DESIGN OF INTEGRATED PUBLIC BUS TERMINAL

A PROJECT REPORT

Submitted by

MURALI KRISHNA T.R
NANDU RAJEEV
RUBEENA P.R
SANDHRA M.S

in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

(Affiliated to Mahatma Gandhi University)

VIDYA NAGAR, PALISSERY, KARUKUTTY,

ERNAKULAM – 683 582

April 2018

SCMS School of Engineering and Technology, Karukutty

Department of Civil Engineering

April 2018

CERTIFICATE

This is to certify that this is a bonafide record of the project work titled "Design Of Integrated Public Bus Terminal" done by Murali Krishna T.R, Nandu Rajeev, Rubeena P.R and Sandhra M.S during the academic year 2017 – 2018 in partial fulfillment of the requirement for the award of Degree of Bachelor of Technology in Civil Engineering of Mahatma Gandhi University, Kottayam.

1/6/18

Y K Remya
Asst.Professor (Project Guide)
Dept. of Civil Engineering
SSET, Karukutty

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY KARUKUTTY ERNAKULAM 683 582

Dr. Anitha G.Pillai
Professor & Head
Dept. of Civil Engineering
SSET, Karukutty

natpac
CSTE-NATPAC

KSCSTE-NATIONAL TRANSPORTATION PLANNING AND RESEARCH CENTRE

(An Institution under Kerala State Council for Science, Technology & Environment)
SASTHRA BHAVAN, PATTOM PALACE P.O., THIRUVANANTHAPURAM – 695 004
Website: www.natpac.kerala.gov.in,E-mail: contactus.natpac@kerala.gov.in
Phone: 0471 –2548200, 2548209, 2548301 Fax: 0471 – 2543677

26-04- 2018

CERTIFICATE

This is to certify that **MURALI KRISHNA.T.R (Reg.No:1415500), NANDU RAJEEV (Reg.No:14015504), RUBEENA.P.R (Reg.No:14015522), SANDHRA.M.S (Reg.No:14015526)** of VIII Semester BTECH (Civil Engineering), from SCMS School of Engineering and Technology, Karukkutty, Ernakulam, Kerala has successfully completed their project work titled **"Design of Integrated Public Bus Terminal"** associating with the studies at National Transportation Planning and Research Centre (NATPAC), Thiruvananthapuram under the guidance of Smt. Salini P N, Scientist in Traffic and Transportation Division of NATPAC, from December 20th to April26th , as part of the curriculum.

Thiruvananthapuram
Pin: 695 004

Salini P N
Scientist

INTEGRATION OF BUS STANDS WITH METRO TO ENHANCE THE RIDERSHIP IN KOCHI

A PROJECT REPORT

Submitted by

NIKHILA ANN ANIL(SCM15CE076)

SHEETHAL SANTHOSH(SCM15CE093)

SHIVANI VINU(SCM15CE094)

SURYA HARILAL(SCM15CE104)

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Bachelor of Technology

in

Civil Engineering

Department of Civil Engineering

SCMS School of Engineering and Technology

Karukutty

MAY 2019

DEPARTMENT OF CIVIL ENGINEERING

SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY

KARUKUTTY

CERTIFICATE

This is to certify that the report entitled **'Integration of Bus Stands with Metro to Enhance Ridership in Kochi'** submitted by **'Nikhila Ann Anil, Sheethal Santhosh, Shivani Vinu, Surya Harilal'** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Civil Engineering is a bonafide record of the project work carried out by him under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor:
Mr. Deeraj A D

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 582

External Supervisor:
Salini P N
Scientist, NATPAC

Project Co-oridnater:
Mrs. Sanju Sreedharan

Head of Department:
Dr. Anitha G Pillai

natpac
KSCSTE-NATPAC

KSCSTE-NATIONAL TRANSPORTATION PLANNING AND RESEARCH CENTRE
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Phone: 0471 – 2548200, 2548209, 2548301 Fax: 0471 – 2543677

16-05-2019

CERTIFICATE

This is to certify that **NIKHILA ANN ANIL (Reg.No: SCM15CE076), SHEETHAL SANTHOSH (Reg. No: SCM15CE093), SHIVANI VINU (Reg. No: SCM15CE094), SURYA HARILAL (Reg. No: SCM15CE104)** students of 8th Semester BTech (Civil Engineering), from SCMS School of Engineering and Technology, Karukutty, Ernakulam, Kerala has successfully completed their project work titled **" Integration of Bus Stands with Metro to Enhance the Ridership in Kochi"** under the supervision of our scientists at Traffic and Transportation Division of this centre, from January 4th to May 16th 2019,as part of their curriculum.

Shaheem S
Head, Traffic and Transportation Division

KSCSTE-NATIONAL TRANSPORTATION PLANNING AND RESEARCH CENTRE ★ KSCSTE
THIRUVANANTHAPURAM
PIN-695004

REDEVELOPMENT PLAN FOR VALIYANGADI IN KOZHIKODE MUNCIPAL CORPORATION

A PROJECT REPORT

Submitted by

SHILPA GEO

SREEPRIYA PRAMOD

SUMITHA M

THANSEER P

in partial fulfilment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

SCMS School of Engineering and Technology

(Affiliated to Mahatma Gandhi University)

Vidya Nagar, Palissery, Karukutty,

Ernakulam – 683 582

April 2017

SCMS School of Engineering and Technology, Karukutty

Department of Civil Engineering

2017

CERTIFICATE

This is to certify that this is a bonafide record of the project work title "REDEVELOPMENT PLAN FOR VALIYANGADI IN KOZHIKODE MUNCIPAL CORPORATION" done by Shilpa Geo,Sreepriya Pramod,Sumitha M,Thanseer P during the academic year 2016 - 2017in partial fulfilment of the requirement for the award of Degree of Bachelor of Technology inCivil Engineering of Mahatma Gandhi University, Kottayam.

Project Guide:

Ms.Mareena George

Assistant Professor

Dept. of Civil Engineering

Er. SOORAJ MADASSERY
Chartered Engineer
AM: 1685565

External Guide:

Sooraj Madassery

B.Tech, M.Tech ,Chartered Engineer

S.M Consultancy, Kozhikode

Dr.Anitha G Pillai

Head of the Department

Dept. of Civil Engineering

Karukutty

19-4-2017

SM CONSULTANTS
Enviro-Civil Consultants
Palazhi Kozhikode-673014

STUDIES ON FRACTURE BEHAVIOUR OF BI-METALLIC PIPE WELD JOINTS OF POWER PLANT STRUCTURES

PROJECT REPORT

submitted by

REENA ELIZABETH JOHN

Reg. No: SCM17CECS13

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Master of Technology

In

Computer Aided Structural Engineering

Department of Civil Engineering

SCMS School of Engineering & Technology

Vidya Nagar, Karukutty, Kerala - 683 576

MAY 2019

DEPARTMENT OF CIVIL ENGINEERING
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY, KARUKUTTY

CERTIFICATE

This is to certify that the project report entitled **"Studies on Fracture Behaviour of Bi-metallic Pipe Weld Joints of Power Plant Structures"** submitted by **Reena Elizabeth John,** Reg No. **SCM17CECS13,** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Technology in Civil Engineering (Computer Aided Structural Engineering) is a bonafide record of the project carried out by her under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

28-5-19
Internal Supervisor

Ms. Airin M. G.
Assistant Professor
Department of Civil Engineering
SCMS School of Engineering
Technology, Karukutty

External Supervisor

Dr. Vishnuvardhan S.
Senior Scientist
Fatigue and Fracture Laboratory
CSIR-Structural Engineering
Research Centre, Chennai

28-5-19
Project Coordinator

Ms. Airin M. G.
Assistant Professor
Department of Civil Engineering
SCMS School of Engineering
and Technology, Karukutty

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY KARUKUTTY ERNAKULAM 683 582

HEAD OF THE DEPARTMENT

Dr. Anitha G. Pillai
Professor and Head
Department of Civil Engineering
SCMS School of Engineering
and Technology, Karukutty

सीएसआईआर-संरचनात्मक अभियांत्रिकी अनुसंधान केन्द्र
CSIR-Structural Engineering Research Centre
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
(Council of Scientific & Industrial Research)
तरमणि, Taramani, चेन्नै 600113 Chennai 600113
Website: https://www.serc.res.in

Dr. J. Rajasankar
Head, Skill and Human Resource Development Division

SS-01-SHRDD/2019-20
03-06-2019

PROJECT COMPLETION CERTIFICATE

This is to certify that **Ms. Reena Elizabeth John, M.Tech (Computer Aided Structural Engineering), Reg. No. SCM17CECS13** student of **SCMS School of Engineering and Technology, Karukutty, Kerala** has successfully completed her final semester project / dissertation work in **CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai** during the period from **19 December 2018 to 3 June 2019.** She worked under the guidance of **Dr. S. Vishnuvardhan, Senior Scientist, Fatigue & Fracture Laboratory (FFL), CSIR-SERC.** Her project title is **"Studies on Fracture Behaviour of Bi-metallic Pipe Weld Joints of Power Plant Structures".**

(J. Rajasankar)
डॉ. के. राजाशंकर / Dr. J. Rajasankar
मुख्य वैज्ञानिक & प्रधान Chief Scientist & Head
प्रधान & कंपन ग्रुप Shock & Vibration Group
सीएसआईआर-संरचनात्मक अभियांत्रिकी अनुसंधान केन्द्र
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तरमणी Taramani, चेन्नै / Chennai - 600 113.

