P-ISSN : 2598-1277
E-ISSN : 2621-3966

JOURNAL OF GREEN SCIENCE AND TECHNOLOGY

ANALYSIS AND DESIGN REINFORCED CONCRETE CONSTRUCTION STRUCTURE OF 4 FLOOR HOTEL IN KUNINGAN

Tira Roesdiana[1*], Renaldi Indra Perdana[1]

[1]) Civil Engineering Department, Universitas Swadaya Gunung Jati, Cirebon.*
Corresponding Author's Email : tira.roesdiana@gmail.com
No. HP Corresponding Author: 085215360069

ABSTRACT

Planning for a 4-storey hotel in Kuningan is projected to support supporting facilities for the tourism sector in Kuningan Regency, supporting facilities like this are really needed by Kuningan Regency which has great potential in the tourism sector and is proven by the continuing increase in the number of tourists every year, with the development of Kuningan Regency and the increasingly widespread the construction of multi-storey buildings is needed planning in order to make efficient use of land. To support the availability of tourism support facilities, this research will examine the planning of hotel building structures based on SNI 2847-2019, SNI 1727-2020 and SNI 1726-2019 and calculate the budget plan for the structural work. Referring to these rules, the dimensions of the structural elements and the need for structural reinforcement can be produced that meet the rules and can also support the work force and loads received on a building including earthquake loads, wind loads and rain loads. The cost of building a 4-storey hotel building in this study is Rp. 26,712,400,000.00 (Twenty Six Billion Seven Hundred Twelve Million Four Hundred Thousand Rupiah), and the cost of building a one square meter building is Rp. 4,345,716.00 (Four million three hundred forty-five million seven hundred and sixteen thousand rupiah).

Keyword: *Building Structure, Concrete, SNI 1726-2019, SNI 1727-2020, SNI 2847-2019.*

1. INTRODUCTION

Indonesia is a country that has natural beauty and cultural diversity in each region, this is what can be used to improve the tourism sector, the tourism sector plays an important role in regional income and also state income. Kuningan Regency is one of the areas considered to have tourism potential with mountainous geographical conditions with various natural beauties and natural springs. With the excellent tourism potential of Kuningan Regency, it can encourage more and more tourists to come, this can be seen from the existing data that the recapitulation of tourist visits to Kuningan Regency from 2016 to 2019 always increases every year.

Table 1. Number of International and Domestic Visitors in Kuningan Regency, 2016–2021

Year	International Visitors	Domestic Visitors	Total
2016	242	3.06.134	3.066.376
2017	325	3.12.623	3.123.948
2018	2.529	4.001.595	4.004.124
2019	618	4.734.790	4.735.408
2020	49	2.480.669	2.480.718
2021	16	2.668.426	2.668.442

P-ISSN : 2598-1277
E-ISSN : 2621-3966

However, since WHO announced the Covid-19 pandemic on March 11 2020, the economic and development pace in Kuningan Regency has slowed down so that the development of tourism supporting infrastructure has experienced a similar impact.

Table 2. Number of Hotels in Kuningan Regency

District Area	Number of Star Hotels by Regency/City				Number of Non-Star Hotels by Regency/City			
	Years				Years			
	2021	**2020**	**2019**	**2018**	**2021**	**2020**	**2019**	**2018**
Kuningan	6	6	6	4	51	53	57	45

It can be seen that the comparison between the number of tourists who come and the number of hotels in Kuningan Regency, the number of tourists who come every year has increased while the number of hotels has not experienced a significant increase, and has even decreased in 2020 and 2021.
It is feared that the decline in the number of hotels could lead to a decrease in the number of tourists coming to Kuningan Regency, due to inadequate infrastructure. This will also reduce regional income because the rotation of the tourism economy in Kuningan has a great impact on regional treasury income because Kuningan Regency is a tourism area not an industrial area where the regional income is greatly supported by economic turnover in the tourism sector.
Starting from these problems, a study on the structural planning of new buildings that are designated as hotels in the Kuningan area can be designed. To build a high-rise building requires careful planning. In planning a high-rise building, there are references or standards listed in the construction SNI.
Since since 2020 there has been no construction of high-rise buildings specifically for hotels. This can be a factor in the development of this research because since 2019 BSN has published the latest SNI for reinforced concrete requirements for buildings and earthquake load planning, and in 2020 BSN has also issued SNI regarding minimum loads for building structures.

By bringing up the problem of the need for hotel buildings and also the latest SNI issued at a time when there was a lack of construction of high-rise buildings for hotels, a study was sparked that raised the theme of hotel building structure planning with reference to SNI - 2847 - 2019 concerning requirements for the construction of building structures using concrete materials reinforced concrete, and also SNI – 1726 – 2019 regarding earthquake resistant building planning, as well as SNI 1727 – 2020 regarding the minimum loading required for buildings..

