

Tectonics of Lumbung (Landa') Duri Traditional House in Enrekang Regency

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Abstract : *Landa 'is the name for the granary of the Duri Tribe, which is different from the barns in the archipelago and is full of architectural metaphysical values. Landa's existence in Enrekang District was founded in three villages, one of which is Kendenan Village, which is the location of the study because the most significant number of Landa is in this village. The community still holds the traditions inherited from their ancestors. This research aims to uncover and discover the characteristics of the structure and construction of the terrace'. The research method used a qualitative approach with descriptive analysis techniques. The research results reveal that vertically the Landa 'is divided into three main parts. the first leg/bottom (Bala Landa') uses the column frame structure system, and the construction uses the fulcrum and perforation system; the second part is the body/middle (Kale Landa).) which uses a siamma structure and construction system, and the third part of the head/top (Dea Landa ') uses a beam frame and a construction system using a stack, notch, and perforation system. Knowledge and the design process of Landa 'are full with local wisdom values responsive to disasters.*

Keywords: landa ', barn, structure, construction, reinforcements', Kale landa ', Dea Landa'

abstrak Landa' merupakan sebutan untuk lumbung masyarakat Suku Duri yang berbeda dengan lumbung yang ada di nusantara dan sarat akan nilai-nilai metafisik arsitektural. Keberadaan Landa' di Kabupaten Enrekang hanya terdapat di tiga desa, salah satunya adalah Desa Kendenan yang menjadi lokasi penelitian dengan alasan bahwa jumlah Landa' terbanyak ada di desa ini dan masyarakat masih memegang adat istiadat warisan nenek moyang. Tujuan dari penelitian adalah untuk mengungkap dan menemukan karakteristik struktur dan konstruksi Landa'. Metode penelitian menggunakan pendekatan kualitatif dengan teknik analisis deskriptif. Hasil penelitian mengungkapkannya bahwa secara vertikal Landa' terbagi atas tiga bagian utama, yaitu: bagian pertama kaki/bawah (Bala Landa') yang menggunakan sistem struktur rangka kolom dan sistem konstruksi menggunakan sistem tumpu dan penlubang, bagian kedua badan/tengah (Kale Landa') yang menggunakan sistem struktur dan konstruksi siamma, dan bagian ketiga kepala/atas (Dea Landa') yang menggunakan rangka balok dan sistem konstruksi menggunakan sistem tumpuk, takik dan penlubang. Pengetahuan dan proses rancang bangun dari Landa' sarat akan nilai-nilai kearifan lokal yang tanggap terhadap bencana.

Kata Kunci: Landa', lumbung, struktur, konstruksi, Bala Landa', Kale Landa', Dea Landa'

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Introduction

Since the time of the Greeks and Romans , knowledge of tectonics has been known as another form of architecture. Tectonics comes from the word Tekton which means builders or builders. Tectonics is also referred to as the "art of joining material" where the tectonic character is influenced by the material used. In other words, tectonics is a knowledge that humans have about the aesthetics of building construction systems, in processing and engineering natural and human resources to meet needs (Oktavia & Prihatmaji, 2019) . Tectonics in architecture is a system that unites all building elements into a unified whole. Architecture that develops in traditional societies is a form of work from a perspective, cultural values, and the ability to always be in harmony with nature (Siwalatri & Ketut, 2016) .

The study of tectonics also plays a role in providing an overview of the mechanism of force distribution on building construction elements. In addition, the processing of forms in tectonic can also produce a distinctive architectural expression of the connection details of the construction used. The resulting forms are artistic forms that have artistic value meanings, not just abstract or figurative formations, even being able to express philosophical symbols of buildings (Sir, 2015) .

technique of engineering the shape is also very varied in architectural tectonics, one example is the *tongkonan house architecture* , the technique of combining the materials used for the roof sheath, namely the bamboo modules which are partially stacked, so that it looks very thick. The method of combining materials for roof sheathing from bamboo is a combination of pen and bonding. The method of stacking the roof shrouds in layers gives the roof a heavy character.

