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Albasia-Glugu as a Structural Glued Laminated Timber

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***Abstract*—Structures timber are more expensive and harder to obtain. Because of that, the effort requires a timber processing technology can solve the problem. Albasia are timber that is easily obtained, but its use for construction is not optimal. The technologies used in order to support wood as is by laminates. Laminate is a combination of great variety of one or more by which the material is made into a r thin layers and glued each other so as to form a larger dimensions. Engineering experiments done by making a laminated beams of albasia and glugu. And also, laminate or Glued laminated timber (glulam, GLT), a highly important product of the wood industry and widely applied in construction engineering, is one of the first one- dimensional structures which, in comparison to single solid wood beams, has a more useable mechanical potential in strength and stiffness thanks to homogenization effects.**

The purpose of this research is to know how much the increase in flexible strenght of beams laminated that made by albasia and with adhesive variation. And from the results of this research, is expected that glued laminated timber can be other alternative in world construction.

Keywords—albasia, glugu, laminate, flexible strenght, adhesive variations.

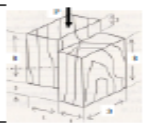
I. INTRODUCTION

The use of wood in construction world are continues to increase, for structural and non structural. The large needs of wood, have an impact on the availability of wood are steadily declining every year, due to the exploitation taken all of a massive. The price of wood structure is expensive and difficult to obtain. Because of that, the effort requires a wood processing technology that can solve the problem. The use of wood construction is limited on teak, sono keling, meranti and the other. But they are difficult to be obtained. Meanwhile, sengon that can be easily obtained, it's use is not optimal. Wood, can optimized by means of preserving and drying. The technologies used in order to support wood as construction material is by laminates. Laminate is a combination of great variety of one or more by which the material is made into thin layers and glued each other so as to form a larger dimensions. This research was applying laminated technology, using jati and sengon as beams laminates. The purpose of this research is to find an increase flexible strenght in beam laminates, and the influence of an adhesive material variations. The other purposes from this research is to improve the quality of the wood, the improvement of the quality of albasia, so that can be used as a construction. This research is expected to have a benefits, among others: (1) Utilizing wood that is easily obtained and achievable price, to used as glued laminated timber; (2) Giving counseling to public, about the use of glued laminated timber in construction; (3) Academically, can provide insight the development of science and technology of glued laminated timber as building materials.

II. METHODOLOGY

Data collection techniques conducted with methods of observation, which is observing the results of testing using sheets of observation. The analysis will be used in this research is the descriptive analysis prosentase to observe the average value of the results of testing the physical properties of wood. Analysis variance be used to analyze the difference as a result of treatment variation laminates. Object of this research is wood, wood with a different kind. Wood construction and wood non construction. The variables which was set in the research, among others: (1) Functional: any laminated wood must be used as its major function for building materials or construction material; (2) Easily obtained: can be exploited easily; (3) Achievable: glued laminated timber have to be more achieved of wood construction , but with the same quality. Various type of testing are listed in table 1.

TABLE I. TESTING SPECIFICATION TABLE

Type of Testing	Type of Glue	Type of Wood	Wood Position	Information Sample
1. Water content	-	- Albasia - Glugu	-	5 sample of both wood, and the dimension is 3x5x8 cm
2. Weight type	-	- Albasia - Glugu	-	5 sample of both wood, and the dimension is 1x1x4
3. Shear strenght	- Epoxy - Aibon	- Albasia - Glugu		5 sample of both wood, and the dimension is 3x4x8
4. Prestressed of block control	- Epoxy - Aibon	- Albasia - Glugu		5 sample of both wood, and the dimension is 5x5x76
5. Prestressed of laminated	- Epoxy	- Albasia	- position: albasia in the center of laminates - position: albasia in the side of laminates	5 sample of both glue. Center dimension: 3 cm. Side dimension: 1 cm.
	- Aibon	- Glugu	- position: albasia in the center of laminates - position: albasia in the side of laminates	5 sample of both glue. Center dimension: 3 cm. Side dimension: 1 cm.