Tel: 044-22544760
E-mail : **shrdd@serc.res.in**
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EFFECTIVENESS OF TUNED LIQUID DAMPER (TLD) FOR VIBRATION MITIGATION OF TALL BUILDINGS

A PROJECT REPORT

submitted by

NIMYA T VARKICHANAN

Reg. No. SCM17CECS12

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Master of Technology

In

Computer Aided Structural Engineering

Department of Civil Engineering

SCMS School of Engineering and Technology

Vidya Nagar, Karukutty, Kerala – 683 576

MAY 2019

DEPARTMENT OF CIVIL ENGINEERING
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY,
KARUKUTTY, KERALA- 683576

CERTIFICATE

This is to certify that the project report titled '**Effectiveness of Tuned Liquid Damper (TLD) for Vibration Mitigation of Tall Buildings**' submitted by **Nimya T Varkichan**, Reg. No. **SCM17CECS12** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Technology in Civil Engineering (Computer Aided Structural Engineering) is a bonafide record of the project work carried out by her under our guidance and supervision.This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor

Mr. Sandeep T. N
Assistant Professor
Department of Civil Engg.
SCMS School of Engineering
& Technology, Karukutty

External Supervisor

Mr. A. G. Balamurali
Scientist/Engineer 'SG'
SMSD/SDAG/STR/VSSC
Thiruvanathapuram-699502

Project Coordinator

28-5-19

Ms. Airin M.G
Assistant Professor
Department of Civil Engg.
SCMS School of Engineering
& Technology, Karukutty

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 582

HEAD OF THE DEPARTMENT

Dr. Anitha G. Pillai
Professor & Head
Department of Civil Engg.
SCMS School of Engineering
& Technology,Karukutty

भारत सरकार
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वनन्तपुरम - 695 022, भारत
ाष 0471-2562444 / 2562555
फैक्स 0471-2706136

Government of India
Department of Space
Vikram Sarabhai Space Centre
Thiruvananthapuram - 695 022, India
Telephone: 0471-2562444 / 2562555
Fax: 0471-2706136

CERTIFICATE

This is to certify that the thesis entitled **"Effectiveness of Tuned Liquid Damper (TLD) for Vibration Mitigation of Tall Buildings"** is a bonafide record of the work carried out by **Ms. Nimya T Varkichan, Reg. No. SCM17CECS12**, Department of Civil Engineering, SCMS School of Engineering and Technology, Karukutty, Ernakulam in partial fulfillment of the requirements for the award of the degree of **Master of Technology** in **Civil Engineering** with specialization in **Computer Aided Structural Engineering** from **APJ Abdul Kalam Technological University** under my guidance and supervision at **Vikram Sarabhai Space Centre, Indian Space Research Organization, Thiruvananthapuram** from January 2019 to May 2019.

Thiruvananthapuram
Date: 16-05-2019

Shri. Balamurali A.G
Scientist/Engineer - 'SG'
SMD/ SDAG / STR
Vikram Sarabhai Space Centre
Indian Space Research Organization
Thiruvananthapuram-695022

FINITE ELEMENT SIMULATION FOR LONGITUDINAL FORCE EVALUATION OF STEEL RAILWAY BRIDGES

A PROJECT REPORT

submitted by

KRISHNENDU SIVADAS
(SCM16CECS04)

to

the APJ Abdul Kalam Technological University
in partial fulfillment of the requirements for the award of the Degree

of

Master of Technology
In
Civil Engineering
(Computer Aided Structural Engineering)

Department of Civil Engineering

SCMS School of Engineering and Technology
Vidya Nagar, Karukutty, Kerala -683582

MAY 2018

DEPARTMENT OF CIVIL ENGINEERING
SCMS SCHOOL OF ENGINEERNG AND TECHNOLOGY,
VIDYA NAGAR, KARUKUTTY, KERALA- 683582

CERTIFICATE

This is to certify that the report entitled "**Finite Element Simulation for Longitudinal Force Evaluation of Steel Railway Bridges**" submitted by **Krishnendu Sivadas** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Technology in Civil Engineering, Computer Aided Structural Engineering is a bonafide record of the project report carried out by her under my/our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

15/5/18

Internal Supervisor
Ms. Nidhi Murali
Assistant Professor
Department of Civil Engineering
SCMS School of Engineering and Technology

Exernal Supervisor
Dr. V Srinivas
Principal Scientist
Special and Multi-functional
Structures laboratory (SMSL),
CSIR- SERC, Chennai

PG Coordinator
Ms. Airin M G
Assistant Professor
Department of Civil Engineering
SCMS School of Engineering and Technology

HEAD OF THE DEPARTMENT
Dr. Anitha G Pillai
Department of Civil Engineering
SCMS School of Engineering
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SCMS SCHOOL OF ENGINEERING & TECHNOLOGY KARUKUTTY ERNAKULAM 683 582

सीएसआईआर-संरचनात्मक अभियांत्रिकी अनुसंधान केन्द्र
CSIR-Structural Engineering Research Centre
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(Council of Scientific & Industrial Research)
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Dr. J. Rajasankar
Head, Skill and Human Resource Development Division

SS-01-SHRDD/2018-19
12-04-2018

PROJECT COMPLETION CERTIFICATE

This is to certify that **Ms. Krishnendu Sivadas, M.Tech. (Computer Aided Structural Engineering), Reg. No. SCM16CECS04** student of **SCMS School of Engineering and Technology, Cochin, Kerala** has successfully completed her final semester project / dissertation work **in CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai** during the period from December **2017 to April 2018**. She worked under the guidance of **Dr. V. Srinivas, Principal Scientist, Special Multi-functional Structures Lab, CSIR-SERC**. Her project title is **"Finite Element Simulation for Longitudinal Force Evaluation of Steel Railway Bridges".**

J. Rajasankar

(J. Rajasankar)
डॉ. के. राजाशंकर / Dr. J. Rajasankar
मुख्य वैज्ञानिक & प्रधान Chief Scientist & Head
प्रधान & कंपन ग्रुप Shock & Vibration Group
सीएसआईआर-संरचनात्मक अभियांत्रिकी अनुसंधान केन्द्र
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तरमणी Taramani, चेन्नै / Chennai - 600 113.

Tel: 044-22544760
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DESIGN OF CONICAL THRUST FRAME STRUCTURE FOR LAUNCH VEHICLE WITH DISCRETE POINT LOADS

Master's Thesis submitted to

MAHATMA GANDHI UNIVERSITY
KOTTAYAM

in partial fulfillment of the requirement
for the award of the degree of

MASTER OF TECHNOLOGY

IN

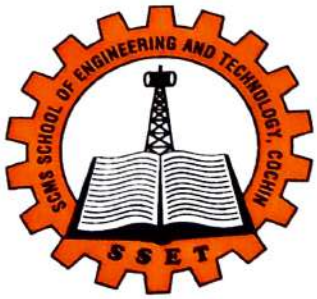
CIVIL ENGINEERING

(Computer Aided Structural Engineering)

Submitted by

SWATHI KRISHNA P

Reg No : 200866



Department of Civil Engineering
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
Vidya Nagar, Karukutty, Kerala - 683 582
(Affiliated to Mahatma Gandhi University, Kottayam)

June 2016

Certificate

This is to certify that the report entitled **"Design of Conical Thrust Frame Structure for Launch Vehicle with Discrete Point Loads"**is a bonafide record of the thesis work done by **Ms.Swathi Krishna P,** Reg No. 200866, during December 2015-June 2016, in partial fulfilment of the requirement for the award of M.Tech degree in Civil Engineering (Computer Aided Structural Engineering) of Mahatma Gandhi University, Kottayam.

Internal Guide

Ms.Geethu R Babu
Assistant Professor
Department of Civil Engineering,
SCMS School of Engineering &
Technology,Karukutty

P.G.Coordinator:

Ms.Sanya Maria Gomez
Assistant Professor,
Department of Civil Engineering,
SCMS School of Engineering &
Technology,Karukutty

External Guide:

Mr.R.Manuel Sathya
Sci/Engr-SF
Deputy Division Head,
Earth Storable Structures Design Division,
Mechanical Design Analysis Entity,
Liquid Propulsion System Centre
ISRO, Trivandrum

आर. मैनुवल सत्या / R.Manuel Sathya
उप प्रभाग प्रधान, / DDH ESSDD
तिरुवनंतपुरम / Thiruvanant

Head of Department

Dr.Anitha G Pillai
Department of Civil Engineering,
SCMS School of Engineering &
Technology,Karukutty

SCMS SCHOOL OF ENGINEERING & TECHNOLOGY
KARUKUTTY
ERNAKULAM
683 582

Date:

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अंतरिक्ष विभाग
द्रव नोदन प्रणाली केंद्र
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तिरुवनंतपुरम - 695 547, भारत
दूरभाष :
फैक्स :

सत्यमेव जयते

Government of India
Department of Space
Liquid Propulsion Systems Centre
Valiamala P.O.
Thiruvananthapuram - 659 547, India
Telephone :
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EARTH STORABLE STRUCTURES &TANKAGES DESIGN GROUP
MECHANICAL DESIGN & ANALYSIS ENTITY

CERTIFICATE

This is to certify that the dissertation entitled "***Design of Conical Thrust Frame Structure for Launch Vehicle with Discrete Point Loads***", submitted by Swathi Krishna,.P student of M.Tech (Computer Aided Structural Engineering), Department of Civil Engineering, SCMS School of Engineering & Technology, Karukutty,Ernakulam in partial fulfillment for the award of the degree of Master of Technology in Computer Aided Structural Engineering is a bonafide record of work carried out by her at the Liquid Propulsion Systems Centre (LPSC), ISRO, Valiamala, Thiruvananthapuram under my guidance from December 2015 to June 2016.