This pile of bamboo produces a rough and rhythmic texture on the appearance of the roof edge (Octawati & Sahabuddin, 2017)

Tectonic systems can also be related to a series of behaviors that are intentionally carried out by one or several people (system of activity) carried out in a series of physical or spatial elements that have certain and related relationships (system of setting) so that they can be used for a particular purpose. certain activities (Rahmani & Karim, 2020)



Figure 1. Visualization of *Bolas to Thorns* and *Landa'* . (Source: Reconstruction based on interview results, 2012)

The traditional house a l *Duri* is one of three traditional houses in the sub-tribe in *Enrekang Regency* (*Massenrempulu*) . *Maiwa* , *Enrekang* and *Duri* . The shape of the traditional *Duri house* is almost the same as the form of houses in the archipelago, mostly in the form of houses on stilts (figure 1), which consists of three levels of space division in the construction of the house such as the lower, main and upper structures, in line with the division of the cosmos into three, namely the underworld. , the human world, and the world above.

Previous publications (As, 2015) found that the traditional *Duri house* is in the form of a stilt house consisting of vertical and horizontal spatial, the spatial is formed by vertical poles and horizontal pegs. The initial form of the traditional *Duri house* is small but has many pillars, with a rectangular shape and a symmetrical pattern of *sulapa' pa'*

(square). The first Duri House only consists of 1 plot (*lantang*) measuring 2 x 3 fathoms with 4 main pillars (*ariri pengindo'na*) on each side and between the two main pillars. *Ariri Pangindo'na* is placed 2 auxiliary poles (*ariri bantu*).

The interesting thing about this traditional Duri house is that there is an additional space in the form of a barn (*Landa'*) which functions as a place to store brown rice and red sticky rice (*pulu' mandoti*). According to Sato (2014) the granary is symbolically far more important than the house, it is considered a place for storing valuables, the territory of the gods, a center for ceremonial activities, a sign of dignity, a meeting place and so on. The existence of barns is most commonly found along the Pacific Islands and has an important role for the community. Sato revealed that the barn is an important part of the house because basically the house is the result of the development of the barn. However, in his writings, Sato only takes the Toraja barn (*alang*) as the object of his study, even though there are other barns that are different in shape and placement from the *alang* , namely the to Duri Tribe barn in Enrekang Regency which is commonly called *Landa'* (figure 2).

The forming elements of *Landa'* cannot be separated from the elements of form, space and structure that support it. Confirmed Krier, (1996) that construction and function cannot be separated from the overall architecture. The concept of space in the field of architecture is also related to the structure of the building, a concept of spatial organization that has been described requires the completion of an appropriate structure. Each element in *Landa'* will greatly affect the visual character, spatial character and structural character.



Figure 2. *Landa'* in Kendenan Village
(Source: Author, 2015)

Study will reveal the characteristics of the structure and construction of the granary (*Landa'*) of the traditional *Duri house* . According to Antariksa (2017) structure is closely related to understanding the anatomy of the building from bottom to top: sub-structure (bottom structure) and super-structure (upper structure), which is divided into the structure of the legs, body and head of the building. There are three principles of construction in buildings, namely, massive construction, frame construction and mixed construction (Krier, 1996).

Method

This study uses a qualitative method. The field survey was conducted as a data collection method. Observations were made on *Landa'* traditional house *Duri* . Data were also collected through literature review related to barns. This research is descriptive analysis, which is a method that uses data explanations in the form of the condition of the research object that has been obtained through the results of field surveys, through observations and interviews (Antariksa, 2017).

The research location is in Kendenan village, Baraka District, Enrekang Regency, South Sulawesi. This location was chosen for the reason that in the Duri Complex area, Kendenan village, which is still strong in carrying out customs among the 3 villages that have *Landa'*, this village has the highest number of *Landa'* (figure 3), approximately up to 510 *Landa'*s



Figure 3. Map of Landa' distribution in Kendenan village (Field observations 2019)

