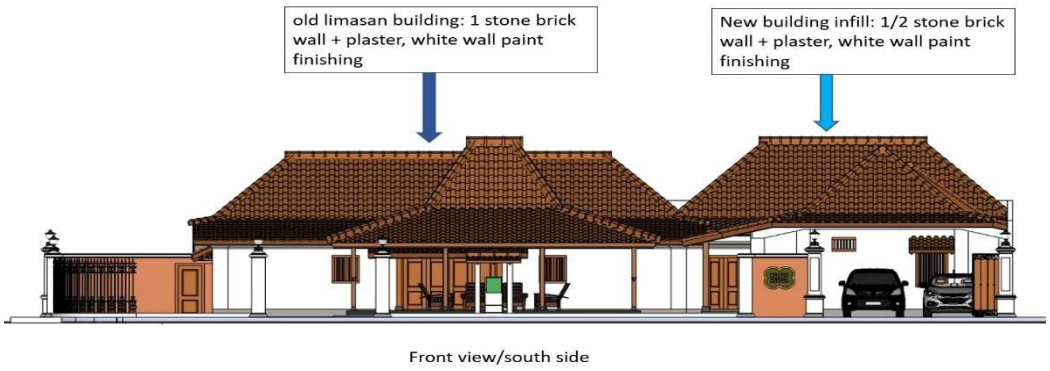
Figure 6. Infill mass

4.2.3 INFILL BUILDING FACADE FACTOR

Table 5. Infill building façade factor

a. The ratio of the height of the walls to the roof
The concrete duct connects the old limasan and the new/infill bangs with a height difference of 1.00 m. 



The old limasan building has the lowest wall height of 2.00 m in the outermost part of the emper, while the highest wall height is 2.75 m in the middle of the room.	New building/infill the height of the outer wall is 3,30 m, the inner wall height is 3,30 cm.
b. Proportion of openings	
 Bangunan limasan lama	The old limasan building has a teak panel door (in the form of 4 folding doors) and 2 small windows that are symmetrically located on the left and right. The rest are massive walls
 Bangunan Baru	The new building adjusts the shape and position of the opening like the old building, only for doors with glass and windows with larger dimensions
c.Building finishing materials.	
 Front view/south side	
Both old and new buildings use the same building materials and finishing	

Discussion :

The process of inserting/infilling a new building in an existing building, in this case the traditional Javanese building, the Limasan house, faces problems with the difference in the height of the wall space in the existing house which is lower than the height of the new building today, there is a difference of about 1.30 m (the existing building is the outermost high tritisan). 2 m edge wall 2.30 m compared to the height of the trellis & edge wall of the new building 3.30 m) so that in its implementation it requires a connector/connector in the form of a non-concrete platform with a height between the two to connect the old and new roofs to make it look more harmonious.

While the facade of the old building has a very minimal opening / opening composition (small window shape) which forms a special feature on the facade of the old limasan building, so that the new building / infill adjusts its composition even though it is not exactly the same in terms of larger window dimensions for natural lighting. The use of building materials and finishing matches the old limasan building with brick walls and white paint color plaster/aci finishing.

Facts related to the Infill Building Facade Factor:

1. There is a difference in height between the traditional limasan building and the new house, so there must be a link in the form of a distance and a flat roof platform.
2. In the process of infilling the traditional building, it is closer to the proportion of the original opening by adjusting the function of the opening.
3. The use of building finishing materials can still be applied to infill buildings.

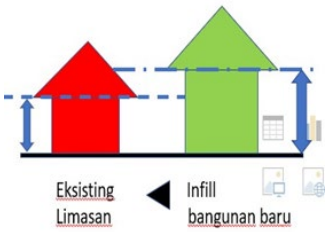
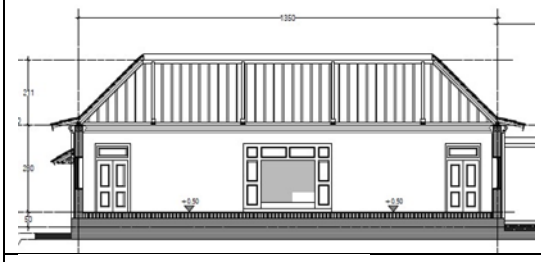
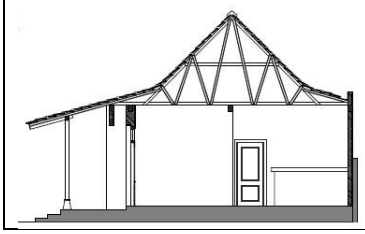