R Krishna Kumar
Group Director
ESTDG/MDA

आर कृष्णकुमार / R. Krishnakumar
समूह निदेशक / Group Director
इएसटीडीजी / ESTDG, एमडीए / MDA
एलपीएससी / LPSC, वलियमला, Valiamala
तिरुवनंतपुरम / Thiruvananthapuram

July 21, 2016
Valiamala

BOSCH

Robert Bosch Engineering
and Business Solutions
Private Limited,
CHIL SEZ Campus,
Keeranatham village,
Coimbatore - 641035, India.
Tel: +91 422 667 4001
Fax: +91 422 667 1208
CIN: U72400KA1997PTC023164
www.bosch-india-software.com

LETTER OF REFERENCE

Date: 25-Apr-19

This is to certify that Mr.Ananthu J V of SCMS School of Engineering & Technology pursuing M. Tech is doing a project internship under the title **EMBEDDED SOFTWARE DEVELOPMENT FOR INTELLIGENT DRIVER ASSISTANCE** in ECJ-EC department from 05.09.2018 to 31.05.2019.

Robert Bosch Engineering and Business Solutions Private Limited

Anitha J
General Manager
(Human Resources)

Asha Begam
Assistant Manager
(Human Resources)

CERTIFICATE

This is to certify that **Ms. Alina Kollannur** of SCMS School of Engineering and Technology pursuing M.Tech has successfully completed the project internship on the title **DEVELOPMENT AND IMPLEMENTATION OF REMOTE SMART PARKING ASSIST** in EPK2-EC department of Robert Bosch Engineering and Business Solutions Pvt. Ltd, Bangalore.

pki, BOSCH, APAC, V, I, Vinaykumar.MR

Digitally signed by pki, BOSCH, APAC, V, I, Vinaykumar.MR
Date: 2020.06.09 11:37:47 +05'30'

Place: Bangalore

Date: 09/06/2020

Mr. Matrubai Vinay Kumar
Group Manager
EPK2-EC Dept.
RBEI
Bangalore

Society for Space Education Research & Development

EDUCATE - INSPIRE - INNOVATE

Date:23-06-2020
Ref No.:IPD-P6/3-2020

LETTER OF REFERENCE

This is to certify that Ms Reshmi R Kumar of SCMS school of Engineering and Technology pursuing M.tech is doing a project internship under the title LoRa for Swarm SAT Communication in Research and Development department from 08/03/2020 to 30/07/2020

SUJAY SREEDHAR
CO-FOUNDER & CHAIRMAN
SSERD

SSERD, 3rd Floor, C.M.Muniyallappa Complex,
Choodasandra, Bangalore - 560035
www.sserd.org
info@sserd.org / hr@sserd.org

ANALYSIS AND DESIGN OF HOSPITAL BUILDING

MINI PROJECT REPORT

submitted by

RINTU KURIAN

Reg. No: SCM18CECS13

to

the APJ Abdul Kalam Technological University
in partial fulfilment of the requirements for the award of the Degree

of

Master of Technology
In
Computer Aided Structural Engineering

Department of Civil Engineering
SCMS School of Engineering & Technology
Vidya Nagar, Karukutty, Kerala - 683 582

MAY 2019

DEPARTMENT OF CIVIL ENGINEERING
SCMS School of Engineering & Technology, Karukutty

CERTIFICATE

This is to certify that the report titled "**Analysis and Design of Hospital Building**" submitted by **Rintu Kurian,** Reg No. SCM18CECS13 to the APJ Abdul Kalam Technological University in partial fulfilment of the requirements for the award of the Degree of Master of Technology in Civil Engineering (Computer Aided Structural Engineering) is a bonafide record of the mini project work carried out by her under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

20/05/2019

Seminar Guide
Ms. Devi Sreenivas
Assistant Professor
Department of Civil Engineering

Head of the Department
Dr. Anitha G Pillai
Professor
Department of Civil Engineering

Stuba
Engineering Consultancy Pvt. Ltd.
32/702 A, St. Vincent De Paul Road, Cochin-682025. Ph:+91 484 2339779, e-mail: info@stuba.in

Ref: SE/INTN/2019/002

Date : 02/05/2019

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. Rintu Kurian , student of SCMS School of Engineering and Technology doing M.tech on Computer Aided Structural Engineering has completed three months (from 1st February to 30th April 2019) long internship programme at this company. During the period of her internship programme with us she was found punctual, hardworking and inquisitive.

We wish her every success in life.

For, Stuba consultancy Pvt Ltd.

Authorized Signature

Stuba Engineering Consultancy Pvt. Ltd. Cochin-25

ABSTRACT

The Mini Project and Site Visits aims at creating a better understanding of engineering practices and possible problems. The training is being guided by Er. Abhilash Joy at Stuba Structural Consultants Ltd. As a part of the training the analysis and design of a hospital building is assigned to me as the mini project. The multi storied hospital building of Gurudharmam Mission Hospital Ltd.is located at Survey Number 596, Vadama Village, Chalakudy Taluk, Mala P.O., Thrissur District. The plot area consist of hard strata around a depth of 7.4 m from ground level. The soil report recommends pile foundation. Modelling and analysis was done using ETABS and the structural components were manually designed and detailed. Site visits were also completed in order to observe and understand how the theory is put into practise.

1. INTRODUCTION

Industrial training and mini project is included in the syllabus to develop practical knowledge and professional skills required by budding Engineers. Technical advancement has made possible the construction of high rise structures with focus on cost and space optimisation. Hence more slender and light buildings are emerging recently. The major aspect is to provide a safe durable economic serviceable ans aesthetically pleasing structures. The design of these building require both knowledge and experience.

The following are the objectives of mini project:

1. To analyse the proposed hospital building using ETABS 2015 Ultimate 15.0.0
2. Manual design of typical members such as beam, column,beam-column joint, slab, ramp, stairs, shear wall, retaining wall, water tank, foundation.

As a part of the industrial training and mini project, I was taught to analyse and design multi-storied structures. The mini project assigned to me, by my guide at Stuba Structural Consultants, is that of a multi storied hospital building of Gurudharmam Mission Hospital Ltd . Survey Number 596, Vadama Village, Chalakudy Taluk, Mala P.O., Thrissur District is the location for the proposed building.

7. DETAILS OF SITE VISIT

As a part of my industrial training, I have visited a five construction sites. The first one is a commercial building made of steel located at Palarivattom, the second one is a residential building at Mamangalam, the third building is a commercial building at Eloor, the fourth building is a Nalukettu at Cheranalloor and the fifth one is the Provincial home for priests at south Kalamassery. The details of the site visits are given below.

7.1. Commercial Building made of Steel at Palarivattom

The commercial building under construction is owned by Mr. Robinson Varghese, Mr. Tony Varghese and Mr. Sam Varghese. The building is located in Survey Number 167/4A, 167/4C at Edappally South Village. As per clause 2.2.5 of IS 875 (Part II) : 1987, the building comes under the occupancy classification of mercantile building.

Fig. 7.1. Elevation of the building

The double storied commercial building shown in fig.7.1, is made of steel members and spreads over a plinth area of 707.02 m^2. The F.A.R., coverage and plot area are 1.03, 49.85 % and 687.99 m^2 respectively. ISMC 175 and ISMB 200 are used in the construction of beams and columns as shown in fig.7.2. The beam and column sections are connected using bolts of 24mm diameter as shown in fig.7.3. The flooring in the first and second floors is a composite floor made by laying concrete mix of grade M20 over corrugated steel panels as shown in fig.7.4.

Fig.7.2. Beam and column supporting the steel corrugated plate of second floor.