2. LITERATURE REVIEW

High-rise buildings are buildings that have more than one floor vertically. This multi-storey building was built based on the limitations of expensive land in urban areas and the high level of demand for space for various activities [1]. The more the number of floors built will increase the efficiency of urban land so that the capacity of a city can be increased, but on the other hand it also requires an increasingly complex level of planning and design, which must involve various disciplines in certain fields.
High-rise buildings are generally divided into two, low-rise buildings and high-rise buildings. This division is distinguished based on the technical requirements of the building structure. Buildings with a height of more than 40 meters are classified as high-rise buildings because the structural calculations are more complex even though they are not multi-storey. Based on the number of floors, high-rise buildings are classified into low-rise buildings (2 - 4 floors) and multi-storey buildings (5 - floors) and skyscrapers. This division is not only based on the structural system but also other system requirements that must be met in the building, such as considerations of accessibility, mechanical, or electrical.
In [2] said that the characteristics of high-rise buildings are grouped into:

1. Low-rise building (Low Rise Building) Low-rise building, with the number of floors 1 – 3 floors, height < 10m
2. Medium-rise building (Medium Rise Building) Medium-rise building, with the number of floors 3 – 6 floors, height < 20 m
3. High-rise building (High Rise Building) High-rise building, with the number of floors > 6 floors, height > 20 m

In planning the building structure of this hotel building project, reinforced concrete structures will be used. The guide used in planning reinforced concrete building structures is SNI 2847-2019. The reinforcement system in concrete structures is very important because it anticipates the weakness of concrete against tensile stress.

Concrete structures for beams require steel reinforcement on the tensile side to anticipate its weakness to tensile stress, but in general the beam cross section has steel reinforcement on both sides [3]. The beam also needs stirrup reinforcement to withstand shear forces. High-rise buildings must have structural elements (such as slabs, beams, columns, stairs, etc.) with sufficient cross-sectional dimensions and reinforcement so that the building is strong, comfortable and economical [4]. A strong structure means that the stress that occurs at each cross section does not exceed the strength of the material of the structure. Safe structure means that under all loading conditions, the structure does not collapse. The comfortable structure means that the deformation of the structure does not make the wearer feel uncomfortable wearing it. Therefore, the open frame concrete frame structure is designed using the concept of strong column weak beam, so that the column is designed to be stronger than the beam which is intended so that plastic hinges occur in the beam. Building structure planning generally consists of two main parts, namely sub structure planning and upper structure planning. The structure of this building consists of several structural elements that can be grouped into 2 groups.

1. Primary Structure
   In planning the structure of the building used columns and beams as the primary elements of the structure. The beam is a structure that functions to carry the load received by the slab and transmit it to the column which is axially loaded by the beam and transfers the load to the foundation and soil.

2. Secondary Structure
   The secondary structure as an integral part of the building structure is designed to accept only bending forces and is not designed to accept lateral forces due to earthquakes, so that the analysis calculations are calculated separately from the primary structure. Secondary structures include beams, stairs, floor slabs.

3. METHODOLOGY

The research method in the preparation of this thesis uses qualitative methods. Qualitative method is a method carried out by surveying and direct observation of the object of research.

3.1. Research Object

The building to be planned is a reinforced concrete portal structure in a college building which consists of 4 floors with a height of 16 meters and a length of 36 meters and a width of 60 meters and a height of 4 meters between floors.

3.2. Research Located

The site is in the administration of Cigandamekar District, Kuningan District. Cigandamekar District is a subdistrict which is located in the northern part of the city center of Kuningan Regency. This subdistrict consists of eleven villages, namely Sangkanurip, Panawuan, Cibuntu, Babakanjati, Bunigeulis, Koreak, Sangkanmulya, Timbang, Karangmuncang, dapatra. The site, which is located on the East Ring Road, Cilimus Kuningan, is included in the Sangkanhurip village area.

The site used is on the CilimusKuningan East Ring Road. The site is a very strategic vacant land to be used as a place for tourists to stop. The available land area is more than 10.000 m^2.

 P-ISSN : 2598-1277
E-ISSN : 2621-3966

3.3. Research Guidelines

1. SNI – 2847 – 2019 (Structural concrete requirements for buildings) [5]
2. SNI – 1726 – 2019 (Procedures for earthquake resistance planning for building structures and Non-buildings) [6]
3. SNI – 1727 – 2020 (Minimum load for building design and other structures) [7]
4. PPPURG 1987 (Load planning guidelines for houses and buildings)

3.4. Data Collection Method

1. Literature Method

The literature is a method that is carried out by collecting, study, and identify literature from books and internet, which is related to building planning.

