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IMPLEMENTATION OF WOOD STRUCTURE ENGINEERING POLICY IN INDONESIA

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ABSTRACT

In wooden buildings, the collapse is generally due to connections or relationship that does not meet the standards. And structural system is not earthquake resistant. Wood Regulation in Indonesia is very outdated, since 1961 Indonesian Wooden Regulation (PKKI 1961) 52 years has not changed. Several draft wood regulations of 1980 and 2002 were made until the issuance of SNI 7973: 2013 Design specifications for timber construction. Currently, the regulations abroad use both Load and Resistance Factor Design (LRFD), and Alowable Stress Design (ASD) design methods, Breyer 2008. PKKI 1961 uses the old ASD way. In SNI 7973: 2013 which adopts NDS 2012, it contains both LRFD / DFBK and ASD / DTI and both are usable in design. The lessons that are learned from structural failure caused by the earthquakes are raising concerns about the weak knowledge about theory, analysis and standards of good building design. Experience in buildings with concrete and steel shows that in general the failure is caused by; Soft story mechanism, short column effect, pounding, excessive time, lack of longitudinal reinforcement and shear, no reinforcement on beam and column relationships and reinforcement detailing such as stirrup, crooked and overlap reinforcement requirements. It may be indicated that existing standards are unknown or followed by the requirements or even inadequate. From experience in earthquake-affected areas, wooden buildings show good resilience to earthquakes even though they are non-engineered buildings. Wooden buildings are generally more resistance to earthquakes. It is because their light mass resulting in small inertia force of earthquake with a large strength / mass ratio

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INTRODUCTION

The lessons that are learned from structural failure caused by the earthquakes have caused concerns about the weak knowledge of both theories, analysis and standards of good building design. Experience in buildings with concrete and steel shows that in general the failure is caused by; Soft story mechanism, short column effect, pounding, excessive time, lack of longitudinal reinforcement and shear, no reinforcement on beam and column relationships and reinforcement detailing such as stirrup, crooked and overlap reinforcement requirements. It may be indicated that existing standards are unknown or followed by the requirements or even inadequate.

From experience in earthquake-affected areas, wooden buildings show good resilience to earthquakes even though they are non-engineered buildings. Wooden buildings are generally more resistance to earthquakes. It is because their light mass resulting in small inertia force of earthquake with a large strength / mass ratio. In wooden buildings, the collapse is generally due to connection or relationship that does not meet the standards and structural system is not earthquake resistant. Wood Regulation in Indonesia is very outdated, since 1961 Indonesian Wooden Regulation (PKKI 1961) 52 years has not changed. Several draft wood regulations of 1980 and 2002 were made until the issuance of SNI 7973: 2013 Design specifications for timber construction. Currently the regulations abroad use both Load and Resistance Factor Design (LRFD) and Alowable Stress Design (ASD) design methods, Breyer 2008. PKKI 1961 uses the old ASD way. In SNI 7973: 2013 which adopts NDS 2012, it contains both LRFD / DFBK and ASD / DTI and both are usable in design. Indonesia's new Timber Regulation SNI

7973: 2013 largely refers to foreign regulations. The generally hardwood tropical nature of the wood can be different from softwood so that the regulations from abroad cannot be adopted just like that. Research on the properties of tropical wood in the ways or theories contained in SNI 7973: 2013 has been partially undertaken. Adjustments have been made as reference strength for broadleaf timber at SNI 7973: 2013. Great equipment and funds support from industry and government abroad led to rapid technological developments in research to prepare appropriate technology in the effort to meet housing needs and also to reduce risk of disaster,especially,due to earthquake

METODOLOGY

Material and Procedures

This study uses survey, by interview using a questionnaire (questionnaire). Sampling method in this research is provided by using purposive sampling, the sampling technique with a certain consideration. The methodis applicable if the sources or respondents interviewed are people who are experts or working in a field, The data used in this research is primary data and secondary data. The primary data are data obtained directly from study subjects using a measuring device or appliance makers as a source of information of data such as interviews, questionnaires, or observation. Secondary data are obtained with a literature study of the relevant agencies. The sampling technique is:

$$n = \frac{Z^2\ \alpha/2\ p\ (1 - p)\ N}{d^2\ (N\text{-}1) + Z^2\ \alpha/2 p\ (1 - p)}$$

This study aimed to analyze Implementation of Wood Structure Engineering Policy in Indonesia . This research applies quantitative descriptive method that use questionnaire as Instruments and techniquesof data collection. The questionnaire first tested for validity and reliability. Activities undertaken in this study are a) an action plan; socializing Implementation of Wood Structure Engineering Policy to the public and stakeholders b) implementation of the action; publish the notice board,operationally implement export and import policies and carry out surveillance of the effectiveness of policy implementation c) observation and reflection on the implementation of policy measures the implication of this research for program examined.

