

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

**By:**

**TIMOTIUS ADITYA REYNALDI SUSANTO**

**NPM: 171316764**



**INTERNATIONAL CIVIL ENGINEERING PROGRAM  
ENGINEERING FACULTY  
UNIVERSITAS ATMA JAYA 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 hidrolis 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 hidrolis 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 hidrolis 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 rutennya (4 full circle dan 1 spiral-circle-spiral), 3 kurva memuncak dan 2 kurva melengkung, volume fill 323929.0839 m<sup>3</sup>, volume cut 197636.3704 m<sup>3</sup>. Hasil desain hidrolis 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<sup>2</sup> adalah Rp. 5.199.907.32/m<sup>2</sup>.

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<sup>3</sup>, cut volume is 197636.3704 m<sup>3</sup>. 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<sup>2</sup> 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

Student Number : 171316764

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(Timotius Aditya Reynaldi Susanto)

# VALIDATION SHEET

Final Project Report

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

By :  
TIMOTIUS ADITYA REYNALDI SUSANTO  
NPM. 171316764

Approved by:  
Supervisor  
Yogyakarta, October 2021



*(Handwritten signature)*  
(J. Dwijoko Anusanto, Ir., M.T., Dr.)

Validated by  
Head of Civil Engineering Study Program



(Ir. A.Y. Harijanto S., M.Eng., Ph.D.)

# VALIDATION SHEET

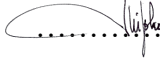

Final Project Report

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By:  
TIMOTIUS ADITYA REYNALDI SUSANTO  
NPM. 171316764

Has been tested and approved by

Name	Signature	Date
Supervisor : J. Dwijoko Anusanto, Ir., M.T., Dr.		24/10/2021 .....
Member : Dinar Gumilang Jati S.T., M.Eng.		25/10/2021 .....

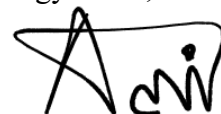
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This report isn't perfect, there may be mistakes that escape Author's judgments, creating room for further improvements. Any constructive criticism will be very welcome to help improve this report or any future ones. Author hopes this report will be 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
$\alpha$	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
$\lambda$	Thickness ratio	8
$\lambda_p$	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
$r_{ts}$	Radius of gyration	9
$C_w$	Warping constant	9
$I$ (mm <sup>4</sup> )	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 <sup>2</sup> )	Gross area	10
$e$ (m)	Welding length	10
$A_e$ (mm <sup>2</sup> )	Effective net area	10
$\phi$	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 <sup>2</sup> )	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
$\alpha$	Depth of effective compression	14
$\alpha_f$	Average $\alpha$ 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
$\rho$	Reinforcement ratio for	15

	concrete design	
$x$ (m)	Horizontal distance	15
$f_c^t$ (MPa)	Concrete design compressive stress	15
$d^1$ (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
$\sigma$ (MPa)	Stress	16
$c$ (mm)	Distance from the top to neutral axis of concrete beam	17
$\beta$	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

$D(^{\circ})$	Degree of curve (road design)	19
$L_s$ (m)	Minimum length of runoff spiral curve	19
$\theta_s(^{\circ})$	Spiral angle/relative slope	19
$k^{\circ}$	Abcissa	21
$p^{\circ}$	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