INFRASTRUCTURE PLANNING FINAL REPORT: TRANSPORTATION, BUILDING STRUCTURE, WATER STRUCTURE AND CONSTRUCTION MANAGEMENT (CASE STUDY: DESIGN OF 4-STORY BUILDING IN YOGYAKARTA)

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ABSTRAK

INFRASTRUCTURE PLANNING FINAL REPORT: TRANSPORTATION, BUILDING STRUCTURE, WATER STRUCTURE AND CONSTRUCTION MANAGEMENT (CASE STUDY: DESIGN OF 4-STORY BUILDING IN YOGYAKARTA), Timotius Aditya Reynaldi Susanto, NPM 171316764, Tahun 2021, Program Teknik Sipil Internasional, Fakultas Teknik, Universitas Atma Jaya Yogyakarta.

Tujuan dari Laporan Akhir ini adalah untuk merangkum dan menguasai 4 bidang teknik sipil, perancangan bangunan dan struktur, perancangan jalan, perancangan hidrolik dan manajemen biaya dan waktu. Perancangan bangunan dan struktur mengharuskan untuk merancang bangunan 4 lantai di Yogyakarta. Perancangan jalan mengharuskan untuk merancang sebuah jalan untuk menghubungkan rute dari titik A ke titik B memakai peta dan data yang disediakan. Perancangan hidrolik mengharuskan untuk merancang ulang weir Kamijoro yang terletak di sungai Progo, Yogyakarta. Manajemen biaya dan waktu mengharuskan untuk menghitung volume kerja, biaya proyek dan durasinya dengan memakai gambar arsitektur rumah Bpk. Gabor Laksamada yang disediakan oleh ACW group.
Perancangan jalan dan bangunan banyak memakai metode yang sudah terlampirkan di literatur untuk membuat rancangan yang mengikuti standar SNI, lulus pengecekan keamanan dan efisien/ekonomis. Perancangan hidrolik mengharuskan pengumpulan data dari institut cuaca dan meteorologi (BMKG) untuk memulai proses perancangan. Lalu, rancangannya mengikuti manual SNI agar bisa memenuhi standar keamanan. Manajemen biaya dan waktu mengharuskan untuk menghitung volume kerja untuk membangun rumah bpk. Laksamada dan menentukan durasi proyek dan harganya dari volume kerja.
Hasil dari perancangan struktur bangunan menunjukkan bahwa profil gording C125*50*20*2.3, profil truss 2L*70*70*6, tulangan “lapangan” tangga bawah D13-50/P10-200, tulangan “pendukung” D13-200/P10-200, tulangan “lapangan” tangga atas D13-200/P10-200, tulangan “pendukung” D13-500/P10-200, tulangan bordes D13-500/P10-200. Memerlukan 5 tipe slab (3 dua arah, 2 satu arah) dengan tulangan P10-250. 5 tipe balok sekunder, 2 tipe balok primer, kolom dengan tulangan 24D19/2P10-200 dan 2 tipe pondasi. Hasil perancangan jalan menunjukkan bahwa rancangan memerlukan 5 kurva untuk rutenya (4 full circle dan 1 spiral-circle-spiral), 3 kurva memuncak dan 2 kurva melengkung, volume fill 323929.0839 m^3, volume cut 197636.3704 m^3. Hasil desain hidrolik menunjukkan bahwa rancangan weir memiliki puncak mercu bulat, panjang 95.681484 m, elevasi 25.2, 3 pintu pembilas, 3 pilar dengan kolam olak USBR tipe IV. Hasil manajemen biaya dan waktu menunjukkan bahwa proyek rumah akan berdurasi 91 hari dan harga per m^2 adalah Rp. 5.199.907.32/m^2.
Keyword: Struktur, weir, jalan, biaya, management

ABSTRACT

INFRASTRUCTURE PLANNING FINAL REPORT: TRANSPORTATION, BUILDING STRUCTURE, WATER STRUCTURE AND CONSTRUCTION MANAGEMENT (CASE STUDY: DESIGN OF 4-STORY BUILDING IN YOGYAKARTA), Timotius Aditya Reynaldi Susanto, Student Number 171316764, Year 2021, International Civil Engineering Program, Faculty of Engineering, Universitas Atma Jaya Yogyakarta.