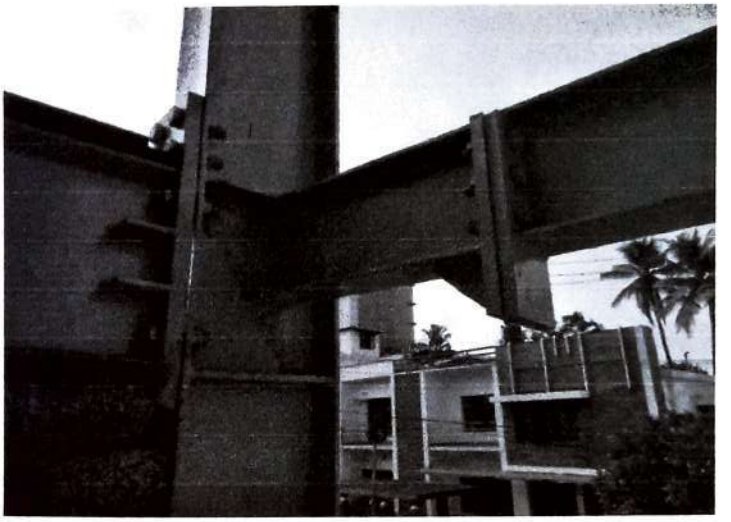


Fig.7.3. Beam column joint

Fig.7.4. Concreting over corrugated steel plates

Fig.7.9. Casting the curb for underground water tank

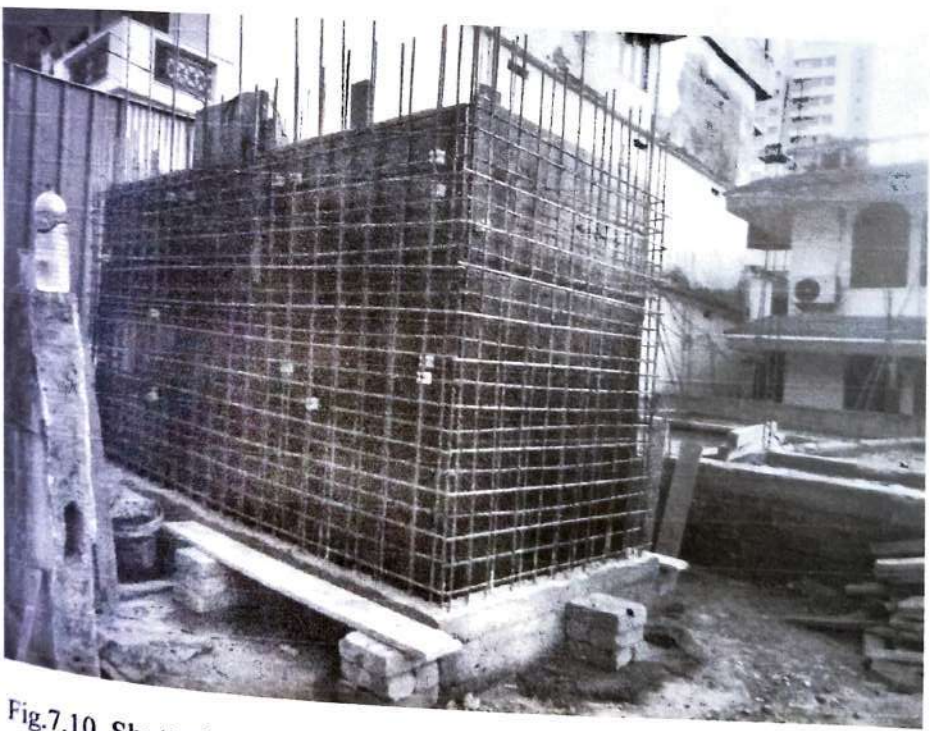


Fig.7.10. Shuttering and erection of reinforcement to cast the water tank

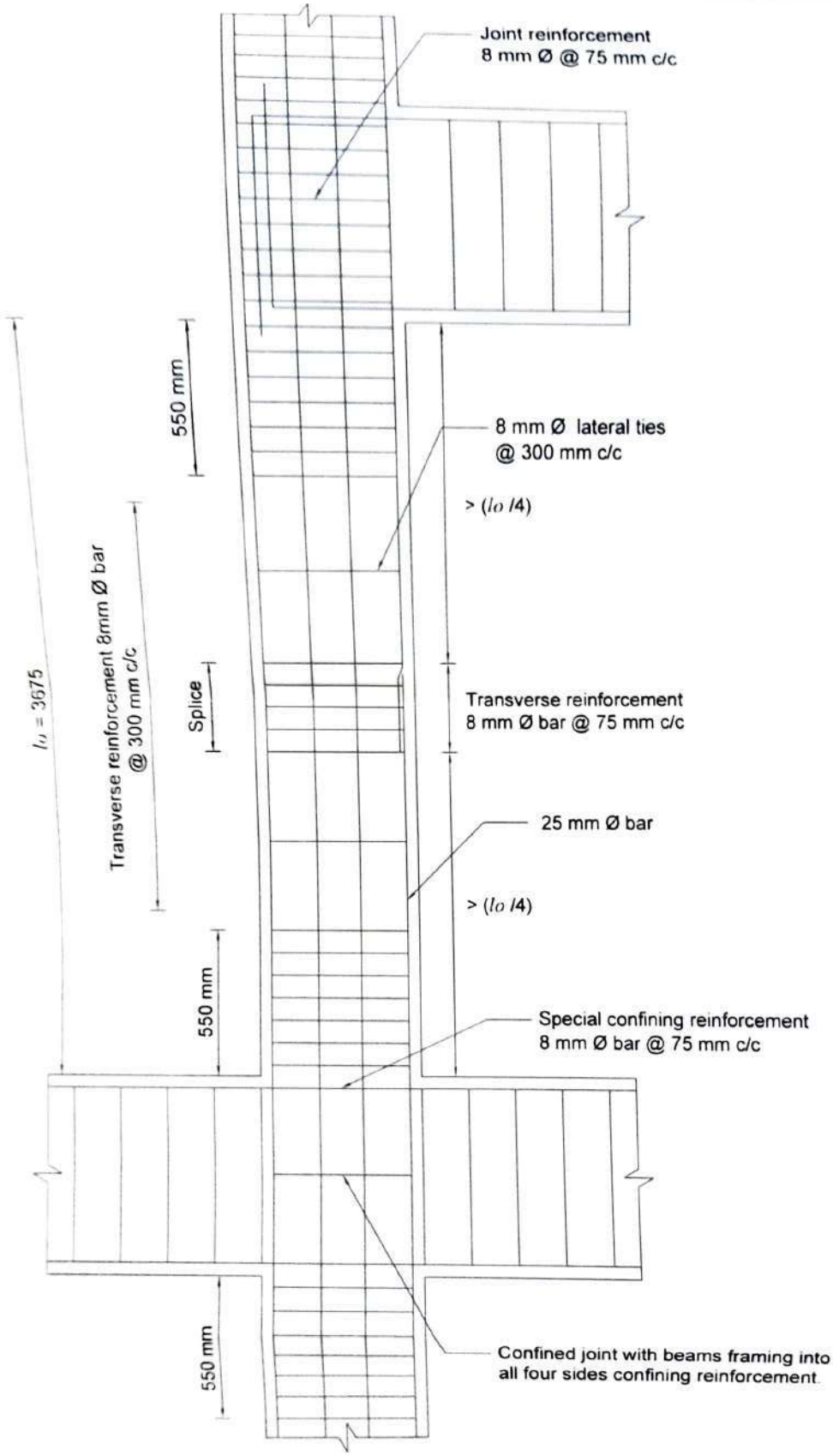
Two brick thick walls in English bond is constructed over the plinth level as shown in fig.7.11. and the column reinforcement was tied as per the structural drawing (fig.7.12). Later the formwork for column was erected and the concreting was done as in fig.1.2.8.

Fig.7.13. Both lintel and sunshade has been casted

Fig.7.14. First and second flight of stair has been concreted

Fig.7.15. Current elevation of building

Two flights of the staircase has been constructed (fig.7.14.). At present the construction upto the first floor is complete as shown in fig.7.15. and the formwork for concreting the roof is to be erected.



NOTES

1. All dimensions in mm unless specified
2. Dimensions shall not be measured directly from this drawing
3. Grade of concrete and steel M30 and Fe 500
4. Clear cover to reinforcement is 40 mm for column and 20 mm for beam

APPENDIX B	
PROJECT HOSPITAL BUILDING	
TITLE REINFORCEMENT DETAIL OF BEAM COLUMN JOINT	
DWG No. 8	SCALE NOT TO SCALE

8. CONCLUSION

The plan of the respective work is studied. The soil report is studied; loads are calculated according to the codal provisions. The beam column layout is drawn, grid lines are drawn using ETABS 2017 and modelling and analysis was done. The 3D view and rendered view of the commercial building was obtained. Design of beam, column, design of slab (two way and one way), shear wall, staircase, ramp,retaining wall were done manually.

The following works were completed :

- Design of structural members
- Reinforcement detailing of the structural elements.
- Site visit

ANALYSIS , DESIGINING AND DETAILING OF A SUBWAY AT TRIVANDRUM

A MINIPROJECT REPORT

submitted by

ARDHIRA P J

Reg. No: SCM17CECS08

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Master of Technology

In

Computer Aided Structural Engineering

Department of Civil Engineering

SCMS School of Engineering & Technology

Vidya Nagar, Karukutty, Kerala - 683 582

APRIL 2018

DEPARTMENT OF CIVIL ENGINEERING
SCMS School of Engineering & Technology, Karukutty

CERTIFICATE

This is to certify that this Mini project report entitled **"Analysis, design and detailing of a subway at Trivandrum"** is a bonafide record of the seminar presented by **Ms. Ardhira P J**, Reg No. SCM17CECS08, during March 2018 in partial fulfillment of the requirements for the award of Degree of Master of Technology in Civil Engineering (Computer Aided Structural Engineering) of A P J Abdul Kalam Technological University,Trivandum.

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Date: 11/04/2018

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of. Dr. P.K. Aravindan
ormer Prof. in Struct. Engg IIT Madras)
ncipal Consultant
obile: 9656650022

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. **ARDHIRA P J** bearing Reg.No.SCM17CECS08 (M.Tech student of SCMS School of Engineering & Technology) had undergone Training as a part of mini project from 28.12.2017 to 7th April, 2018. During this period she was exposed to Analysis and Design of Subway at Trivandrum. Her conduct during the training period was good.

07.04.2018

SREE GIRI CONSULTANTS COCHIN-41

Prof.Dr.P.K.Aravindan

Prof. Dr. P. K. ARAVINDAN
Rtd. Prof. in. Struct. Engg
IIT Madras

ABSTRACT

The planning and Construction of Advanced Underground facilities are very much essential in modern times as we notice that majority of the Metropolitan Cities in India are on the verge of getting saturated due to Urbanization. It promotes safe pedestrian movement and hence indirectly promotes walkability in a city.

The mini project is to analyze design and detailing of a subway located in front of the Government Medical College Hospital Trivandrum. This is undertaken at SREEGIRI CONSULTANTS, Kochi. Height of story is 6m, Sap 2000 software is used for modeling, analysis design and detailing of the structure.

CHAPTER 1
INTRODUCTION

Industrial Training is an essential component in the development of the practical and professional skills required by an engineer. The purpose of Industrial Training is to achieve exposure on practical engineering fields. Through this exposure, we would have a better understanding of engineering practice in general and sense of frequent and possible problems.

The objectives of mini project are:

a) To get exposure to engineering experience and knowledge, which are required in industry.

b) To apply the engineering knowledge taught in the lecture rooms in real industrial situations.

c) To share the experience gained from the project in discussions held in the lecture rooms.

d) To get a feel of work environment.

d) To get exposure to responsibilities and ethics of engineers.

The design of structure must satisfy the following requirements:

Stability: To prevent the overturning, sliding or buckling of the structure, or any part of it, under the action of loads.

Strength: To resist safely the stresses induced by the load in the various structural members.