2. Observation Method

Observation is data obtained from survey results directly to the location. With a direct survey, the conditions in the field can be seen so that an overview can be obtained that can be taken into consideration in the preparation of research.

3.5. Data Type

1. Primary Data
   a. Boundaries Map, Boundary Map is a map made to show the boundaries of areas in a district, such as the boundaries of the sub-districts in Kuningan Regency.
   b. Site Plan Map, Site plan map is a map that serves to show the original location of a project to be worked on, this site plan map is made based on real time location data directly from google satellite.
   c. Soil Type Distribution Map, Soil type distribution maps are used to monitor the distribution of soil types in a large area, soil type distribution maps require soil type data taken from the FAO official website.
2. Secondary Data
   a. Dutch Cone Penetration Test Data (CPT Data), Dutch cone penetration test is a type of soil test whose results can determine how much the value of soil resistance is and determine the depth of hard soil for a foundation [8].
   b. Soil Laboratory Data, Soil lab data is data contain data about water content test, atterberg limit test, direct shear test, the data from this test is obtained from the PUPR service of Kuningan Regency.
   c. Indonesia Earthquake Spectrum Design for Cigandamekar District, Earthquake spectrum graph is a data that is used to determine earthquake loads in a planning analysis of building structures. This earthquake spectrum response graph data was obtained from the official website managed by the Ministry of PUPR [9].
   d. Wind Speed Data, Wind speed data is a data used to determine wind load in a planning analysis of building structures. Wind data was obtained from the official website managed by World Meteorological Organization.
   e. Kuningan Regency's Statistic Data, This Kuningan Regency statistical data is legal data made by the Kuningan Regency BPS agency, the statistical data used in this study is in the form of data on the number of tourists, data on electricity production, and data on water distribution.
   f. Basic Price List for Salaries, Materials and Tools, This data This data is used asbasic data for compiling the AHSP in the making of the RAB, this data is obtained from the local PUPR institution, Kuningan Regency.

1.6. Quality

a. Quality of Building Concrete, The quality of the concrete used in the planning of this building has strong concrete pressure (f'c) of 30 MPa [10].

P-ISSN : 2598-1277
E-ISSN : 2621-3966

b. Quality of Foundation Concrete, The quality of the concrete used for the structure bottom (foundation) has concrete compressive strength (f'c) of 30 MPa [10].
c. Reinforcement Steel Quality, The yield stress used for longitudinal reinforcement is BJTS 40 of 420 MPa. The yield stress for the transverse reinforcement is BJTP 28 of 280 MPa [11].