Aim of this Final Report is to summarize and study four major fields of civil engineering, building and structure design, road design, hydraulic design and Cost and time management. Building and structure design require designing a 4-story office building in Yogyakarta. Road design require designing a road connecting point A to B using provided maps and initial data. Hydraulic structure design require redesigning Kamijoro Weir located at the Progo river, Yogyakarta. Cost and time management require estimating work volume, project costs and duration using provided architecture drawing of Mr. Gabor Laksamada's house by ACW group.

Road and building design primarily use existing methods from established literature to create a design that follows SNI standards, pass safety checks and is efficient/economical. Hydraulic design method first requires data collection from weather and meteorological institute (BMKG) to acquire necessary data to begin designing. Then it follows pre-existing SNI guidelines to design the hydraulic structure that meets safety standards. Cost and time management requires calculating work volume needed to build Mr. Laksamada's house and determine the project duration and costs by its work volume.

Results of the building structure design shows that the building will have purlin profile of C125*50*20*2.3, roof truss profile 2L*70*70*, bottom stairs field reinforcement D13-50/P10-200, support reinforcement D13-200/P10-200, top stairs field reinforcement D13-200/P10-200, support reinforcement D13-500/P10-200, bordes reinforcement D13-500/P10-200. 5 types of slabs are acquired (3 two directions and 2 one direction plate) with reinforcement P10-250. 5 types of secondary beams, 2 types of primary beams, column with reinforcements 24D19/2P10-200 and 2 types of foundations. Road design results shows that 5 curves are needed for the route (4 full circle and 1 spiral-circle-spiral), 3 cresting curve and 2 sagging curves, fill volume is 323929.0839 m^3, cut volume is 197636.3704 m^3. Hydraulic design results shows that the weir have a rounded top, 95.681484 m long, 25.2 m elevation, with 3 flushing doors, 3 pillars with stilling basin USBR type IV. Cost and time management results show that house project will have 91 days duration and cost per m^2 is Rp. 5.199.907.32.

Keywords: Structure, weir, road, cost, management

STATEMENT PAGE

I, one whom sign below,

Student Name : Timotius Aditya Reynaldi Susanto

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Declare in earnest that the Final Assignment Report with the title:

"INFRASTRUCTURE PLANNING FINAL REPORT: TRANSPORTATION, BUILDING STRUCTURE, WATER STRUCTURE AND CONSTRUCTION MANAGEMENT (CASE STUDY: DESIGN OF 4-STORY BUILDING IN YOGYAKARTA)"

Is for certain a result of my own work and not a result of plagiarism. All ideas, data, planning result, quotes, either direct or indirectly sourced from other writings or ideas, are stated and included in writing within this Final Assignment Report. If in the future this report was proven to be a result of plagiarism, then the diploma I received will be declared illegitimate and will be returned to the chancellor of Universitas Atma Jaya Yogyakarta.

Yogyakarta, October 13th 2021

(Timotius Aditya Reynaldi Susanto)

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Final Project Report

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PREFACE

Praise upon God and His generous blessings, for with His help the report have been finished on time and without encountering any major problems. As the first report of its kind to become a requirement for a civil engineering bachelors degree, it gave Author new learning experiences as well as further improving further civil engineering knowledge from Author's study in Universitas Atma Jaya Yogyakarta. As this report with the title "Infrastructure Planning Final Report: Transportation, Building Structure, Water Structure and Construction Management" is completed, Author would like to extend his deepest gratitude to the following parties for their invaluable role in helping Author finish this report:

1. Ir. A.Y. Harijanto S., M.Eng., Ph.D. as head of civil engineering program
2. J. Dwijoko Ansusanto, Ir., M.T., Dr., as the supervisor of my final report, who's guidance has helped author overcome problems and finish the final report without any major issues
3. Author's close friends and family members that gave invaluable moral support during the making of this final report
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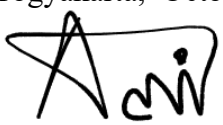
This report isn't perfect, there may be mistakes that escape Author's judgments, creating room for further improvements. Any constructive criticism will be very welcome to help improve this report or any future ones. Author hopes this report will be as beneficial to Author as it is to the readers. Thank you.