Results and Discussion

Landa' traditional house of Duri

The *Duri* people, especially in Kendenan village, store their rice in *Landa'*, not on a *tapan* (attic) such as *rakkeang* in a traditional Bugis house or *pammakg* in a traditional Makassar house for several reasons, including to prevent rodents from eating rice, this is the main reason for using it. *banga* wood (*pigafetta elata*) as a pole because the typology of this tree trunk is specific in the form of a cylinder with a diameter of ± 40 cm, with a trunk height of up to 50 m which is dark green/brown green, shiny, and has a very slippery leaf midrib ring making it difficult to climb. Residents of Duri Kendenan also believe that if rice is stored on a *tapan*, it can cause itching for the residents. Logically, this is very reasonable because their habit of storing rice is not put in sacks or containers first, usually they immediately store dry rice stalks in certain bonds with *Landa'*. If this treatment is also applied to *tapan*, of course there is part of the rice that falls into the center of the body of the house, this small part of the rice can make the house dwellers itch.

The embodiment of the *Landa'* form is a manifestation of respect (gratitude) to the creator (God) who gives abundance of sustenance, where rice is a symbol of life and the one who gives life is the creator, so rice should not be placed under the house (disgrace), it must be elevated (sacred). . This is the reason that *Landa's* form takes

the form of a stage. *Landa'* is also a symbol of prosperity, so each *bola unit* (house) has at least one *Landa'*. The more *Landa'* owned, the higher the prestige value owned by the *Landa'* owner.

Landa' orientation is the same as the *bola's* orientation, North-South and for *Landa's* placement it can be in front, behind, left or right side of the '*bola*' (As, 2015). *Landa'* placements can be grouped at one particular point, such as at the top of a hill which is considered sacred by the local community, and some are located near rice fields, essentially following the owner's land, the topography of the land and making it easier to access to *Landa'*. There are three types of barns used by the *Duri* people, namely:

- Pa'pak*. It is round in shape, made of woven bamboo with a diameter of ± 100 cm and a height of 1.2 m (Figure 4). This *pa'pak* is used by the people of *Duri Buntu Batu*, *Curio* and *Masalle*. This type of barn is not used by the *Duri Kendenan* community



Figure 4 . *Pa'pak* (Field observation 2019)

- Batutu*. It is rectangular in shape with 4 pillars made of *pa'tung* (big and thick bamboo) similar to *Landa'* but the roof does not protrude forward. All materials used use bamboo starting from the poles, floors and walls. Especially for the roof, using *bangkawan* roofing material (thatch)

combined with *fur* (ijuk). But the current condition of *batutu* is no longer found.

- c. *Landa'*. Rectangular in shape with a frame structure system and *siamma* (support/bearer). It has 4 pillars of *banga* wood, $\pm 40 - 60$ cm above the ground, which functions as *sali* (community hall) where people carry out social interactions (Figure 5). The roof protrudes forward but the material for the roof has undergone a change from that previously using a thatched roof, now using a zinc roof. There are various decorations on the *petuo* and *pesa'pi* beams in the form of ornaments and on the *lindo para* and *bareang* parts in the form of carvings of buffalo horns. *Landa'* location is near the house, be it in front, behind, right side or left side of the *bola* (Figure 6).



Figure 5. *Landa'* (Field observations 2019)



Figure 6. Visualization of *Landa' Looks'* (Field observation 2019)

According to local belief when you to build a *Landa'* all building materials used should not be stepped on by humans because it will cause rats to climb into *Landa'*. The process of making *Landa'* is unique, which in the first stage is made *Kale Landa'* then *Dea Landa'*. After everything is finished, including the ornamentation, then it is lifted and mounted on four pillars of *banga* wood, which are seated on a rock. The measurement rules used are spans and feet to measure the short and *fathoms* (8 inches) to measure the long (figure 7).