III. RESULT AND DISCUSSION

The results of this research includes the achievement of the output target of the research, namely data analysis and testing objects test, as follows: Wood water content; (1.1) albasia water content: the average of albasia water content is 16.62 %, can be seen on figure 1; (1.2) glugu water content: the average of glugu water content is 19,83 %, can be seen on a figure 2; (2) Wood weight type; (2.1) albasia weight type: the average of albasia weight type is 0.39 grams/cm3, can be seen on a figure 3; (2.2) glugu weight type: the average of glugu weight type is 0.84 grams/ cm3, can be seen on a figure 4: (3) Shear strength with adhesive variation; of the results of testing obtained shear strength glued laminated timber, the average for an adhesive aibon is 39.11 kg/cm2, and to an adhesive epoxy is 66.717 kg/cm2. Then of these results, shear strenght greater is that uses an adhesive epoxy, can be seen on the figure 5 and 6: (4) Wood flexible strenght; (4.1) According to PKKI, albasia included in strong class IV, the average value of flexible strenght 360- 500 kg/cm2, and glugu included in strong class II, and the value of flexible strenght 725-1100 kg/cm2. Can be seen on a figure 7 to albasia flexible strenght, and figure 8 for glugu flexible strenght and table 2. (4.2) Flexible strength of glued laminated timber: with differences in variations of adhesive and the position of wood. These differences can be seen from figure 9, 10, 11, and 12. The biggest flexible strength is made by EPS, with an adhesive epoxy and the position albasia is in the middle. The result showed that the product increased laminates, strong class IV into a buoyant strong III, with an increase in 254.025 kg/ cm2 or 59.72 %. Of which initially was strong class IV 425.325 kg/ cm2 become 679.350 kg/ cm2 (class III). Can be seen on a figure 13 and table 3.