Serviceability: To ensure satisfactory performance under service load condition which implies providing adequate stiffness and reinforcement to control deflections, crack width and vibrations within adequate limits, and also providing impermeability and durability. Other two important considerations that a sensible designer ought to bear in mind is that the structure should be economical with regard to both construction and maintenance cost and aesthetically pleasing during the expected design life.

CHAPTER 2
MODELING AND LOADS ON THE SUBWAY

Modeling consists of fixing the position of columns and beams, member property specification, giving support condition and loading. The column centre lines were taken for fixing joint coordinates. Members were connected along the joint coordinates. Beams were also marked. Connecting all beam ends retaining wall elements modeled.

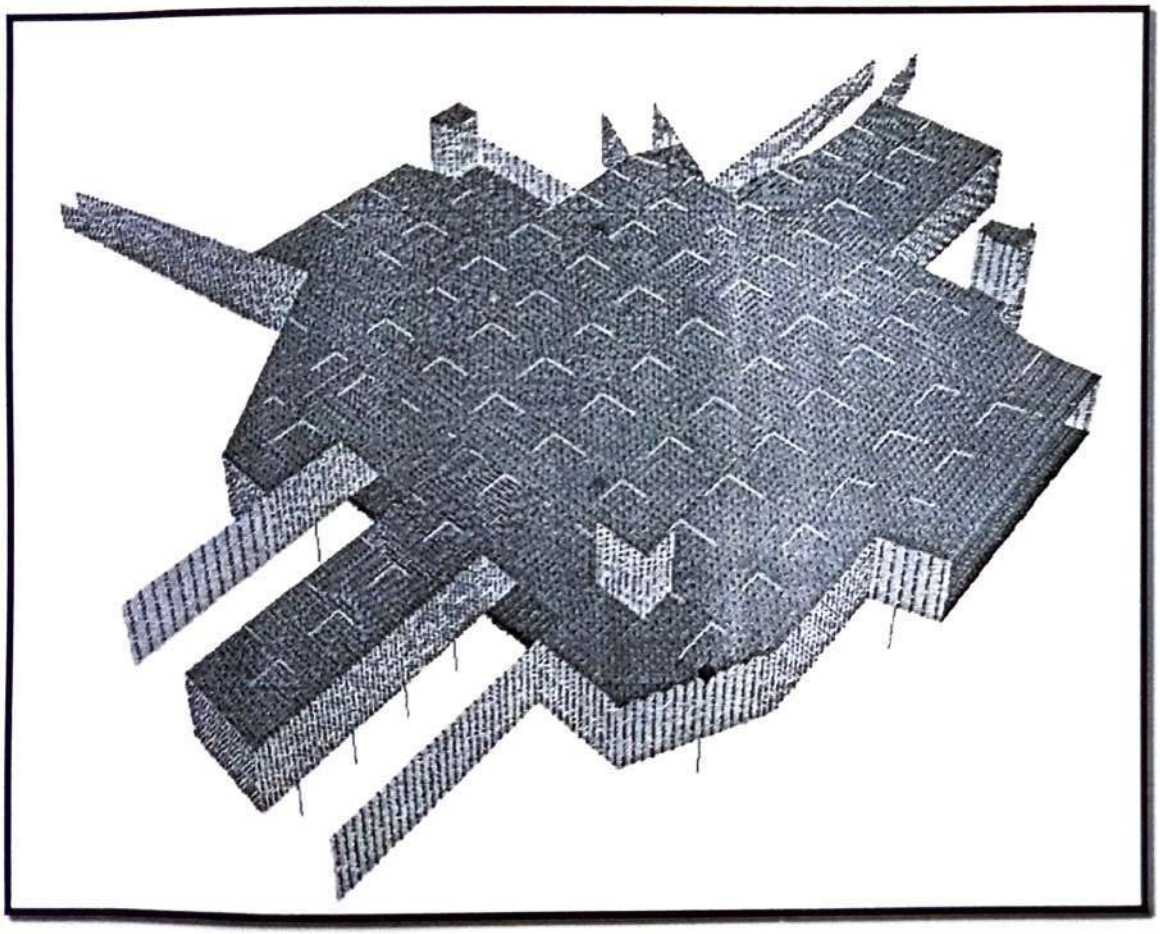


Fig.2.1 Modeling of subway

4.2 CONSTRUCTION OF BRIDGE ACROSS CHAMPAKKARA RIVER IN KOCHI

The bridge is proposed to construct Across Champakkara River in Kochi which connects Vytila and Pettah. This bridge is constructing parallel to the existing bridge which is very week due to age. It contains two lanes road and Kochi Metro Rail in between. This project is a part of extension of Kochi Metro to Pettah.

Total length of bridge is 250 m. One span is across the river and 8 spans are on land area. The structure is supported on 2 piers at riverside and 8 piers at land area. The length of span across river is 44 m and all other spans are 25 m length. Width of carriage way is 6 m. Pier is supported on pile cap and pile. Two piers at river side consists of 12 piles and other piers at land consists of 8 piles. Diameter of pile is 1.20 m and contains main bars of 32 mm dia bar 18 set. A set contains two bars which are binded together. Stirrups are 10 mm dia bars which have 100 mm spacing.