1.7. Flowchart

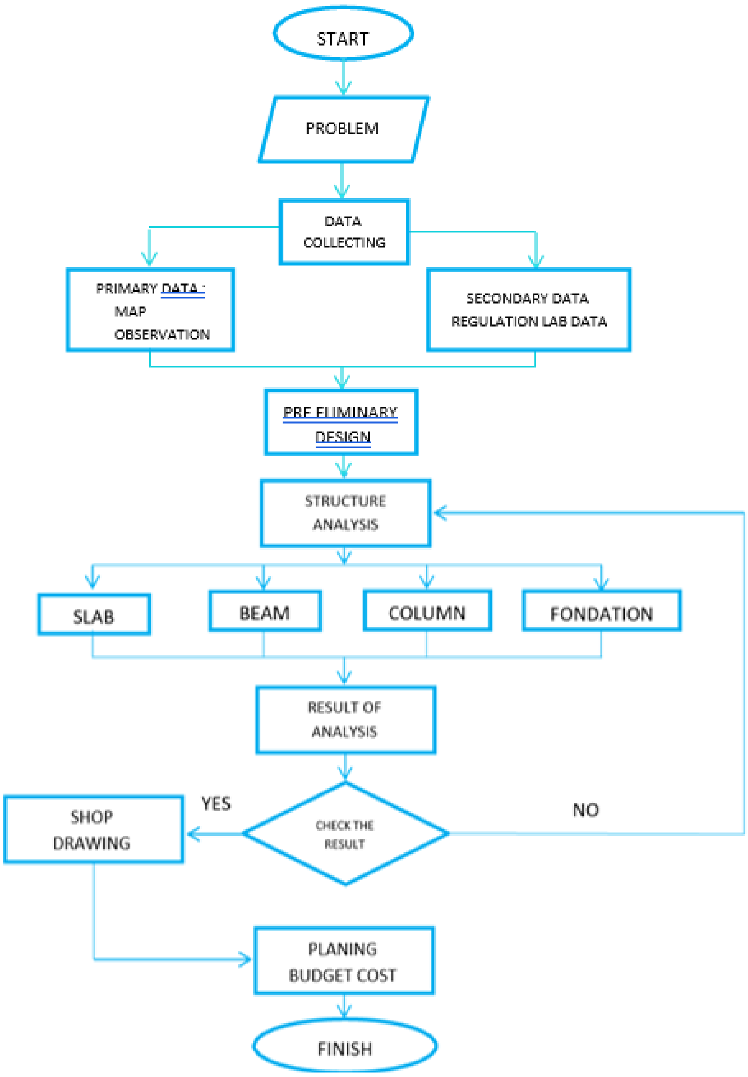

Figure 1. Research Methodology

4. RESULTS AND DISCUSSION

4.1. Preliminary Design

which will then be calculated with the help of computer applications to obtain efficient and strong dimensions [5]. The standard reference in the preliminary design process in this study is SNI 2847-2019 as a reference for determining minimum dimensions and for working loads using SNI 1727-2020 reference. The preliminary design process produces dimensions that are considered efficient for building structures in research.
The first preliminary design process is to determine the efficient dimension or thickness for the floor plate and roof plate structure, the reference for two-way plate dimensions in SNI 2847-2019 is in table 3.

P-ISSN : 2598-1277
E-ISSN : 2621-3966

Table 3. Minimum slab thickness based SNI 2847-2019

α_{fm}	h minimum (mm)		
$\alpha_{fm} \leq 0{,}2$	apply 8.3.1.1		(a)
$0{,}2 < \alpha_{fm} \leq 2{,}0$	Biggest of	$\dfrac{ln\left(0{,}8 + \dfrac{fy}{1400}\right)}{36 + 5\beta\,(\alpha fm - 2)}$	(b)
		125	(c)
$\alpha_{fm} > 2{,}0$	Biggest of	$\dfrac{ln\left(0{,}8 + \dfrac{fy}{1400}\right)}{36 + 9\beta}$	(d)
		90	(e)

Source : SNI 2847-2019

After the calculation process is carried out with reference to the table, the results of the efficient thickness for the two-way plate thickness are obtained.

Table 4. Result Minimum Thickness of Two Way Slab

Story	Thickness of Floor Slab
1st floor	150 mm
2nd floor	150 mm
3rd floor	150 mm
4th floor	150 mm
Roof Top	150 mm

The next process is to determine the dimensions for the beams which refer to SNI 2847- 2019 in table 5 for the dimensions of the beam height while for the width of the beams.

Table 5. Minimum Height of Beam

Kondisi perlekatan	Minimum *h*[1]
Perlekatan sederhana	$\ell/16$
Menerus satu sisi	$\ell/18{,}5$
Menerus dua sisi	$\ell/21$
Kantilever	$\ell/8$

And for the beam width provisions listed in article 18.6.2.1, three conditions must be met.
- $bmin_1$ = 0,3h
- $bmin_2$ = 250 mm
- $bmin_3$ = 2 h

The results of the preliminary design beam dimensions are the minimum height and width of the beam along with the planned height and width for each type of beam.

Table 6. Table of Result Beam Dimension

Beam Type	Beam Length	hmin (L / 16)	h used (mm)	$bmin_1$ (0,3 x h)	$bmin_2$ 250 mm	$bmin_3$ (2/3 x h)	b used (mm)
Type 1	5000	416,67	450	105	250	333,333	350
Type 2	4000	333,33	400	75	250	266,667	300
Type 3	3000	250,00	350	60	250	233,333	250
Type 4	7000	583,33	600	150	250	400,000	400

P-ISSN : 2598-1277
E-ISSN : 2621-3966

The last preliminary process is to determine the column dimensions which refer to SNI 2847-2019 article 18.7.2.1. which must meet 3 conditions.
- If : $b < h$ (SNI 2847-2019 18.7.2.1)
- b > 300 mm (SNI 2847-2019 18.7.2.1)
- b/h > 0,4 (SNI 2847-2019 18.7.2.1)

So that the preliminary design for the column produces a minimum value and also the dimensional value used in planning.

Table 7. Table of Result Column Dimension

Column Type	b_{min} (mm)	b_{used} (mm)
Column 1	424	600
Column 2	377	500
Column 3	321	450
Column 4	270	400

4.2. Slab Reinforcement Analysis

In the process of analyzing the reinforcement of a two-way slab structure, each type of slab is planned for the diameter of the reinforcement required in the x and y directions, the distance between the reinforcement in the x and y directions, and also the required area which is also used in the x and y directions. So that all the data obtained from the analysis can be recapitulated into the following table.