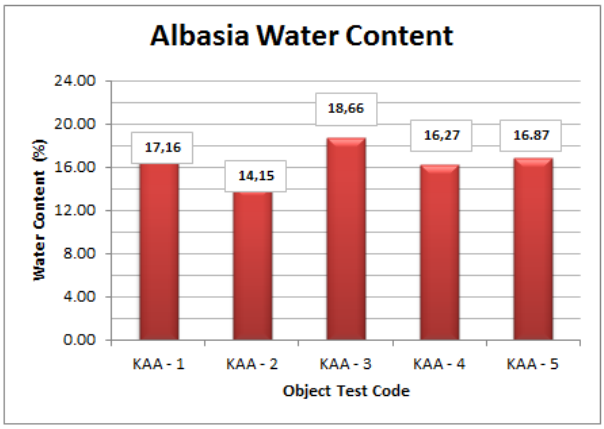


Figure 1. Albasia water content

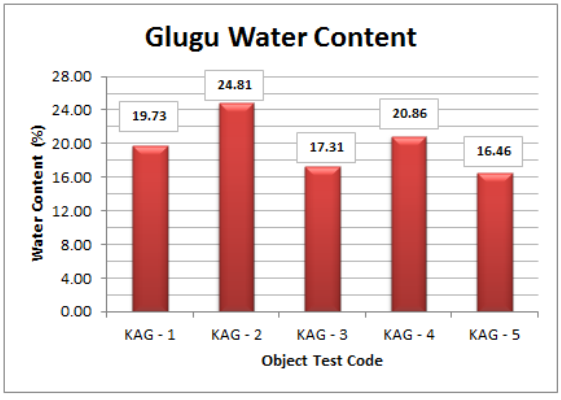


Figure 2. Glugu water content

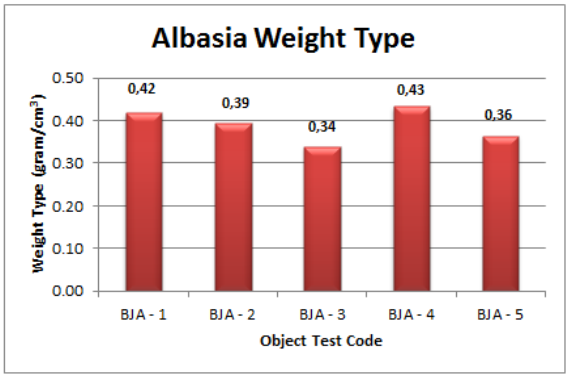


Figure 3. Albasia weight type

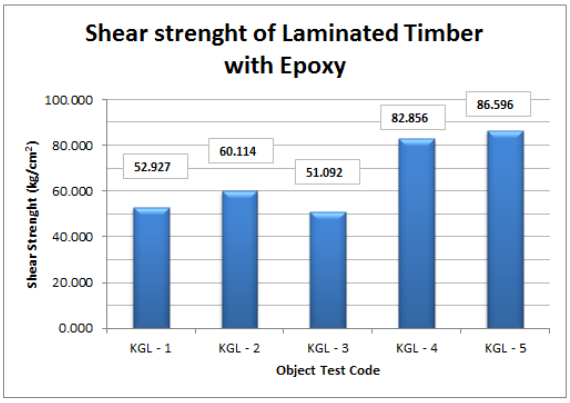


Figure 6. Shear strength of laminated timber with epoxy

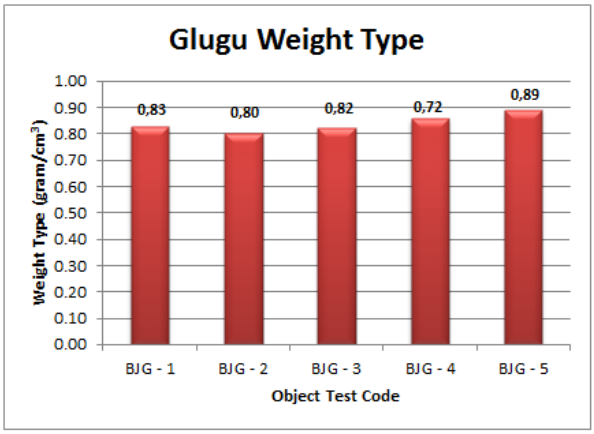


Figure 4. Glugu weight type

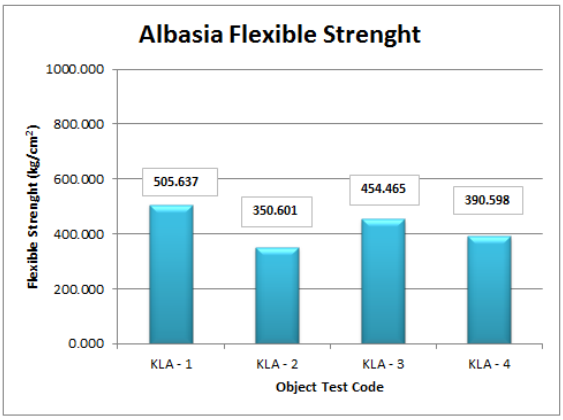


Figure 7. Albasia flexible strenght

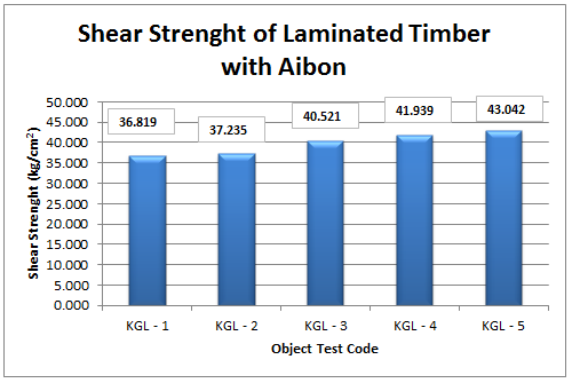


Figure 5. Shear strength of laminated timber with aibon

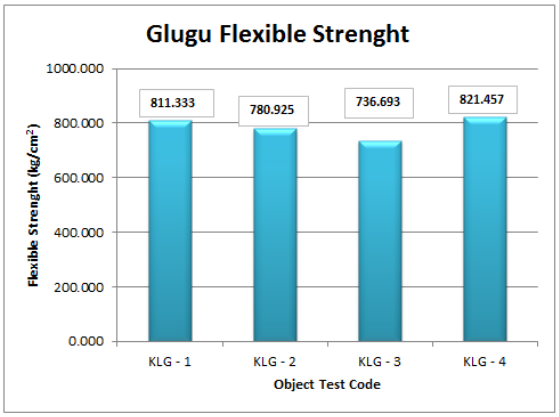


Figure 8. Glugu flexible strength

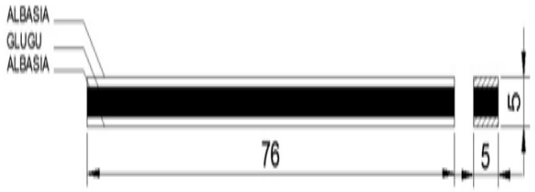


Figure 9. EPG (An adhesive material: glue epoxy, and position wood: glugu in the middle)

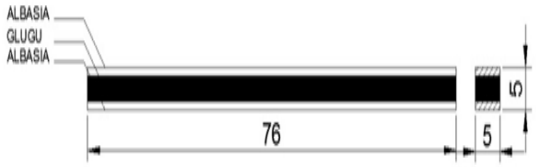


Figure 10. AIG (An adhesive material: glue aibon, and position wood: glugu in the middle)