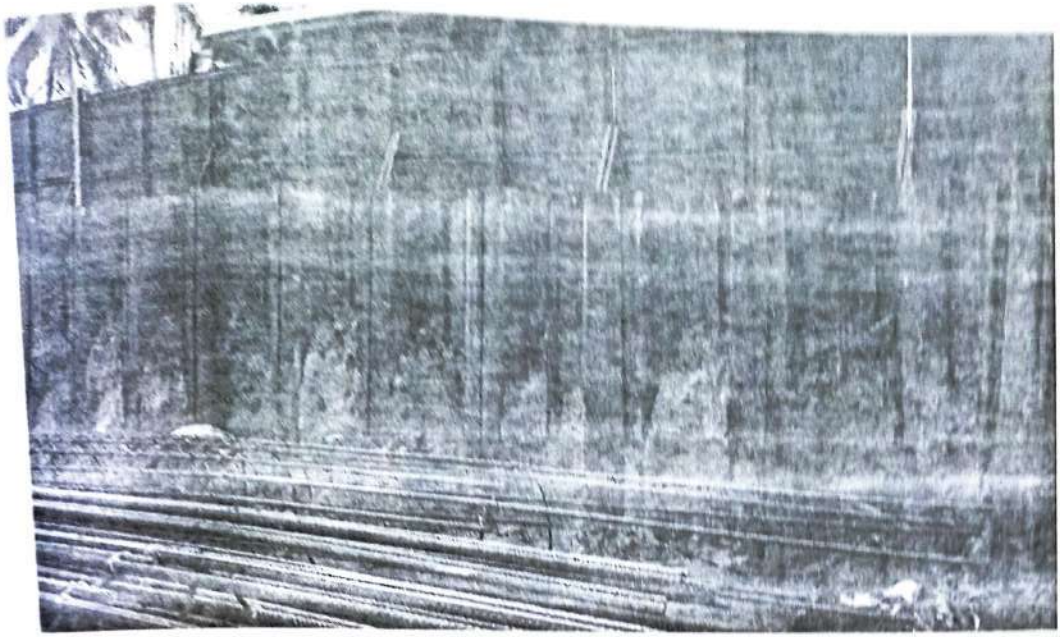


Fig.9.2 sheet pile

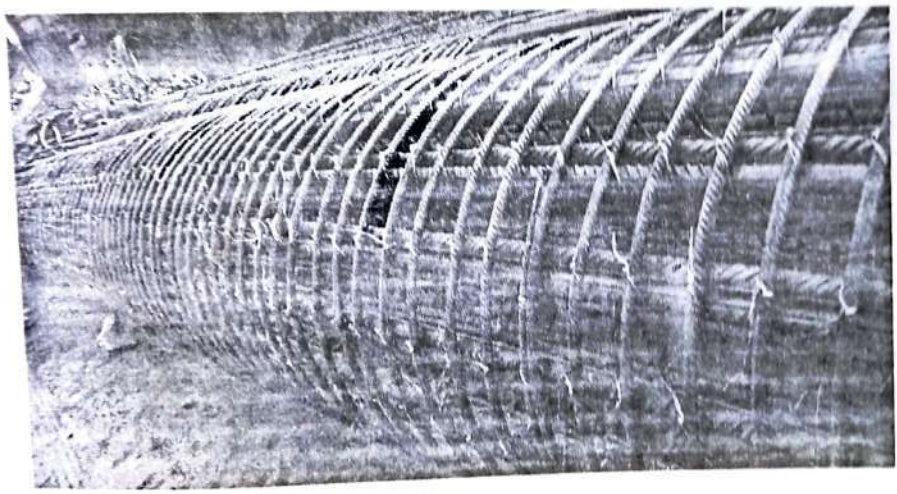


Fig.9.3 Reinforcement for pile

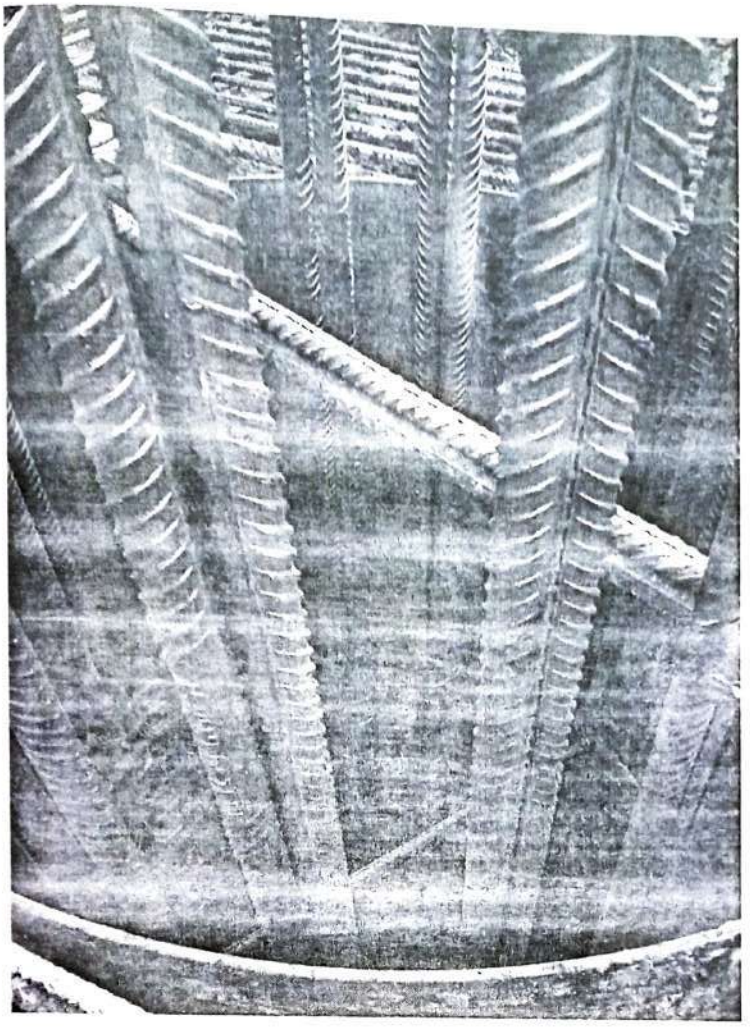
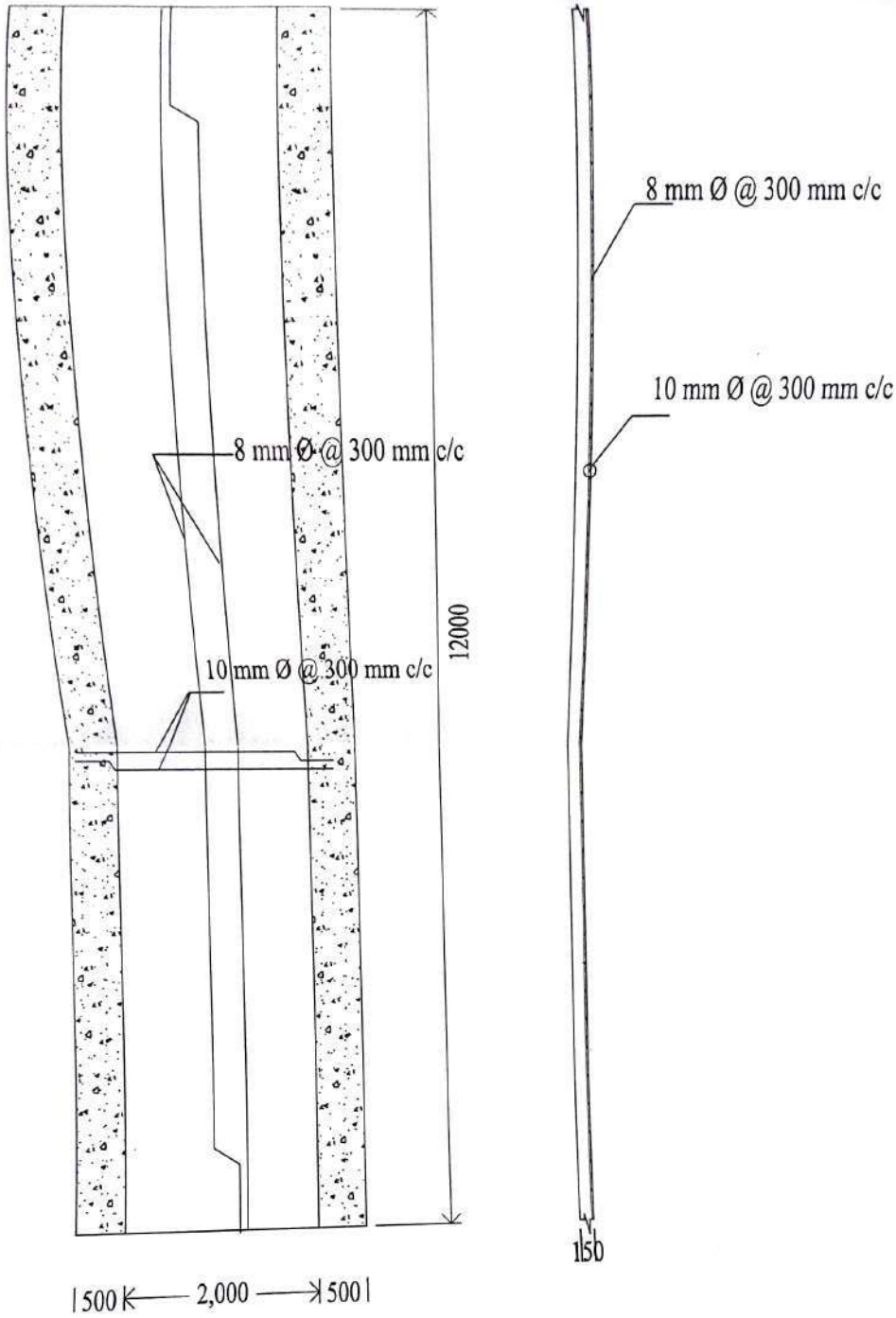
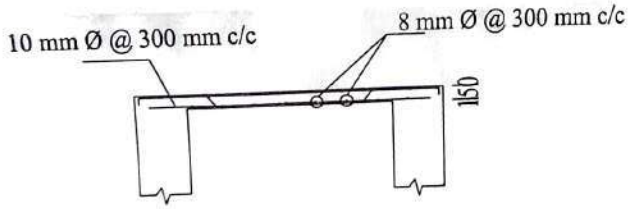


Fig.9. 4 Reinforcement for pile

4.3 IP BUILDING NEAR AMRITA HOSPITAL (CHILDRENS HOSPITAL)

This site is located at edapally near to Amritha hospital. The construction mainly involves piling process. More than 200 piles are used in this IP building. Design mix used for piling is M_{50}. The ratio is 1:1.76:2.64.Cover of 75mm is used. These piles are of length 39 to 40 m. The diameter of piles used are 1m, 80cm and 90 cm. Auger boring method is used for drilling holes. 56 numbers of bar of 25mm diameter are bundled together in a cage. 3 or 4 pile foundations were seen under a single column. Pile cap provided is of depth 1.2m. 25mm dia bars are used in pile cap. Pile cap





REINFORCEMENT DETAILS OF RAMP

FIGURE B7
All dimensions are im mm

CONCLUSION

As a part of mini project, subway was taken for the analysis design and detailing. The industrial training helped to gain exposure to various field practices in the analysis and design of multi-storied buildings, and also in various construction techniques used in the industry. The analysis was done in SAP 2000 and detailing was done in AutoCAD 2013.The structural component of the building includes pile foundation, column, beam, slab and shear wall, retaining wall, ramp, stair which were designed manually according to the IS specifications. The use of software (SAP 2000) offers saving in time, the calculations are very easy. It takes value on the safer side than manual design. The designing and detailing was done according to standard specifications of various IS codes to the possible extend. This training helped to understand and analyze the structural problem faced by the construction industry. Site visit also gave an exposure to the industry.

ANALYSIS AND DESIGN OF COMMERCIAL CUM RESIDENTIAL BUILDING

MINI PROJECT REPORT

submitted by

VRINDA C G

Reg. No: SCM18CECS18

to

the APJ Abdul Kalam Technological University

in partial fulfillment of the requirements for the award of the Degree

of

Master of Technology

In

Computer Aided Structural Engineering

Department of Civil Engineering

SCMS School of Engineering & Technology

Vidya Nagar, Karukutty, Kerala - 683 576

MAY 2019

DEPARTMENT OF CIVIL ENGINEERING
SCMS SCHOOL OF ENGINEERING & TECHNOLOGY,
KARUKUTTY

CERTIFICATE

This is to certify that the mini project report titled "**ANALYSIS AND DESIGN OFCOMMERCIAL CUM RESIDENTIAL BUILDING**" submitted by **VRINDA C G**, Reg No. **SCM18CECS18**, to the APJ Abdul Kalam Technological University in partial fulfilment of the requirements for the award of Degree of Master of Technology in Civil Engineering (Computer Aided Structural Engineering) is a bonafide record of the work carried out by her under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Guide

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Head of the Dept.

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Asia Infrastructure Advisory Services Pvt Ltd
Corp Office: Coral Springs, #184, Vivekananda Nagar, Pangode, Thirumala P.O., Trivandrum 695006
Regd. Office: S-1 Apurva Enthral, 4A Cross, Gundappa Reddy Layout, Chola Nagar, Bangalore - 560032
CIN: U74900KA2012PTC065551

10th April 2019
Trivandrum

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Vrinda C G** (SCM18CECS18), student of SCMS School of Engineering and Technology doing M.Tech on Computer Aided Structural Engineering has completed three months (from 1st February to 20th April 2019) long internship programme at this company. During the period of her internship programme with us, she was found punctual and hardworking.

for, Asia Infrastructure Advisory Services Pvt Ltd.

Jithin Joy
Technical Manager (Operations)

ABSTRACT

The industrial training was carried out at Asia Infrastructure advisory services PVT Ltd, Trivandrum under the guidance of **Mr. Jithin Joe**, Structural Engineer. Asia Infrastructure advisory provide multi-discipline consultancy services with diverse range of design engineering, transaction, and business skill taking every element of an infrastructure project from conception through commissioning ensuring sustainable maintenance and management for the life period. Asia Infrastructure advisory has a core group of structural designers of world class repute, it is phenomenal that we provide optimized structural solutions compliant, with extensive safety norms through update technologies of analysis and design. Asia Infrastructure advisory provides complete structural design services for all type of buildings from minor alterations and additions through to new residential, commercial, industrial and institutional projects, incorporating complete projects supervision of the structural of the development projects.