Table 8. Recapitulation Table of Slab Reinforcement Design

Structure Type		X-Direction			Y-Direction		
		Rebar Diameter-Rebar Distance (mm)	Rebar Area (mm²)		Rebar Diameter-Rebar Distance (mm)	Rebar Area (mm²)	
			Requirement	Used		Requirement	Used
Slab Type 1 (4,0m x 5,0m)	Field	Ø10 – 175	417	449	Ø10 - 200	383	393
	Support	Ø10 – 175	417	449	Ø10 - 200	383	393
Slab Type 2 (5,0m x 3,0m)	Field	Ø10 - 175	417	449	Ø10 - 200	383	393
	Support	Ø10 - 175	417	449	Ø10 - 200	383	393
Slab Type 3 (5,0m x 5,0m)	Field	Ø10 - 175	417	449	Ø10 - 200	383	393
	Support	Ø10 - 175	417	449	Ø10 - 200	383	393
Slab Type 4 (5,0m x 7,0m)	Field	Ø10 - 175	417	449	Ø10 - 200	383	393
	Support	Ø10 - 200	417	449	Ø10 - 125	625	628

4.3. Beam Reinforcement Analysis

In the process of analyzing the structural reinforcement of each beam type, it analyzes the need for longitudinal reinforcement in the pedestals and the field, the diameter of the longitudinal reinforcement, the minimum reinforcement area and the area of reinforcement used for longitudinal reinforcement, the transverse bone diameter, the distance of each transverse reinforcement in the pedestal and field sections, minimum reinforcement area and reinforcement area in transverse reinforcement. So that the resulting data can be recapitulated for each type as in the following tables.

P-ISSN : 2598-1277
E-ISSN : 2621-3966

Table 9. Recapitulation Reinforcement Bar Design of Beam Type 1

Beam Type 1				
Bending Capacity (ϕMn > Mu)		OK		
Shear Capacity (ϕVn > Vu)		OK		
Longitudinal Rebar				
Reinforcement Bar Used		As Min (Calculation)	As min (ETABS)	As used
Upper Support Longitudinal	5D16	815 mm²	669 mm²	1005 mm²
Bottom Support Longitudinal	3D16	517 mm²	437 mm²	603 mm²
Upper Field Longitudinal	3D16	517 mm²	217 mm²	603 mm²
Bottom Field Longitudinal	4D16	720 mm²	473 mm²	804 mm²
Transversal/Ring Rebar				
Reinforcement Bar Used		Av/s min (ETABS)	As used	
Support Transversal Rebar	2Ø10-150	0,985 mm²/mm	1,047 mm²/mm	
Field Transversal Rebar	2Ø10-150	0,809 mm²/mm	1,046 mm²/mm	

Table 10. Recapitulation Reinforcement Bar Design of Beam Type 2

Beam Type 2				
Bending Capacity (ϕMn > Mu)		OK		
Shear Capacity (ϕVn > Vu)		OK		
Longitudinal Rebar				
		As Min (Calculation)	As min (ETABS)	As used
Upper Support Longitudinal	3D16	489 mm²	406 mm²	603 mm²
Bottom Support Longitudinal	2D16	291 mm²	266 mm²	402 mm²
Upper Field Longitudinal	2D16	285 mm²	132 mm²	402 mm²
Bottom Field Longitudinal	2D16	285 mm²	302 mm²	402 mm²
Transversal/Ring Rebar				
Reinforcement Bar Used		As min (ETABS)	As used	
Support Transversal Rebar	2Ø10-150	0,716 mm²/mm	1,0460 mm²/mm	
Field Transversal Rebar	2Ø10-150	0,601 mm²/mm	1,0460 mm²/mm	

Table 11. Recapitulation Reinforcement Bar Design of Beam Type 3

Beam Type 3				
Bending Capacity (ϕMn > Mu)		OK		
Shear Capacity (ϕVn > Vu)		OK		
Longitudinal Rebar				
Reinforcement Bar Used		As Min (Calculation)	As min (ETABS)	As used
Upper Support Longitudinal	3D16	557 mm²	370 mm²	603 mm²
Bottom Support Longitudinal	2D16	370 mm²	242 mm²	402 mm²
Upper Field Longitudinal	2D16	237 mm²	120 mm²	402 mm²
Bottom Field Longitudinal	2D16	197 mm²	215 mm²	402 mm²
Transversal/Ring Rebar				
Reinforcement Bar Used		As min (ETABS)	As used	
Support Transversal Rebar	2Ø10-150	0,627 mm²/mm	1,0460 mm²/mm	
Field Transversal Rebar	2Ø10-150	0,585 mm²/mm	1,0460 mm²/mm	