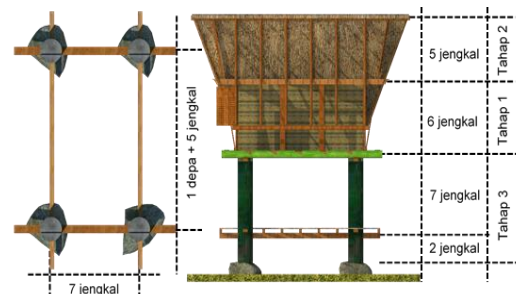


Figure 7. Plan size and height of *Landa'* (As, 2015)

Landa' Tectonics

The vertical structure of *Landa'* is the same as the vertical structure of the traditional *Duri* house which is divided into three main parts (figure 8), namely:

- The foot / bottom (*Bala Landa'*), The lower part of the barn functions as a *sali* (community hall), a space for social interaction from the community. *Bala Landa'* uses a truss structure system of columns (*ariri banga*) and beams (*Pattolo'-garasang*) which is reinforced by the presence of joist (*tuma'bak*).
- Body/middle part (*Kale Landa'*) The middle part of the barn is used as a place to store red rice and red sticky rice (*pulu' mandoti*). *Kale Landa'* uses the *siamma* structure system (Sir, 2015) , this system has the same function as a load-bearing wall, the difference is that the materials and components of this wall are made of planks.
- The head / top (*Dea Landa'*) The upper part of the barn serves as a cover for the entire *Landa'* structure . The *Dea Landa'* structural system uses a beam frame.

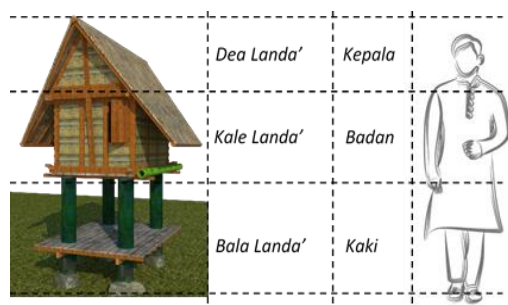


Figure 8. Landa' division vertically (As, 2015)

The three parts of the *Landa'* structural system are structural systems that can support each other. The unification and compilation of these three parts is done by; placing each part on the other. The placement of the *banga* wood column truss system on *Bala Landa'* is placed on the *umpak* foundation (*pa'tumpak batu*) (figure 11), the *siamma* structure system on *Kale Landa'* sits on the *banga* wood column truss system on the *Bala Landa'* section . In the *Dea Landa'* section there are two structural systems,

namely the plane system on the roof mounted on the beam column truss system, and both systems are seated on top of the *siamma structural* system on the *Kale Landa'* section.

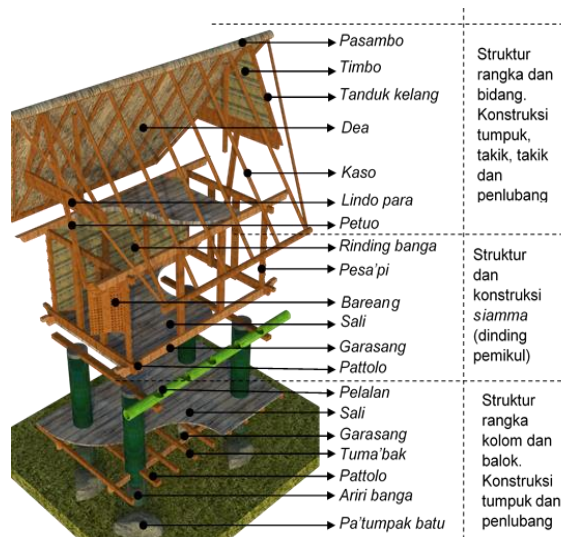


Figure 9. Tectonics Landa' (As, 2015) .

Structural loads on *Landa'* are earth gravity loads acting vertically on the structure. This load includes loads caused by the earth's gravitational force. Lateral wind and earthquake loads are loading that act horizontally on the structure. When there is a load due to wind gusts, the structure will sway sideways, as well as when an earthquake occurs on the ground where it is erected, the *Landa'* structure will quickly balance the force in a stable manner. Large earthquake forces act on structures when the mass of the structure resists sudden lateral forces. Structural elements in freestanding *Landa'* will remain stable because it has an interlocking structure, with purus, notches, and clamp join systems. (figure10)

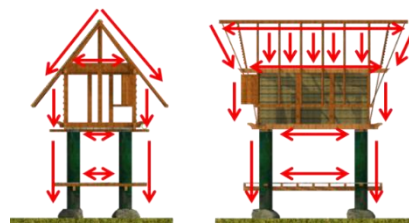


Figure 10. Illustration of Landa Loading' (As, 2015) .