Giving meaning to categories of coefficient are as follows:

1. 0.00 and 0.20 , the category is very small and can be ignored
2. 0.20 and 2.99 , the low category
3. 3.00 and 3.50 , the moderate category (enough)
4. 3.51 and 3.99 , the category is High
5. > 4.00 then the very high category

Pictures the general design of action research with spiral cycle as follows:

Data Analyzed

Data that should be analyzed in this study are described next section. The instrument by using the formula Pearson Product Moment Correlation (Pearson Product Moment Correlation). as follows:

$$r_{xy} = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{\{N\sum x^2 - (\sum x)^2\}\{N\sum y^2 - (\sum y)^2\}}}$$

Structural equation model to be tested takes the form of multiple Linear Regression Analysis as follows: $Y = a + b_1 X_1 + b_2 X_2 + e$

RESULTS

Statistical Test

To determine degree of relationship variables Wood Policy (X_1) , Wood Structure Engineering (X_2) and the ultimate solution of residential buildings (Y) then used Pearson correlation analysis . Based on results of data processing SPSS20 .0 for Microsoft Windows.

DISCUSSION

Wood Policy (X_1) significantly affects ultimate solution of Residential Building (Y)

Based on Table .1 Correlation that the influence between variables Wood Policy (X_1) on ultimate solution for Residential Building (Y), which is calculated gives coefficient correlation of 0.714 or (r_{xy} = 0.714). This shows the strong influence among Wood Policy on ultimate solution of Residential Building. Meanwhile, to declare the size of contributions X_1, Y or coefficient against determinant = r^2 X 100% or 0.7142 X 100% = 52.91%, while the remaining 47.01% are determined by other variables. Then to find significant levels of correlation coefficients X_1 to Y by using one hand (one tailed) of output (measured from Probability) .00 Since the probability of generating numbers far below 0.50, then the influence Wood Policy on ultimate solution of Residential Building was significant Coefficients of table .4, illustrates that the regression equation is as follows: $Y = a + b_1 x_1 = 9.912 + 0.651$ The constant of 9.912 states that if there is no increase in value of variable Implementation of Wood Policy (X_1), then, value of ultimate solution of Residential Building (Y) is 9.912. A regression coefficient of 0.651 states that any additions (for the sign +) of the score or value of Implementation wood policy will increase to a score of 0.651.

T test is applied to test the significance of the constants and dependent variable of ultimate solution of Residential Building. Test criteria regression coefficients of the variables Wood Policy on ultimate solution of Residential Building as follows: The first hypothesis proposed in form of sentence is: Ha: Implementation Wood Policy significantly affects ultimate solution of Residential Building Ho: Implementation Wood Policy does not significantly affects ultimate solution of Residential Building Basis for a decision by comparing the value t table with t, as follows: If the t count > t_{table}, then, H_o is rejected, it means a significant regression coefficient If t< t_{table}, then, H_o is accepted, it means regression coefficients were not significant = 5,331 Taken from table .4, t value variable coefficient X_1 = 5,331 t table = 1.684. Significance level œ = 0.05 df (degrees of freedom) = the number of data (n) -2 = 50-2 = 48. The test was done one side, so that the value t table = 1.684 (interpolation). Decision: because t count > t table, or 5.331 > 1.684, then Ho Rejected. Visible column sig (significant) in the table 4 coefficient sig 0,000 or less than probability valueof 0.05, or 0.05 value> 0,000 hence Ho refused and Ha acceptable means significant regression coefficients, it is thus Wood Policy significantly affects

Table 1. Correlations

			Wood Policy	Structure Enginering	Residential Building
Spearman's rho	Wood Policy	Correlation Coefficient	1.000	.415	714
		Sig. (2-tailed)	.	.919	.736
		N	50	50	50
	Structure Enginering	Correlation Coefficient	.415	1.000	.364**
		Sig. (1-tailed)	.000	.	.709
		N	50	50	50
	Residential Building	Correlation Coefficient	.714	.364**	1.000
		Sig. (2-tailed)	.736	.709	.
		N	50	50	50

Tabel 2. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.850[a]	.722	719	3.48320	2.031

a. Predictors: (Constant), Wood Policy
b. Dependent Variable: Residential

Tabel 3. ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.106	2	6.553	.540	.586[a]
	Residual	570.236	47	12.133		
	Total	583.341	49			

a. Predictors: (Constant), Wood Policy
b. Dependent Variable: Residential building