Yogyakarta, October 2021



(Timotius Aditya Reynaldi Susanto)

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LIST OF ABBREVIATION

Symbol	Meaning	Appear first at page
m (m)	Length of angled roof	7
n (m)	Length of angled terrace	7
ql (KN)	Sum of dead load	7
qd (KN)	Sum of live load	7
qw (KN)	Sum of wind load	7
α	Wind coefficient	7
Md (KNm)	Dead load moment	8
Ml (KNm)	Live load moment	8
Mw (KNm)	Wind load moment	8
Mu (KNm)	Moment ultimate	8
Fy (Mpa)	Yield strength	8
a	Centroid	8
A	Area	8
Z	Plastic section modulus	8
λ	Thickness ratio	8
λ_p	Boundary for compact profile	8
E (MPa)	Young modulus	8
l_p (mm)	Maximum unbraced length	8
l_b (mm)	Maximum unbraced	8

	length of compression flange.	
DL (KN)	Short for dead load	9
LL (KN)	Short for live load	9
WR (KN)	Short for wind resistance	9
l_r (mm)	Limiting laterally unbraced length for the limit state	9
rts	Radius of gyration	9
Cw	Warping constant	9
I (mm^4)	Moment inertia	9
C	Modifying factor for lateral torsional buckling if the profile is canal	9
h (m)	Height or depth	9
C_b	Bracing coefficient	9
M_n (KNm)	Nominal flex strength with steel reinforcement at yield stress, concrete at design strength (Reinforced concrete design)	9
M_p (KNm)	Plastic moment	9
L (m)	Length of member	10
r	Radius of gyration	10

F_u (Mpa)	Ultimate stress	10
A_g (mm^2)	Gross area	10
e (m)	Welding length	10
A_e (mm^2)	Effective net area	10
ϕ	Resistance factor	10
R_n (Kips)	Failure strength	10
P_u (KN)	Load acting for tension member/Shear force ultimate	10
K	Effective length coefficient	10
F_e (MPa)	Euler buckling stress	10
F_{cr} (MPa)	Buckling stress	10
S (mm)	Minimum spacing	11
l_e (mm)	Minimum distance from edge to nearest bolt	11
O_p (mm)	Step height	12
A_n (mm)	Step length	12
t^1 (mm)	Midpoint height relative to the stair slope	12
tt (mm)	Stair plate thickness	12
A_s (m^2)	Area for steel reinforcement	13
b_w (mm)	Width of web for concrete	13

	T beam cross section	
S (mm)	Spacing between reinforcements	13
V_c (KN)	Shear force capacity	13
V_s (KN)	Shear force capacity for shear stirrups	13
V_w (KN)	Shear force capacity for web	13
f_c (MPa)	Compressive stress	13
d (m)	Effective depth from top of reinforced concrete beam to centroid of tensile steel	13
W_u (KN)	Loading of the slab	14
α	Depth of effective compression	14
αf_m	Average α from every side	14
l_x (m)	Span at x axis	14
l_y (m)	Span at y axis	14
M_u (KNm)	Maximum moment from factored loads	14
b (m)	Width (cross section)	15
f_y (MPa)	Yield stress or strength	15
ρ	Reinforcement ratio for	15

	concrete design	
x (m)	Horizontal distance	15
f'_c (MPa)	Concrete design compressive stress	15
d' (mm)	Effective depth from top of reinforced concrete beam to centroid of compression steel	15
B_e (mm)	Effective width of flange of a concrete T beam cross section	16
y (mm)	Vertical distance	16
q	Probable moment strength divided by compression in concrete	16
σ (MPa)	Stress	16
c (mm)	Distance from the top to neutral axis of concrete beam	17
β	Coefficient to determine stress block height	17
R	Minimum radius/corner	19
c	superelevation	19
V (Km/h)	Velocity (road design)	19
e	Rate of superelevation (road design)	19

$D(^{o})$	Degree of curve (road design)	19
Ls (m)	Minimum length of runoff spiral curve	19
$\theta_s(^{0})$	Spiral angle/relative slope	19
k^{o}	Abcissa	21
p^{o}	Ordinate	21
L_v (m)	Curve length	21
A	Slope difference	21
E_v	Vertical shifting	21
S (m)	Stopping visibility distance (road design)	21