Sub-structure

Bala Landa ' structural and construction system uses a truss system, where the columns and beams each reinforce each other. The process of making the *Bala Landa* ' structure is the third stage or the final stage of the entire *Landa* ' manufacturing process. The structure and construction of the lower part of *Landa* ' consists of 4 round pillars made of *banga* wood (*pigafetta elata*) which are supported by *gara'sang* beams in the longitudinal direction and *Pattolo* ' beams in the transverse direction from *Landa* ' (figure 12). The use of *banga* wood as a pole because of the shiny character of the wood, and has a very slippery leaf midrib ring that makes it difficult for rodents to climb.



Figure 11. *Bala Landa* ' (As, 2015) .

Ariri banga is seated on the *pa'tumpak* stone that serves as a free foundation and also as a barrier so that the pole does not come into direct contact with the ground which can accelerate the weathering of *banga* wood . *Tuma'bak* beams are placed freely on *gara'sang* beams parallel to *Pattolo* ' beams as the basis of the *sali tapan* (wooden plank floor) or *sali ta'tak kajao* (bamboo floor) which functions as a space for social interaction from the community.

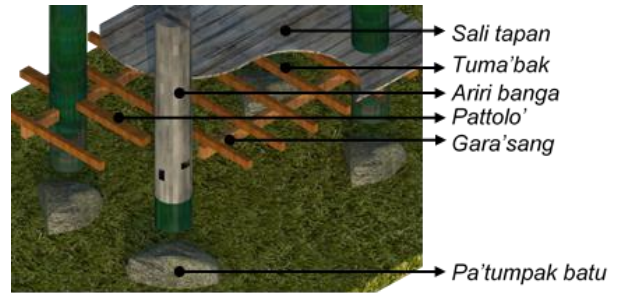


Figure 12. *Landa* 's Sub Structure (AS, 2013).

Middle structure

The shape of *Kale Landa* ' is rectangular with the structural system and construction in the form of a stand-alone bearing wall system, separate from the *Bala Landa* ' structural system. This piece of *Kale Landa* ' is seated on a *Pattolo* ' beam which is connected to the *ariri banga*. The strength of the structure and its construction comes from the *conjoined siamma* connection in the masonry walls. These space-forming elements from *Kale Landa* ' are intertwined and intertwined with each other. (figure13)

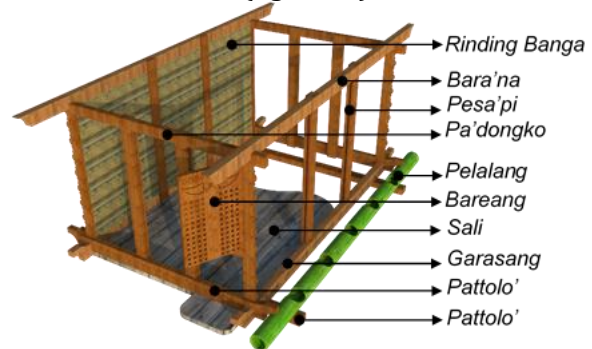
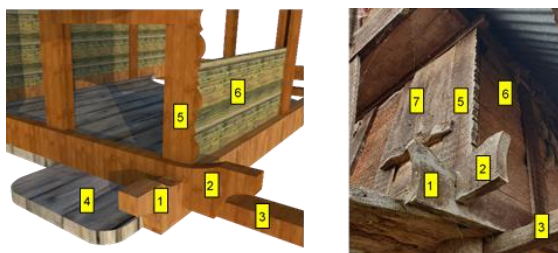


Figure 13. *Landa* 's Middle Structure (AS, 2013).

Bara'na beams rest on *pa'dongko* beams with a notch system, each end of which is given a curved notch as an aesthetic element. Each of these beams is connected to the beams of *pesa'pi* with a system of purus connections and open holes, which function as clamping beams from *rinding banga* (*banga* wood walls). There is an aesthetic element to the beams of *pesa'pi* which are placed in each corner of *Kale Landa* '.



