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Planning of Development Upper Structure of the Rorotan Labor Intensive Flats North Jakarta

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ABSTRACT

The planning for this 16-storey building is a re-planning of the construction project for the Padat Karya Flats located in Rorotan, North Jakarta. This building planning is carried out based on the procedure for calculating concrete structures for buildings (SNI 2847:2019). The data for this building plan was obtained from the architect planning the construction of the Rorotan Solid Work Flats. The design of the superstructure includes the planning of slab, beam and column elements; The scope of the discussion includes calculation of loading, calculation of initial dimensions, ETABS analysis, control of analysis results, final dimension design and reinforcement, design drawings. The material used is reinforced concrete with a concrete quality of fc'35 Mpa fc'40 Mpa and fy 420 Mpa. The basics of planning refer to SNI 2847:2019 Procedures for Planning Concrete Structures for Buildings. And SNI 1726:2019 Earthquake Resistance Planning for Building Structures. Structural analysis using ETABS program with dynamic analysis of Response Spectrum.The keyword Multi-storey building, planning, superstructure, slab, column, beam.

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1. INTRODUCTION

Flats are multi-storey buildings that are built in an environment that is divided into functionally structured parts in both horizontal and vertical directions and are units, each of which is used separately [1]. Efforts are being made so that some Indonesians, especially those in DKI Jakarta, can live in decent and affordable houses.

Indonesia began to recognize flats around the 1970s. Flats were introduced in the 1800s by the government, as housing for low-income Civil Servants and to overcome the increasingly crowded and slum areas of public housing [1][2].

Lately, physical development in big cities is being encouraged by the government. Especially in Jakarta, the construction of flats is carried out in various places. To produce a quality building required structural planning with security requirements [3]. In planning a building, the structural designer design of structure is an important initial part of determining the strength or serviceability of a building [4]. With the planning of this building structure, it is expected that the resulting building will be able to carry the load or the forces that work during the period of use of the building so that the design of the superstructure must meet the criteria of strength, serviceability, safety, and economy. and the design life of the building durability [5][6].

Regarding the new building, the Rorotan Intensive Work Condominium, which consists of a 16-story building [7]. Because the building is located in the city Jakarta, with strong seismic effects and carrying heavy loads, the structural system of the building is planned to use a rigid frame structure system consisting of

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columns, beams, and plates, shear walls the structural system consists of columns, beams, plates and shears. walls of reinforced concrete [8][9][10]. Structural columns and beams vary depending on the length of the span and the magnitude of the load to be supported [11][12]. The foundation of the building uses a bored pile foundation [13][14]. From the results of geotechnical calculations, it is found that the permissible bearing capacity must be able to withstand the load of the structure.

2. METHOD

Construction of a labor-intensive flat "Building work" is located in Rorotan Village, Cilincing, District, North Jakarta

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2.1. Primary Data

Primary data is data obtained from direct observations and research in the development area and around the construction site. These data include:

Project working drawing

Project location point

Bulding Data

Figure1. Project Location

2.2. Secondary Data

He data collection process required for building structural planning are Literature studies or reference materials used in the completion of this thesis include [15][16][17][18]:

- SNI 2847:2019, Requirements for Structural Concrete for Buildings
- SNI 1727:2020 Minimum Load for Planning of Buildings and Other Structures
- SNI 1726-2019, Procedures for Planning Earthquake Resistance for Buildings
- SNI 2052-2017 Regarding Concrete Reinforcement Steel.