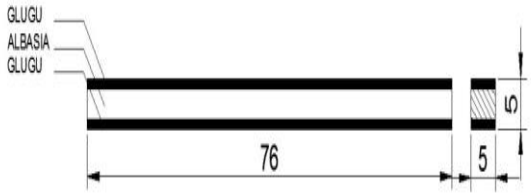


Figure 11. EPA (An adhesive material: glue epoxy, and position wood: albasiah in the middle)

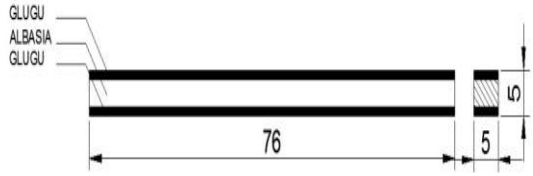


Figure 12. (An adhesive material: glue aibon, and position wood: albasiah in the middle)

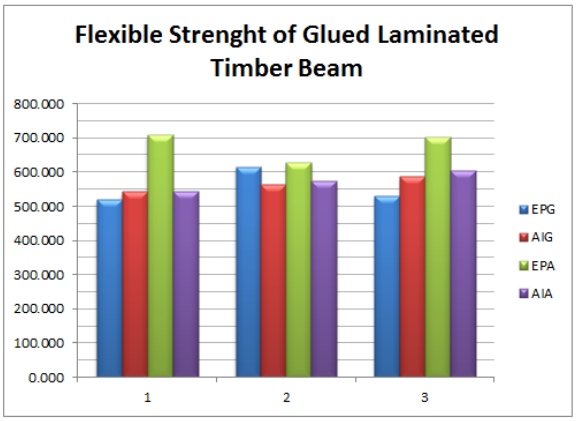


Figure 13. Flexible strenght of glued laminated timber beam

TABLE II. INSPECTION FLEXIBLE STRENGTH OF BEAM CONTROL

Inspection Flexible Strenght of Beam Control			
No.	Flexible Strenght of Beam Control		Explanation
	Albasia (KLA)	Glugu (KLG)	
1	505.637	811.333	According to PKKI, albasia including wood class strong IV, with the average of flexible strenght 360-500 kg/cm^2. And glugu including wood class strong II, with the average of flexible strenght 360-500 kg/cm^2.
2	350.601	780.925	
3	454.465	736.693	
4	390.598	821.457	
Average	425.325	787.602	

TABLE III. TABLE 3. FLEXIBLE STRENGTH OF BEAM CONTROL

No.	Maximum Loading (kg)				Flexible Strenght of Beam Control (kg/cm^2)				Explanation
	EPG	AIG	EPS	AIS	EPG	AIG	EPS	AIS	
1	550	650	850	650	518.498	541.718	708.401	541.718	According to PKKI, glued laminated timber is including wood class strong III, with flexible strenght 500 - 725 kg/cm^2
2	690	675	750	600	614.938	564.077	626.752	572.203	
3	600	630	800	730	530.336	586.669	702.897	603.441	
Average	613.333	651.667	800.000	660.000	554.591	564.155	679.350	572.454	

IV. CONCLUSION

After conducting the research, can be concluded that: (1) Prestressed of glued laminated timber with EPG code is 554.591 kg/cm^2, and maximum load is 690 kg; (2) Prestressed of glued laminated timber with EIG code is 564.155 kg/cm^2, and maximum load is 675 kg; (3) Prestressed of glued laminated timber with EPS code is 679.350 kg/cm^2, and maximum load is 850 kg; (4) Prestressed of glued laminated timber with EIS code is 572.454 kg/cm^2, and maximum load is 730 kg.

The biggest prestressed is made by glued laminated timber with EPS code, with an adhesive epoxy and the position albasia is in the middle. The result showed that the product increased laminates, strong class IV into a buoyant strong III, with an increase in 254.025 kg/ cm^2 or 59.72 %. Of which initially was strong class IV 425.325 kg/ cm^2 become 679.350 kg/ cm2 (class III).

V. SUGGESTION

From the research that has been done, there are some suggestions that can be concluded to the reader and further research, among others: (1) Gluing on the side of the wood, possible there are not sticking perfect because the surface of wood is not uniform, then need more carefulness, because perfection of gluing is make affect of glued laminated timber strenght. (2) To prevent damage occurs on the surface of glue, need attention in the process of the emphasis of test objects.

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