P-ISSN : 2598-1277
E-ISSN : 2621-3966

Table 12. Recapitulation Reinforcement Bar Design of Beam Type 4

Beam Type 4				
Bending Capacity (ϕMn > Mu)	OK			
Shear Capacity (ϕVn > Vu)	OK			
Longitudinal Rebar				
Reinforcement Bar Used		As Min (Calculation)	As min (ETABS)	As used
Upper Support Longitudinal	4D22	1375 mm²	1298 mm²	1520 mm²
Bottom Support Longitudinal	2D22	702 mm²	755 mm²	760 mm²
Upper Field Longitudinal	2D22	702 mm²	417 mm²	760 mm²
Bottom Field Longitudinal	4D22	956 mm²	786 mm²	1520 mm²
Transversal/Ring Rebar				
Reinforcement Bar Used		As min (ETABS)	As used	
Support Transversal Rebar	2Ø10-150	0,692 mm²/mm	1,0460 mm²/mm	
Field Transversal Rebar	2Ø10-150	0,554 mm²/mm	1,0460 mm²/mm	

4.4. Column Reinforcement Analysis

In the process of analyzing the reinforcement column structure of each type, it analyzes the need for longitudinal reinforcement, the diameter of the longitudinal reinforcement, the minimum reinforcement area and the reinforcement area used for longitudinal reinforcement, the transverse bone diameter, the distance between each transverse reinforcement, the minimum reinforcement area and the reinforcement area in the reinforcement. transverse. So that the resulting data can be recapitulated for each type as shown in the following table.

Table 13. Recapitulation of Column Reinforcement Bar

TYPE OF COLOUMN	ETABS ANALYSIS		REINFORCEMENT PLANNING			
	Longitudinal	Shear	Longitudinal		Shear	
	Rebar Area Used (mm²)	Rebar Area Used (mm²)	Reinforcement Bar Used	Rebar Area Used (mm²)	Reinforcement Bar Used	Rebar Area Used (mm²)
COLOUMN TYPE 1	3600	0,263	14 D22	5319	2Ø10-200	0,785
COLOUMN TYPE 2	2500	0,434	8 D22	3040	2Ø10-200	0,785
COLOUMN TYPE 3	2025	0,430	6 D22	2280	2Ø10-150	1,047
COLOUMN TYPE 4	1802	0,905	6 D22	2280	2Ø10-150	1,047

4.5. Fondation Structure Analysis

In the process of analyzing the foundation structure for each type, analyzing the dimensions of the pile cap, the need for pile caps, the diameter of the pile cap reinforcement, the area of reinforcement area required for pile caps in the x and y directions, the area of reinforcement used in the x and y direction pile caps, the distance between the piles, the distance between the piles pile to the edge of the pilecap and the diameter of the pile. So that the resulting data can be recapitulated for each type as shown in the following table.

P-ISSN : 2598-1277
E-ISSN : 2621-3966

Table 14. Recapitulation of Fondation Reinforcement Bar

TYPE FONDATION	PILE CAP DIMENSION (Lx x Ly x h) (m)	n PILE	REINFORCEMENT	
			X Direction	Y Direction
PILECAP 1	2 x 2 x 0,8	4 PILE	D22 - 150	D22 - 150
PILECAP 2	1,90 x 1,50 x 0,8	2 PILE	D22 - 150	D22 - 150
PILECAP 3	1,85 x 1,45 x 0,8	2 PILE	D22 - 150	D22 - 150

4.6. Budget Plan Analysis

The process of analyzing building structure cost planning is the process of analyzing the cost requirements for building structure planning in research, the costs analyzed at this stage are construction preparation costs such as mobilization of tools and materials and preparation of project areas, foundation structure costs, beam, column and structural costs. slab which the three elements take into account the costs for ironing, casting, and formwork costs. So that the cost required for the construction of this building structure is Rp. 26,712,000,000 and for the cost of the structure for each square meter is Rp. 4,345,716.85.

Table 15. Recapitulation of Structure Cost Budget Plan

RECAPITULATION OF BUDGET PLAN COST				
NO.	WORK DESCRIPTION	SUM		WEIGHTS (%)
1	2	3		4
A.	PREPARATION WORK	Rp.	291.590.252	0,012
B.	PILE FOUNDATION WORK			
	Mobilization and Demobilization of pile Tools	Rp.	40.000.000	0,002
	Stake Material 40cmx40cm	Rp.	1.976.000.000	0,081
	Joint and Welding	Rp.	59.280.000	0,002
	Wage stagnation	Rp.	58.800.000	0,002
	Pilecap concrete casting Work	Rp.	120.740.067	0,005
C.	FLOOR STRUCTURE WORK			
1.	BASE			
	Column Work	Rp.	280.042.866	0,012
	Sloof Work	Rp.	580.419.709	0,024
2.	1ND FLOOR			
	Column Work	Rp.	937.284.831	0,039
	Beam Work	Rp.	1.192.992.967	0,049
	Slab Work	Rp.	3.058.769.872	0,126
3.	2RD FLOOR			
	Column Work	Rp.	824.106.891	0,034
	Beam Work	Rp.	1.192.992.967	0,049
	Slab Work	Rp.	3.046.796.706	0,126
4.	3TH FLOOR			
	Column Work	Rp.	824.106.891	0,034
	Beam Work	Rp.	895.097.059	0,037
	Slab Work	Rp.	2.149.633.269	0,089
5.	4TH FLOOR			
	Column Work	Rp.	343.018.079	0,014
	Beam Work	Rp.	895.097.059	0,037
	Slab Work	Rp.	2.149.633.269	0,089
6.	ROOF FLOOR			
	Column Work	Rp.	1.243.771.153	0,051
	Beam Work	Rp.	605.451.605	0,025
	Slab Work	Rp.	1.371.605.456	0,057
7.	ELEVATOR FOOR FLOOR			
	Beam Work	Rp.	46.599.267	0,002
	Slab Work	Rp.	65.314.546	0,003
	SUM (A)	**Rp.**	**24.249.144.778**	1
	PPN 10% x (A)	Rp.	2.424.914.478	
	SUM (A + PPN) = B	Rp.	26.674.059.256	
	IMB = 1*1*1,1*1*1,2*1,2((1/1000)*(A))	Rp.	38.410.645	
	TOTAL BUDGET AMOUNT	**Rp.**	**26.712.469.901**	
	ROUNDED CORNERS RIGHT	**Rp.**	**26.712.400.000**	