Figure 7. Infill Facade

4.2.4 BUILDING CONSTRUCTION STRUCTURES AND BUILDING MATERIALS

Table 6. Building construction structures and building materials

	The old Limasan building has a continuous foundation structure of river stone, 1 stone red brick walls and a wooden frame roof construction with an exposed roof without a ceiling with a flam tile
	The new building uses a continuous foundation structure of river stone, a reinforced concrete frame of red brick stone walls and a lightweight steel roof construction with a flat ceiling room and a modern flam tile roof covering.

Discussion:
In general, the appearance does not show any differences in the structure and construction system between the old building/limasan and the new/infill building, although in fact there are differences in the old building structure system, namely: continuous foundation, 1 stone wall and wooden roof frame compared to new buildings with foundations. continuous, reinforced concrete frame structure with stone walls, light steel roof frame. Both use a flam tile roof covering.

Facts related to the building construction structure:
In appearance, there is no difference in structure / material, benefiting from the type of structure of the old building construction that does not fully use wood construction, like most traditional Javanese wooden houses.

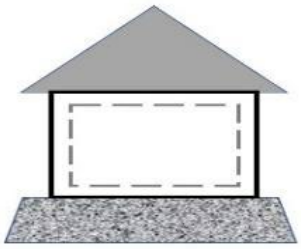


Figure 8. Buiding structure

4.2.5 LANDSCAPE

	Plants of various types of rare shade trees that are in the yard of the limasan house are located between the buildings.

Facts about landscape arrangement
The existence of shade trees in the landscape of this Limasan house, which has existed since the beginning, has helped a lot in refining and unifying the appearance of the existing building/limasan with the new building/infill located on the site, thereby adding to the beauty of the environment.

5. CONCLUSIONS AND RECOMMENDATION

The Urban Infill Design method is a well-known method in an effort to anticipate the development of building functions that must follow current conditions which are often no longer in accordance with their original functions. The reality in the application of this method is not as easy as imagined, namely: only inserting a new building into the site / empty space between the old building, there are many factors that must be considered and fulfilled so that the final result is as expected, both from the aspect of fulfilling the new function. as well as from the aesthetic aspect as a whole, what is meant is not only success in inserting and constructing new buildings but also synergy/unity between the existing building and the infill building.

5.1 CONCLUSIONS

1. Site Existing Factor
   The thing that needs to be considered from the site factor is that in addition to the site area related to local building regulations, especially the basic building coefficients and building boundary lines, it is also necessary to pay attention to the shape and position of the site face on the road.
2. Mass Form Factor
   The thing to note is that the setting of a Javanese house usually consists of a background, pavilion, ndalem, pawon which has its own value context so that in inserting a new building both the composition, shape and dimensions of the mass

must be adjusted, especially if it is located in a cultural heritage area, aspects of the building style. very much noticed.

3. Building Facade Factor
   The facade factor is very important because it is related to visual appearance, the thing that needs to be paid attention is that traditional Javanese houses usually have a lower space height than today's new buildings so there needs to be a special solution (providing distance and connecting roofs) at the meeting. between existing buildings and new buildings. Meanwhile, the proportion of openings can be modified but still adjusted and harmonized with the existing building.
4. Structural and construction factors
   The more unique the existing building construction system, the more detailed the infill building design will be, the use of today's structural systems and building materials can still be used but with finishing techniques that support the appearance of the existing building.
5. Landscape factor
   If the final result of urban infill visually is not optimal, then this may be smoothed out/covered by landscape settings, especially the addition of shade trees/shade trees that can visually unify the view.

5.2 RECOMMENDATION

From the results of the case study above, it was found that the urban infill method with the existing building is a traditional Javanese house/limasan, so it is more appropriate and easier to choose the direction of the urban infill concept with a harmonious design, especially if the building is located in a city conservation area.

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