General data:

The project data for the Rorotan Flats Building Construction are as follows:

- Project Name : Construction of Labor-Intensive Building Works
- Project Location : Rorotan – North Jakarta
- Project Owner : DKI Jakarta Provincial Government Department of Public Housing and Regions Settlers
- Contract Value (Include VAT) : Rp. 177,000,000,000,-

- Scope of Work : Preparation, Lower Structure, Upper Structure, Roof Structure, Finishing
- Number of floors : 16 floors

Technical Data
The technical specifications of the structural work on this project are as follows:

- 16 storey building : Residential
- Building area : 22.865 m2
- Superstructure : reinforced concrete
- roof structure : reinforced concrete
- Finishing : ACP Wall Curtain Wall

The quality of the material used in the structural calculation is :
Concrete quality of slab, column and slab foundation f'c. 35 Mpa and f'c. 40 Mpa and Quality of the stirrup base reinforcement fy. 525 MPa

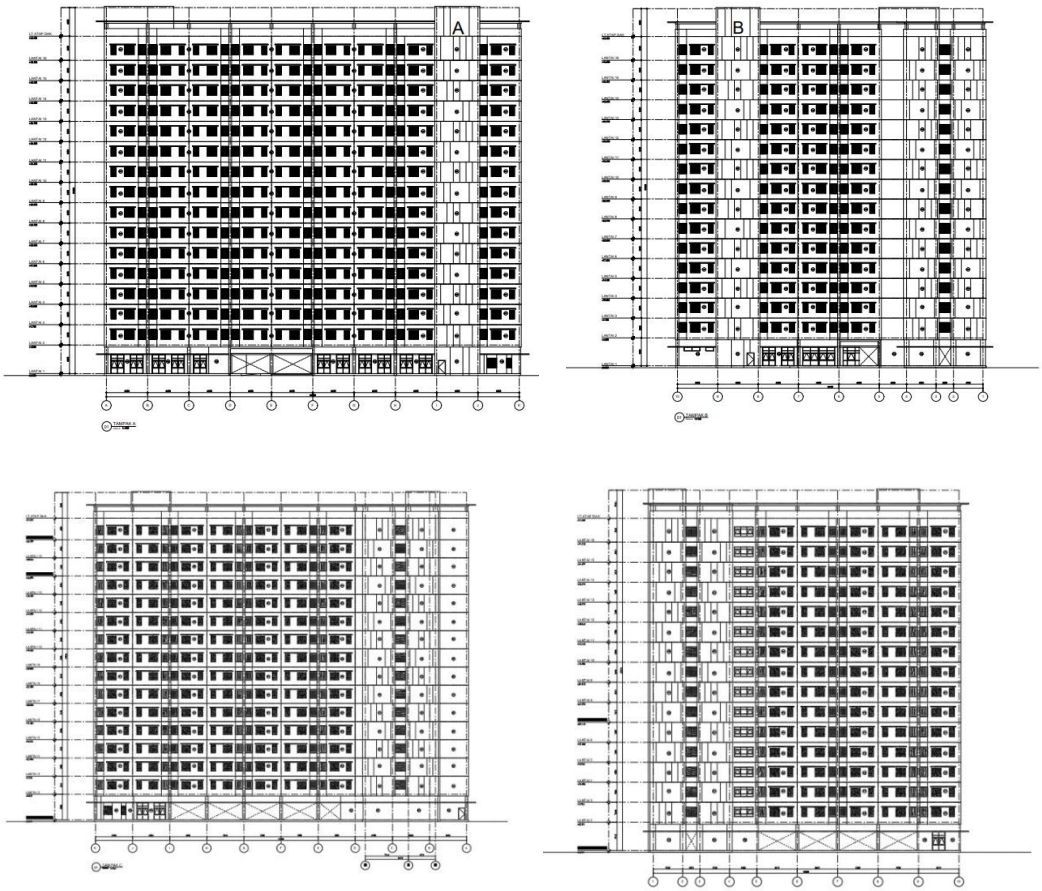

Figure 2. Side view

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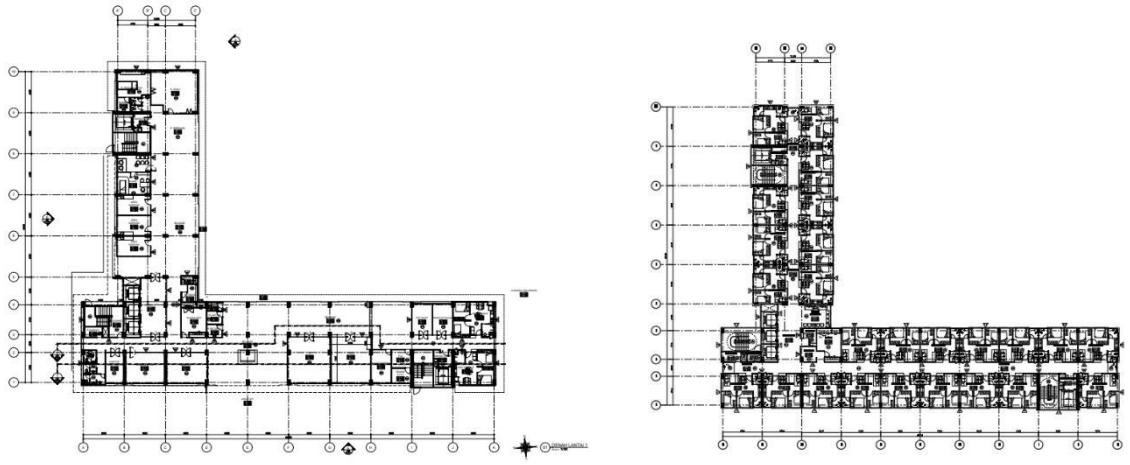
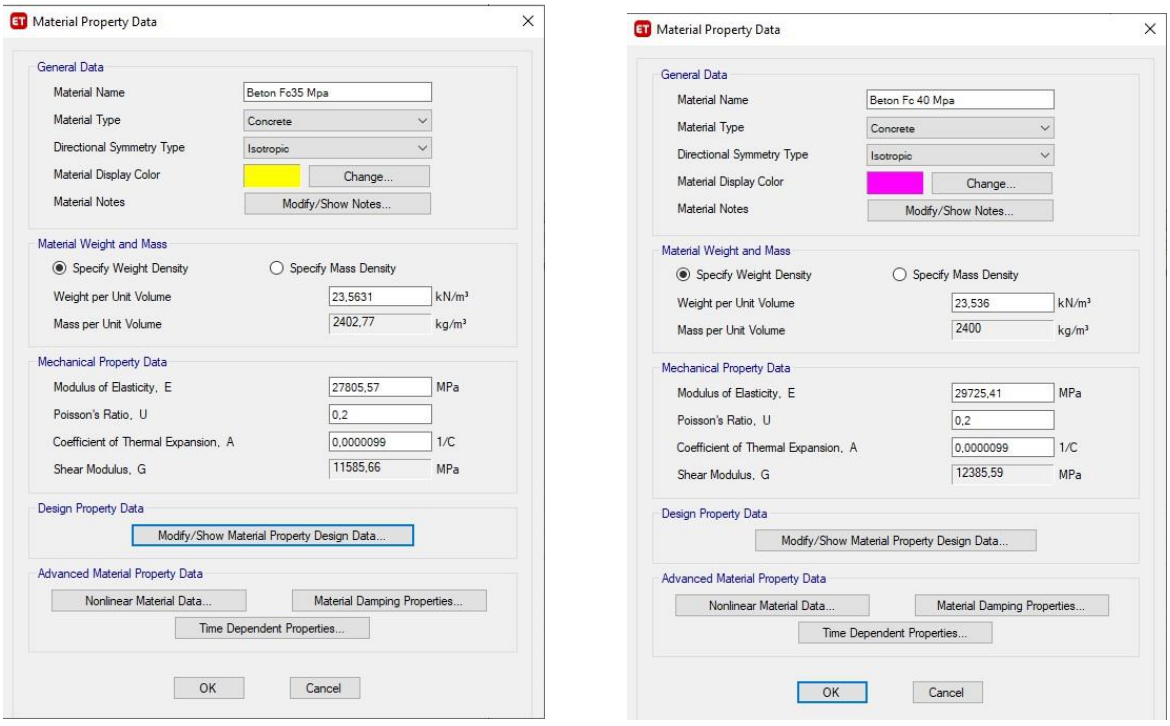


Figure 3. First floor plan and Second Floor Plan to Floor 16 (typical)

3. RESULTS AND DISCUSSION

3.1. Structure Modeling

Input material data based on the planned concrete quality, namely fc' 35 Mpa and 40 Mpa, for steel reinforms BJTS B and BJTS stirrups.