5. CONCLUSION

Research on planning for the construction of a 4-storey hotel building that refers to several standards including SNI 2847-2019, SNI 1727-2020, SNI 1726-2019, PPURG 1978, produces output dimensions

P-ISSN : 2598-1277
E-ISSN : 2621-3966

of the structure as well as reinforcement plans that have been declared to meet the minimum standards and are also resistant to loads. earthquake, the output dimensions of the structure include :

a. Column Structure Output :
   1) Column Type 1 (Dimension: 600 x 600 mm Longitudinal Rebar : 14 D22 Transversal Rebar : Ø10 - 200)
   2) Column Type 2 (Dimension: 500 x 500 mm Longitudinal Rebar : 8 D2 Transversal Rebar : Ø10 – 200)
   3) Column Type 3 (Dimension: 450 x 450 mm Longitudinal Rebar : 6 D22 Transversal Rebar : Ø10 – 150)
   4) Column Type 4 (Dimension : 400 x 400 mmLongitudinal Rebar : 6 D22 Transversal Rebar : Ø10 – 150)
b. Beam Structure Output :
   1) Beam Type 1 (Dimension : 450 x 350 mm Length : 5000 mm ; Support Rebar Top : 5 D16 Bottom : 3 D16 ; Field Rebar Top : 3 D16 Bottom : 4 D16 ; Transversal Rebar : Ø10 – 150)
   2) Beam Type 2 (Dimension : 400 x 350 mm Length : 4000 mm ; Support Rebar Top : 3 D16 Bottom : 2 D16 ; Field Rebar Top : 2 D16 Bottom : 2 D16 ; Transversal Rebar : Ø10 – 150)
   3) Beam Type 3 (Dimension : 300 x 250 mm Length : 3000 mm ; Support Rebar Top : 3 D16 Bottom : 2 D16 ; Field Rebar Top : 2 D16 Bottom : 2 D16 ; Transversal Rebar : Ø10 – 150)
   4) Beam Type 4 (Dimension : 600 x 400 mm Length : 7000 mm ; Support Rebar Top : 4 D22 Bottom : 2 D22 ; Field Rebar Top : 2 D22 Bottom : 4 D22 ; Transversal Rebar : Ø10 – 150)
c. Slab Structure Output :
   1) Slab Type 1 (Dimension : 5000 x 4000 mm Thickness : 150 mm ; X Direction Rebar Field : Ø10 – 175 Support : Ø10 – 175 ; Y Direction Rebar Field : Ø10 – 200 Support : Ø10 – 200)
   2) Slab Type 2 (Dimension : 5000 x 3000 mm Thickness : 150 mm ; X Direction Rebar Field : Ø10 – 175 Support : Ø10 – 175 ; Y Direction Rebar Field : Ø10 – 200 Support : Ø10 – 200)
   3) Slab Type 3 (Dimension : 5000 x 5000 mm Thickness : 150 mm ; X Direction Rebar Field : Ø10 – 175 Support : Ø10 – 175 ; Y Direction Rebar Field : Ø10 – 200 Support : Ø10 – 200)
   4) Slab Type 4 (Dimension : 5000 x 7000 mm Thickness : 150 mm ; X Direction Rebar Field : Ø10 – 175 Support : Ø10 – 175 ; Y Direction Rebar Field : Ø10 – 200 Support : Ø10 – 125)
d. Fondation Structure Output :
   1) Fondation Type 1 (Pilecap Dim. : 2000 x 2000 x 800 mm ; Number of Pile: 4 Pieces ; X Direction Rebar : D22 - 150 ; Y Direction Rebar : D22 – 150)
   2) Fondation Type 2 (Pilecap Dim. : 1900 x 1500 x 800 mm ; Number of Pile: 2 Pieces ; X Direction Rebar : D22 - 150 ; Y Direction Rebar : D22 – 150)
   3) Fondation Type 3 (Pilecap Dim. : 1850 x 1450 x 800 mm ; Number of Pile: 2 Pieces ; X Direction Rebar : D22 - 150 ; Y Direction Rebar : D22 – 150)
e. Budget Stucture Plan : From the results of the analysis of the cost plan for the construction of the 4th floor hotel building structure, the costs incurred for the construction of the building structure required a cost of Rp. 26,712,400,000, and the construction cost on square meter of the building structure is Rp. 4,345,716.85. The cost of this amount is used for the construction of superstructures such as columns, beams, slabs and the construction of substructures such as foundations. These costs are obtained based on an analysis of calculations including the volume of concrete, the volume of steel reinforcement and also the volume of formwork.