Remarks: 1. garasang, 2. Pattolo Landa', 3. Pattolo, 4. sali banga, 5. pesa'pi, 6. rinding banga, 7. bareang
Figure 14. Details of *Landa'* superstructure (As, 2015)

On the top right of *Kale Landa'* there is a *bareang* (door) which has a motif of carved buffalo horn and grains of rice, but not all of the *bareang* are carved depending on the wishes of the owner of *Landa'*. The use of buffalo horn as a carving motif is because the teachings of *aluk tojolo* (the belief of the ancestors) believe that the buffalo is a sacred animal that will be used as a vehicle to heaven, and also as a symbol of respect for the buffalo who are friends of farmers in cultivating their fields. The carving of rice grains is only a symbol that *Landa'* is a place for storing rice.

At the bottom of the *bareang* there is a transverse beam that has a hole in the middle as a place for *pa'joli panglacak* (door lock pegs), this beam also functions as a reinforcement of the *pesa'pi* beam. For the floor, use a wooden plank which at the right end there is a wooden plank that protrudes forward as a place to lean on (stairs) and a foothold before entering *Landa'*. This *practice* is temporary, so after use it is placed on the right side of *Landa'* near the *bareang* on the *Pattolo* beam

Superstructure

The roof of *Landa'* is saddle-shaped with each end protruding forward, so that it will be trapezoidal when viewed from the side and hexagon-shaped when viewed from above (figure 15). The construction system at *Dea Landa'* uses a frame and plane system that is arranged so as to produce a structural system that can

carry the load from the roof. The *Dea landa* construction system consists of notch, tie and eyelet joints.



Remarks: 1. petuo para, 2. lindo para, 3. horn kelang, 4. bara'na, 5. ballo petuo, 6. kaso, 7. passambo.

Figure 15. *Landa'* roof shape and structure

The composition of the *Landa'* structure consists of rafters resting on *bara'na* beams and *passambo* with tie connections. To support and strengthen the *passambo* beams, there is a *petuo* beam with a notch system that is perpendicular to the *pa'dongko* beam and the *horn kelang* (beam strung together in a triangular shape) on the front and back of the roof which also functions as a clamping beam from the *timbo* as a front and rear cover. roof (figure 16). The *kelang* horn beam rests on the *lindo para* which has a carved motif of buffalo horn and grains of rice. To support the roof that protrudes forward there is a *para petuo* that rests on *Pattolo'* continuously to the *lindo para* to the *passambo* beam. On the front of the *petuo para* there is a *ballo petuo* that has a curved thread motif, apart from being an aesthetic element as well as a locking beam between the *lindo para* beam and the *petuo para*. For the roof covering material, *Dea bangkawan* (thatch roof) is used which is usually combined with *Dea bulu'* (palm fiber roof) on the ridge.

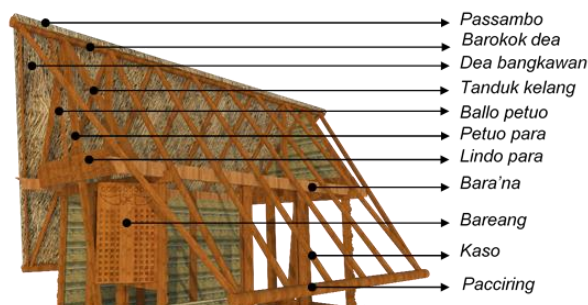


Figure 16. *Landa'* roof structure and construction

Conclusion

The conclusion that can be drawn from that *Landa'* is the granary designation for the Kendenan Duri Tribe. Rectangular in shape with 4 pillars of banga wood, $\pm 40 - 60$ cm above ground level, it is used as a *sali* (community hall) where people carry out social interactions. The roof protrudes forward but the material for the roof has undergone a change from that previously using a thatched roof, now using a zinc roof. There are various decorations on the *petuo* and *pesa'pi* beams in the form of ornaments and on the *lindo para* and *bareang* parts in the form of carvings of buffalo horns. *Landa' location* is near the house, be it in front, behind, right side or left side of the *bola'*.