As part of the project an Analysis and Design of commercial Cum Residential Building at Idukki is to be analysed and designed according to the relevant Indian Standard codes. The work is carried out in three stages. First stage is modelling and analysed of the proposed building. Second stage is the design of different structural components. The final stage is the detailing of different structural components. The structure is analysed in ETABS 2017 and the design of structural components are done manually. The detailing work are done in AUTOCAD 2018. In addition to the analysis and design, construction sites were visited during the industrial training period.

CHAPTER 1

INTRODUCTION

Industrial training is an important component in the development of the practical and professional skills required by an engineer. The purpose of industrial training is to achieve exposure on practical engineering fields. Through this exposure, we would have a better understanding of engineering practice in general and sense of frequent and possible problems.

The objectives of industrial training are:

a) To get exposure to engineering experience and knowledge, which are required in industry and not taught in the lecture rooms.

b) To apply the engineering knowledge taught in the lecture rooms in real industrial situations.

c) To share the experience gained from the 'industrial training' in discussions held in the lecture rooms.

d) To get a feel of the work environment.

e) To gain exposure on engineering procedural work flow management and implementation.

f) To get exposure to responsibilities and ethics of engineers.

The search of man for new methods for constructing his shelter and the invention of cement, led him to the use of multi-storey buildings in the form of framed structures. The R.C.C roofs made it easier to build on top of one another. More and more people began opting for multi-storey flats as the land value showed a sharp increase, to exponential increase in the population and limited land supply. Due to scarcity of land and high population density, multi-storied buildings are becoming a necessity these days. Recently, there have been a considerable increase in the number of tall buildings, both residential and commercial and modern trend is towards taller and taller structures.

The advancement in science and technology had made it possible to build high rise structures in areas even susceptible to cyclones and earthquakes. Thus the effect of lateral loads like wind loads and earthquake forces are gaining importance and almost every designer is faced with problem of providing adequate strength and stability against lateral loads. These lateral forces

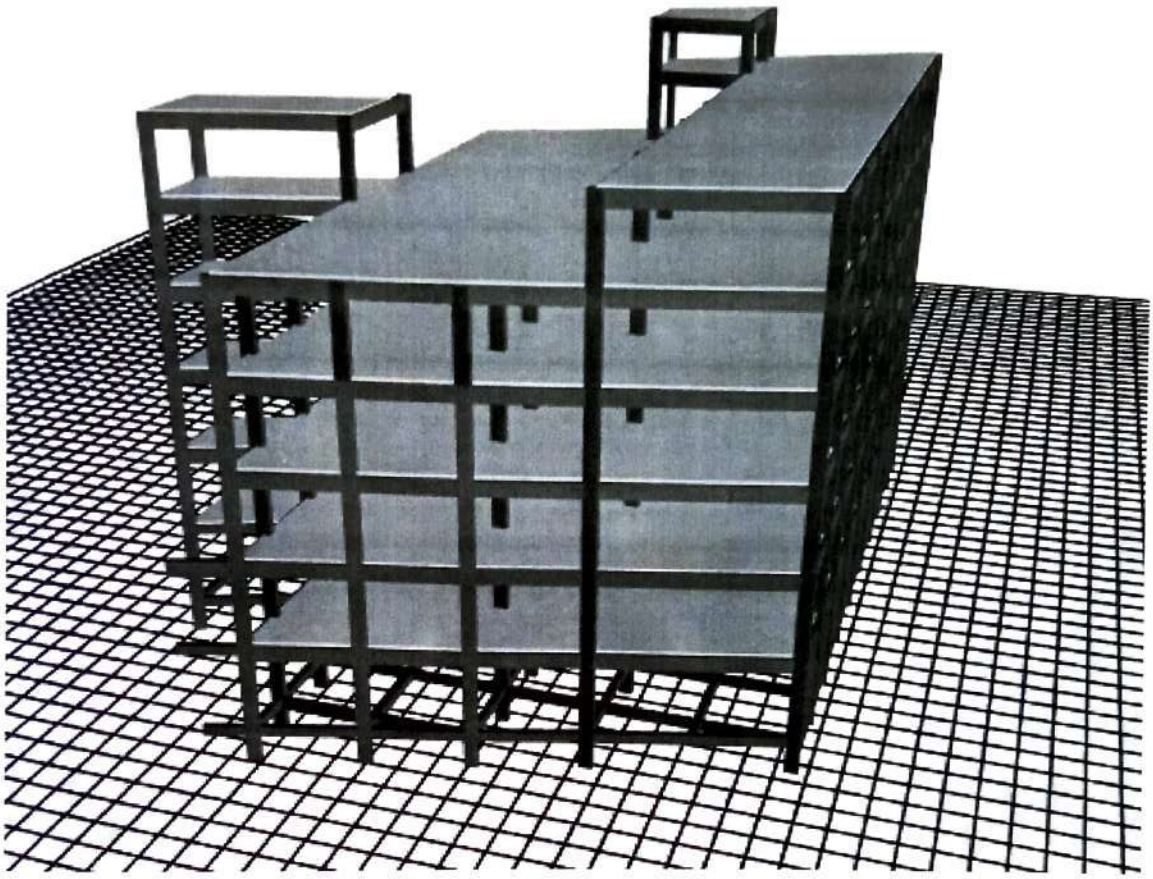


Figure 6.2: Rendered view of the model

CHAPTER 8
SITE VISIT REPORT

8.1 SITE VISIT-1: IISER-THIRUVANANTHAPURAM

Date of visit: 09/3/2019

As part of by industrial training, I visited the construction site of Indian Institute of Science Education and Research Thiruvananthapuram (IISER-TVM) on 09/3/2019. It is an education building project undertaken by RDS pvt ltd. The site is located at Vidura, 40 kilometers from Thiruvananthapuram, at the foot of Ponmudi hills. It is a G+7 building. At the time of my visit, the construction of isolated column footing, plinth beam and Raft foundation was going on the site. The construction of column foundation was clearly visible in the site. The column are casted with M_{30} grade concrete and Fe 500 steel.