REFERENCES

[1] N. C. Idham, “Earthquake Disaster Mitigation in the Building Industry,” J. Archit. Res. Des. Stud., vol. 4, no. 2, 2020, doi: 10.20885/jars.vol4.iss2.art11.
[2] W. N. Salim dan C. M. Sujana, “Project delay analysis of highrise building project in Jakarta,” in IOP Conference Series: Earth and Environmental Science, 2020, vol. 426, no. 1. doi: 10.1088/1755-1315/426/1/012051.
[3] T. Rahayu, “PERENCANAAN STRUKTUR GEDUNG PERKANTORAN 7 LANTAI,” J. MOMEN Tek. SIPIL, vol. 4, no. 01, 2021, doi: 10.35194/momen.v4i01.1564.

P-ISSN : 2598-1277
E-ISSN : 2621-3966

[4] A. Almufid dan S. Hidayah, "Perencanaan Struktur Atas Gedung Hunian 12 Lantai Menggunakan Srmpk," J. Tek., vol. 8, no. 2, Mar 2019, doi: 10.31000/jt.v8i2.2229.

[5] A. P. Nurjaman, "PERENCANAAN STRUKTUR BETON BERTULANG BANGUNAN GEDUNG EKON 3 LANTAI DI KOTA WAISAI," J. Tek. Sipil Ranc. Bangun, vol. 2, no. 2, 2019, doi: 10.33506/rb.v2i2.480.

[6] Z. A. Jauhari, Armada, F. Ananda, dan R. A. Fitrah, "Comparison of the design acceleration response spectra in Riau Province between SNI 1726:2019 and SNI 1726:2012 methods," in IOP Conference Series: Earth and Environmental Science, 2021, vol. 708, no. 1. doi: 10.1088/1755-1315/708/1/012009.

[7] H. Medriosa dan F. A. Akbar, "ANALISIS STRUKTUR GEDUNG IRNA (INSTALASI RAWAT INAP) RUMAH SAKIT UMUM PASAMAN BARAT MENGGUNAKAN SNI BETON BERTULANG 2847:2019 DAN SNI GEMPA 1726:2019," Ensiklopedia J., vol. 3, no. 4, 2021, doi: 10.33559/eoj.v3i4.796.

[8] B. Doloksaribu dan D. S. Nababan, "PEMETAAN DAYA DUKUNG TANAH DAN PEMILIHAN JENIS FONDASI KONSTRUKSI BANGUNAN DI DISTRIK MERAUKE," MUSTEK ANIM HA, vol. 7, no. 3, 2018, doi: 10.35724/mustek.v7i3.1733.

[9] S. Farlianti dan S. Sapta, "PERHITUNGAN RESPON SPEKTRA PERCEPATAN GEMPA DESAIN KOTA PALEMBANG BERDASARKAN SNI 1726;2019 DENGAN CARA MANUAL DAN MENGGUNAKAN APLIKASI ONLINE SPEKTRUM RESPONS DESAIN INDONESIA 2019 (http://rsapuskim2019.litbang.pu.go.id)," Tek. J. Tek., vol. 7, no. 1, 2020, doi: 10.35449/teknika.v7i1.135.

[10] P. Y. Putri dan Candra, "Assessment of the structure of public elementary school 28 Air Tawar Timur Padang," in IOP Conference Series: Earth and Environmental Science, 2021, vol. 871, no. 1. doi: 10.1088/1755-1315/871/1/012012.

[11] W. T. Nugraha, "PERENCANAAN STRUKTUR GEDUNG HOTEL 5 LANTAI DKOTA BALIKPAPAN," J. MOMEN Tek. SIPIL, vol. 4, no. 2, 2021, doi: 10.35194/momen.v4i2.1908.