(a) (b)

Figure 4. Input concrete quality data (a) Fc 35 MPa (b) Fc 40 Mpa

3.2. Burden

1. Dead Load

a.	Reinforced concrete	: 2400kg/m3
b.	Ordinary concrete	: 2200kg/m3

2. Building Compenents

a.	Wall brick	: 250kg/m3
b.	Ceilling And Hangers: 28kg/m3	
c.	Tile (24 kg/m2 + Specs (21 kg/m2)	: 45kg/m2
d.	Partition	:72kg/m2
e.	Plumbing	: 10kg/m2
f.	Sanitation	: 20kg/m2

3.3. Live Load

According to SNI 1727:2020 Minimum design load and related criteria for buildings and other structures.

3.3.1. Subsub section 1

In determining the KDS, it is necessary to know the value of the acceleration of the short spectrum response (Ss) and the value of the acceleration of the response spectrum of 1 second (S1). The values of Ss and S1 can be seen on the spectrum response map of SNI 1726:2019. However, to get more accurate Ss and S1 scores, the author uses the Spectra Indonesia Design assistance program which can be accessed on the website http://rsa.ciptakarya.pu.go.id/2021/

The results obtained are: Latitude	= -7.6663
Longitude	= 114.0419
Ss	= 0.658885
S1	= 0.291585

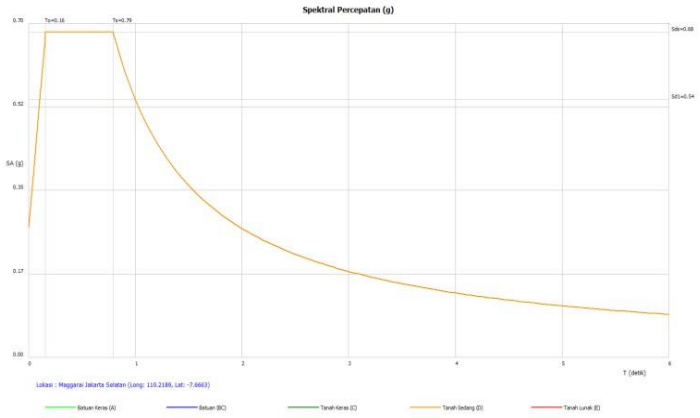


Figure 5. Graph of Medium Soil Spectrum Respons

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3.3.2. Structural Analysis

Structural Analysis is carried out after entering all dead loads, live loads, earthquake loads, and load combination based on SNI 1726:2019, so the structural analysis is obtained as follows:

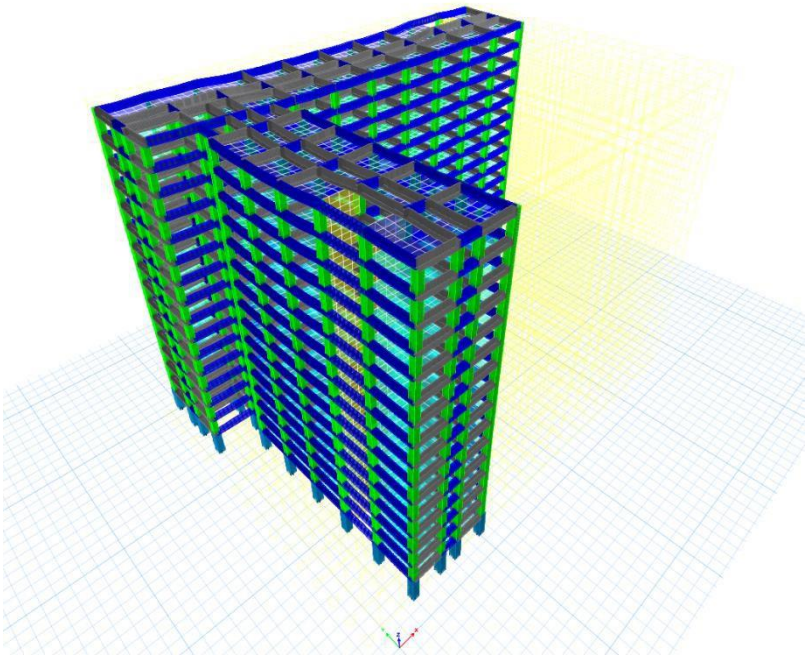


Figure 6. Modeling after Run Analysis

3.3.3. Moments and Forces on Beams 600 x 1000

Moments and forces acting on each beam, namely there is a positive design moment due to factored load (Mu+), negative design moment due to factored load (Mu-), and design shear force due to factored load (Vu).

Table 1 Recap of moments and forces on the beam 600 x 1000

Block Plan Shear Moments and Forces 600x1000		
Mu^+	723.2993	kN-m
Mu^-	-817.9377	kN-m
Vu	822.5841	kN

Support Reinforcement:

- Reinforcement Ratio Required : 0.0048
- Minimum reinforcement ratio : 0.0035
- Reinforced area required : 2703 mm2
- Required amount of : 5D29

reinforcement Field Reinforcement:

- Reinforcement ratio required : 0.0043
- Minimum reinforcement ratio : 0.0035
- Reinforcement ratio required : 0.0035
- Area of reinforcement used : 1970 mm
- Required amount of reinforcement : 40D29

3.3.4. Moments and Forces on Columns 800 x 800

Table 2 Recap of moments and forces on column

ColumnPlanMomentsandStyles 800x800		
Pu	10193.3025	kN
Mu	634.1586	kN-m
Vu	568.6108	kN

3.3.5. Preliminary Design Floor Plate

Structure Material Data

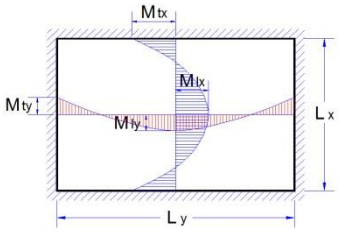
Concrete compressive strength fc = 35 MPa
Yield stress of steel for flexural fy = 420 Mpa

Reinforcement b. Floor Plate Data

Length of directional plate span x Lx = 4750 mm
Length of span of y Ly direction plat = 6500 mm
Floor plate thickness h = 200 mm

Floor plate moxent coefficient:

Ly / Lx (6500 / 4750) = 0,73 (Coefficient of Plate Moment)



Bidirectional Because Ly/Lx < 2

Field x Clx : 52
Field y Cly : 21
Support x Cty : 21
Support y Cty : 52

Diameter of reinforcement used Ø = 25 mm
Net thickness of concrete blanket ts = 20 mm

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4. CONCLUSION

Based on the results of the Planning of Development Upper Structure of the Rorotan Labor Intensive Flats North Jakarta, based on SNI 1726: 2019, SNI 1727: 2020 SNI 2052: 2017 and SNI 2847: 2019 using the Etabs V- 18 program and structural components designed on beams, columns, and plates, then concluded as follows:

On beam 1 with dimensions of 600 x 1000

- Positive design moment due to factored load Mu+ = 723.2993kNm
- Negative design moment due to factored load Mu- = 817.9377 kNm
- Design shear force due to factored load Vu = 822.5841 kN

Support Reinforcement:

- Reinforcement Ratio Required = 0.0048
- Minimum reinforcement ratio = 0.0035
- Reinforced area required = 2703mm^2
- Reinforced area required = 5D29

Field Reinforcement:

- Reinforcement ratio required = 0.0043
- Minimumreinforcementratio = 0.0035
- Reinforcementratiorequired = 0.0035

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