Tabel 4. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	9.912	1.600		6.195	.000		
	Wood Policy	653	.660	651	5,331	.742	.874	1.144
	Structure Enginering	662	.678	524	3.804	.425	.024	1.144

a. Dependent Variable: Residential Building

ultimate solution of Residential Building Structure Enginering (X_2) significantly affects ultimate solution of Residential Building, based on Table .1. Correlation between variables that influences Structure Enginering (X_2) on ultimate solution of Residential Building (Y), which is calculated using coefficient correlation of 0.709 or (r_{xy}) = 0.709. This shows the strong influence among ultimate solution of Residential Building. As for the size of the contribution declare variables X_2 to Y or coefficient determinant = r^2 X 100% or 0.7092 X2 100% = 50.27%, while the remaining 49.73% determined by other variables. Then to find significant levels of correlation coefficients X_2 to Y by the method of one-sided (one tailed) of output (measured from Probability) .00 Since the probability of generating numbers far below 0.50, then, influence for Structure Enginering on ultimate solution of Residential Building was significant Coefficients of table 4.4, illustrates that the regression equation is as follows: $Y = a + b_2x_2 = 9.912 + 0.524$ The constant of 9.912 states that if there is no increase in value of variable Structure Enginering (X_2), then, value of ultimate solution of Residential Building (Y) is 9.912. A regression coefficient of 0.524 states that any additions (for the sign +) of the score in Structure Enginering will increase to a score of 0.24. T test is used to test the significance of the constants and dependent variables of ultimate solution of Residential Building. Test criteria regression coefficient of variable Structure Enginering on ultimate solution of Residential Building as follows: The first hypothesis isproposed in sentence is: Ha: Structure Enginering significantly affects ultimate solution of Residential Building

Ho: Structure Enginering does not significantly affects ultimate solution of Residential Building Basis for a decision by comparing the value t table with t, as follows: If the t count > t_{table}, then, H_o is rejected it means a significant regression coefficient If $t < t_{table}$, then, H_o is accepted it means regression coefficientis not significant t = 3.804.

Taken from table 4. , the coefficient t value X_2 = 3.804 t table = 1.684. Significance level œ = 0.05 df (degrees of freedom) = the number of data (n) -2 = 50-2 = 48 The test was done one side, so that the value t table = 1.684 (interpolation). Decision: because t count> t table, or 3.804> 1.684, then Ho rejected. Show column sig (significant) in the table .4. coefficient sig 0.24 or smaller than the probability value 0.05, then $H_o$is rejected and Ha accepted means significant regression coefficients , it is thus Structure Enginering significantly affects ultimate solution of Residential Building

Implementation of Wood Policy (X_1), and Structure Enginering (X_2) jointly significant effect on ultimate solution of Residential Building (Y)

Based on table .2. Model Summary that the influence Wood Policy and structure engineering together -Same against which performance is calculated by the correlation coefficient is 0.850 or r_{X1X2Y} = 0.850, suggesting a strong influence, while for together (simultaneously) variable X_1 and X_2 to Y = R^2 = 0.8502 x 100% x 100% = 72.25% while the remaining 27.75% are determined by other variables.

Then, to determine the level of significant multiple correlation coefficients shown in Table:3 Anova between variables Implementation wood policy and structure engineering together on ultimate solution of Residential Building . With the first method tailed of output (measured by probability), yielding 0.000 sig figures. Because the probability is much lower than the figures sig 0.05, then, influence of Implementation wood policy and structure engineering together against ultimate solution of Residential Building is significant From table 4 illustrates that multiple regression coefficient as follows: $Y = a + b_1X_1 + b_2X_2 = 9.912 + 0.524 + 0,651\ X_1\ X_2$ Constantant amounted to 9.912 states that if there are no increase of the variable Implementation Wood Policy (X_1) and Structure Enginering (X_2), then the ultimate solution of Residential Building value is 9.912. A regression coefficient of 0.651 and 0.524 states that each additional score or value of Implementation wood policy and Structure engineering, will increase to a score of 0.651 and 0.524. F test at Anova table 3,to test the significance of the constants and dependent variable (The ultimate solution of Residential Building). Test criteria regression coefficients of the variables of Implementation Wood Policy and of structure engineering on ultimate solution of Residential Building as follows: The third hypothesis is proposed: Ha: Implementation wood policy and Export of structure engineering jointly significant effect on ultimate solution of Residential Building Ho: Implementation wood policy and structure engineering together no significant effects on ultimate solution of Residential Building Taken from the table 3. Anova, F count = 7.544.

Basis for a decision by comparing value F arithmetic with F table value as follows: If $F_{count} > F_{table}$ value, then H_o is rejected, it means a significant regression coefficient. If the value of F arithmetic $< F_{table}$ value, then Ho received, meaning that a significant regression coefficient Looking Ftable value using the F table with the formula: Significance œ = 0.05 Ftable = F (1-œ) (df = k), (df = n-k-1) = F (1-œ) (df = 2), (df = 50-2-1) = F (1 to 0.05), (2.47) Or numerator = 2, denominator = 47 Ftable = 3.20 (interpolation) Decision: It turned out that F count > F_{table} value, or 7.544> 3.20, then reject Ho and Ha accepted that Implementation wood policy and structure engineering jointly significant effect on ultimate solution of Residential Building

Conclussion

- Implementation wood policy showed good applicability
- Structure engineering shown good improvement / increase
- The ultimate solution of Residential Building high performance / good
- Implementation wood policy and structure engineering significant effect either partially or jointly against ultimate solution of Residential Building

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