Landa' characteristics are vertically divided into three main parts, namely: the foot/bottom (*Bala Landa'*), the barn/middle part (*Kale Landa'*), and the head/top part (*Dea Landa'*). The *Bala Landa' section* functions as a *sali* (Balai-Balai), a space for social interaction from the community. *Bala Landa'* uses a truss structure system of columns (*ariri banga*) and beams (*Pattolo'-garasang*) which is reinforced by the presence of child beams (*tuma'ba*). The construction system uses a pedestal system and a perforated pen. The *Kale Landa' section* functions as a place to store red rice and red sticky rice (*pulu' mandoti*). *Kale Landa'* uses the *siamma* structure and construction system. This system has the same function

as a load-bearing wall, the difference is that the materials and components of this wall are made of planks. Meanwhile, the *Dea Landa' section* serves as a cover for the entire *Landa' structure*. *Dea Landa'* structural system uses beam and plane frames. The construction system uses a system of stacks, notches and hole pens.

Landa' own knowledge and design process is full of local wisdom values, including disaster response. Structural loads on *Landa'* are earth gravity loads acting vertically on the structure. This load includes dead load and live load caused by the earth's gravitational force. Lateral wind and earthquake loads are live loads that act horizontally on the structure. When there is a load due to wind gusts, the structure will sway to the side, as well as when an earthquake occurs, the ground where the *Landa'* structure is erected will quickly sway to the side.

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References

- Antariksa. (2017). *Teori & metode pelestarian arsitektur & lingkungan binaan*. Cahaya Atma Pustaka. <https://opac.perpusnas.go.id/DetailOpac.aspx?id=1033637>
- As, Z. (2015). *Kecenderungan wujud arsitektur tradisional duri terhadap arsitektur tradisional*

- bugis dan toraja di kabupaten enrekang. *Teknosains: Media Informasi Sains dan Teknologi*, 9(2), 236–246. <https://doi.org/10.24252/teknosains.v9i2.1870>
- Krier, R. (1996). *Komposisi Arsitektur Ed. 1*. Erlangga.
- Oktavia, A. M., & Prihatmaji, Y. P. (2019). Tektonika rumah gadang sebagai bentuk struktur konstruksi yang ramah gempa. *SENADA (Seminar Nasional Manajemen, Desain Dan Aplikasi Bisnis Teknologi)*, 2, 655–663. <https://eprosiding.idbbali.ac.id/index.php/senada/article/view/113>
- Oktawati, A. E., & Sahabuddin, W. (2017). Karakter Tektonika Rumah Tongkonan Toraja. *Kebanggaan Arsitektur Nusantara*, 172. <http://repositori.uin-alauddin.ac.id/9355/>
- Rahmani, A. I., & Karim, A. (2020). Tematisasi Desain: Studi Behavior Setting Pengguna terhadap Tema Ruang Perpustakaan. *Jurnal Desain*, 8(1), 27–39. <https://doi.org/10.30998/jd.v8i1.7588>
- Sato, K. (2014). Menghuni Lumbung: Beberapa Pertimbangan Mengenai Asal-Usul Konstruksi Rumah Panggung di Kepulauan Pasifik. *Antropologi Indonesia*. <https://doi.org/10.7454/ai.v0i49.3291>
- Sir, M. M. (2015). Pengetahuan Tektonika Arsitektur Tongkonan. *Posiding Seminar Nasional Dan Loka Karya Nasional Pemahaman Sejarah Arsitektur (LPNSA)*. Seminar Nasional dan Lokakarya Nasional Pemahaman Sejarah Arsitektur (LNPSA) XI. <https://eng.unhas.ac.id/arsitektur/files/588d11549d286.pdf>
- Siwalatri, N., & Ketut, A. (2016). *Tektonika Arsitektur Bali*. 383–394.

Author Contributionship

Zulkarnain AS contributed to conceptualization, data collection and analysis as well as drafting articles **Ahmad Ibrahim Rahmani** contributed to data analysis, drafting articles, editing and visualizing data