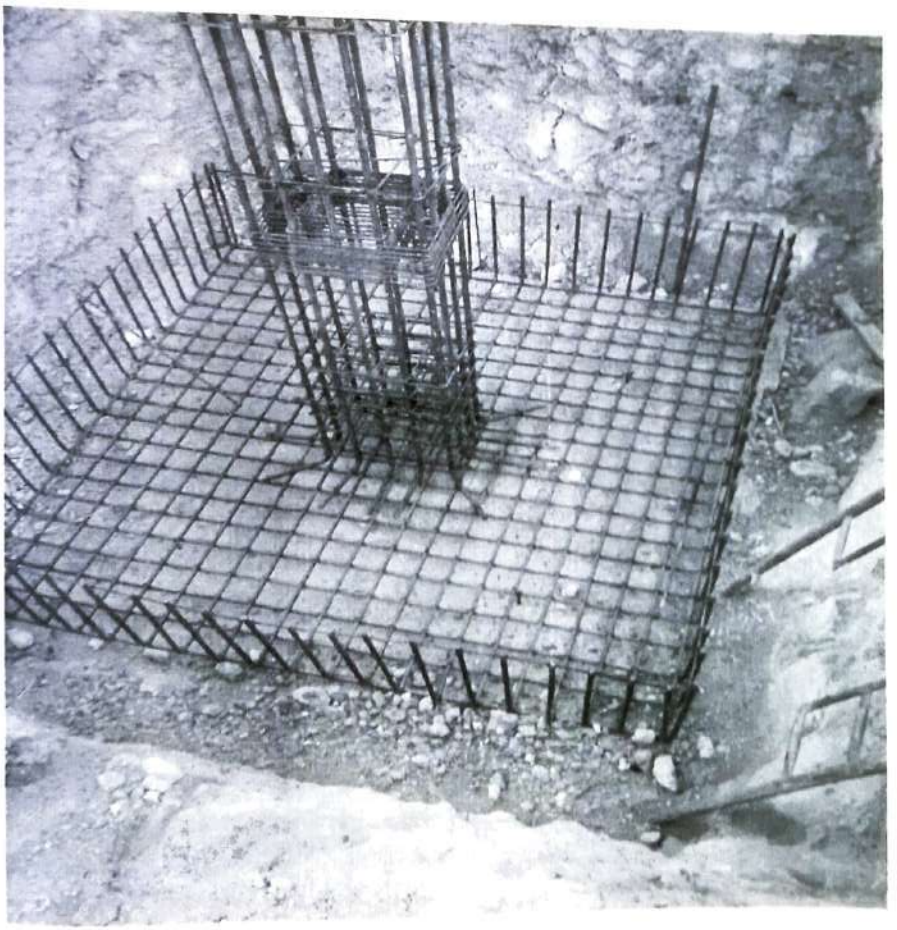


Fig 8.1 Isolated column footing

Fig 8.2 Plinth Beam

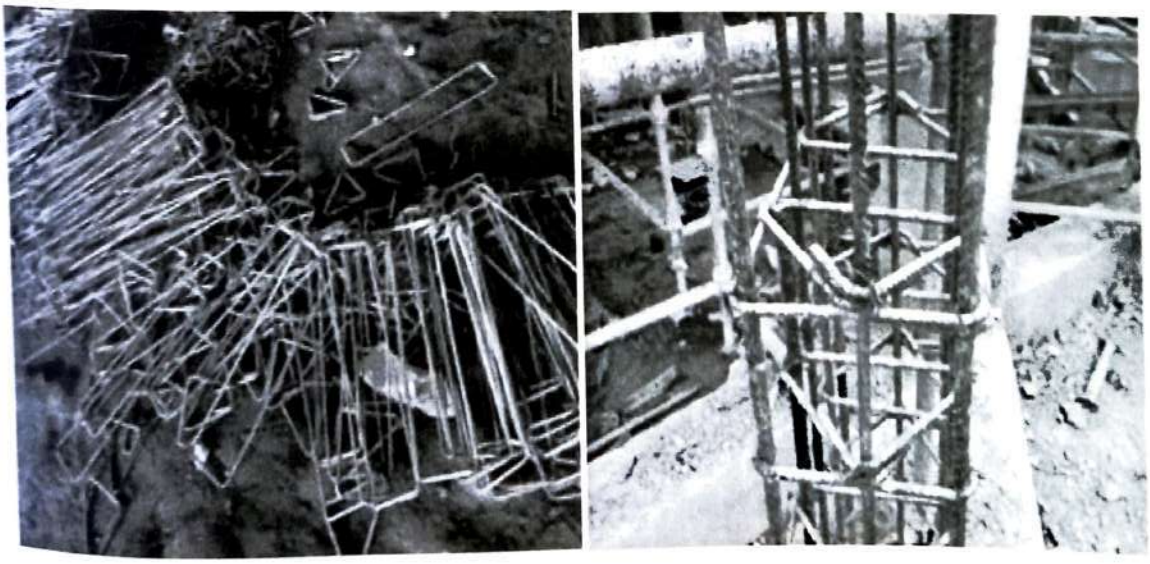
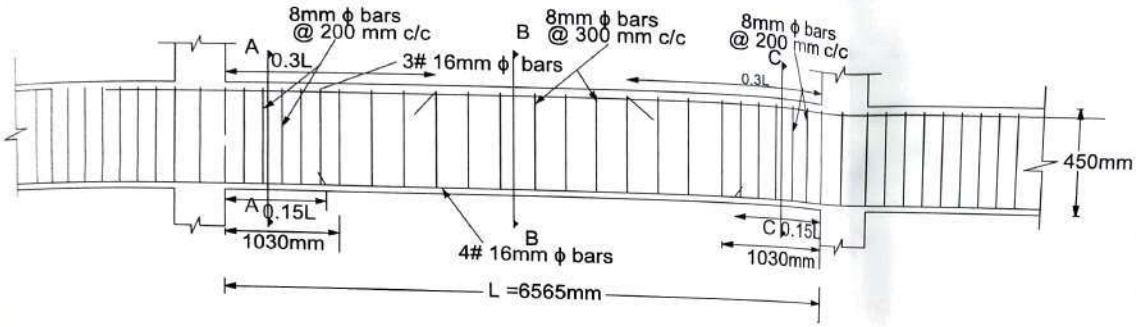
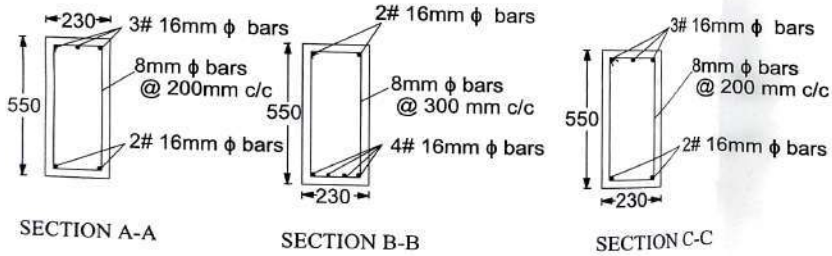


Figure 8.3: Triangular and rectangular stirrups

Figure 8.5 Slab Casting

Figure 8.6 Ready Mix Concreting





SECTION A-A SECTION B-B SECTION C-C

NOTES:

1. DIMENSIONS SHALL NOT BE MEASURED DIRECTLY FROM THIS DRAWING
2. GRADE OF CONCRETE AND STEEL : M25 & Fe415
3. CLEAR COVER TOREINFORCEMENT IS 30 mm

SSET , KARUKUTTY

M Tech - INDUSTRIAL TRAINING

PROJECT: COMMERCIAL CUM RESIDENTIAL BUILDING

CONSULTANT: ASIA INFRASTRUCTURE ADVISORY PVT Ltd

TITLE:
REINFORCEMENT DETAILS OF BEAM

DWG NOB2

DRAWN AND DESIGNED BY:VRINDA CG

SCALE : NOT TO SCALE

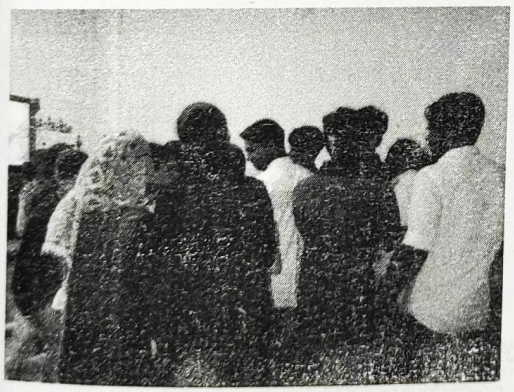
CHAPTER 9

CONCLUSIONS

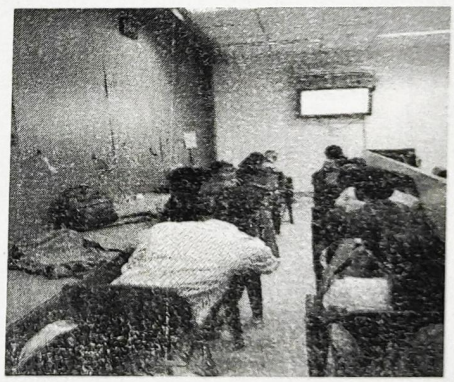
The industrial training helped me to gain ample exposure to various field practices in the analysis and design of multi-storied buildings, and also in various construction techniques used in the industry. The analysis was done in ETABS 2017 and detailing was done in AutoCAD 2018. All the structural components were designed manually. Though the use of software (ETABS 2017) offers saving in time, the calculations are not appropriate. It takes value on the safer side than manual design. The designing was done according to standard specifications of various codes to the possible extend. The various difficulties encountered in the design process and various constraints faced by the structural engineer in designing were well understood. This training helped to understand and analyze the structural problem faced by the construction industry. Site visit also gave exposure to the industry.

Industrial Training at BSNL (15/06/2017-29/06/2017)

A two weeks training program was arranged for the students in BSNL at Thrissur, Kochi and Trivandrum. Training was conducted by an eminent panel of highly qualified trainers and concepts of transmission system, optic fibrecoomunication,Spicing process,2G, 3G, 4G data transfer method, satellite communication, etc were covered. The training helped students correlate theory with industrial applications and ignite interest in the field of communication.Students were exposed to solve some of the real time issues .They were familiarized with different equipments used in Mobile Communication. The students have visited Satellite Station, other BSNL offices like BSNL



Muvattupuzha, BSNL Chembukavu, Mission Quarters, Thrissur.



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8	MERIN PAPPACHAN
9	MOHAMED SYED BAVA
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11	NITIN SATISH
12	NOURIN P N
13	PRAJITH P
14	PRANAV P S
15	PREETHY SOMARAJAN PILLAI NAIR
16	RESHMA RADHAKRISHNAN
17	RICHA SUSAN VARGHESE
18	ROHIT P. R.
19	ROJAN THAMBI
20	SANGEETH S G
21	SHRUTHI SUDHIR NAIR
22	SREELAKSHMI S
23	VISMAYA P

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(भारत सरकार का उद्यम A Govt.of India Enterprise)
प्रधान महाप्रबंधक का कार्यालय O/o Principal General Manager
एरणाकुलम कोची Ernakulam, Kochi-682016

To

The Principal
SCMS School of Engineering & Technology,
Karukutty, Ernakulam 683 582

No./TRG/INPLANT/2017-18/02 **dated 13/04/2017.**

Sir,

Sub:- Summer Industrial Training for Engineering Students-Reg..

BSNL is imparting training for Engineering Students during May – June- July 2017 as part of summer vocational training. This vocational training is meant for the Engineering students in the stream of Electronics and Communications, Information Technology, Computer Sciences & Electrical who are studying in the 1st, 2nd and 3rd year of Engineering Curriculum.

The vocational training offered through this module is more of application oriented in nature. In the current model, we add value to the knowledge of the students by giving them structured contents, classroom sessions and guided field sessions.

Certificates will be issued to the participating students after completion of their trainings. As reference reading, the participants will be given a reference manual published by the training centre of BSNL, by mail which also serves as course material.

Students are advised that after getting exposed to all the technologies, they may in their final year, choose one of the areas for doing their final year project with BSNL Training Centers where further in-depth inputs will be given on their choice of specialization.

The training structure envisages visit to a Telephone Exchange building, Switching Equipments, Local Network, Transmission centre and Mobile Installations to familiarize the students with all the main Telecommunication Technologies namely Switching, OFC, FTTH, GSM Mobile, CDMA, Broadband, TCP-IP, NGN Systems and to give an exposure with the working Telecommunication equipment deployed in BSNL.

The training contents consists of Telecom Networks, Fundamentals of Data Communication, IP Net work services, Broadband ADSL Technology, Wi-Fi, Wi-Max, GSM, GPRS,EDGE and 3G, Telecom CPE, Telecom switching and Transmission equipments, Optical Fibre Systems, SMPS power Plants and VRLA Battery, NGN Systems.

The aim of the vocational training is to equip the students for selecting the areas of their choice to enter the Telecom Industry.

The training will be conducted at BSNL Bhavan Conference hall during May, June and July 2017 or as per the requirement if the institution sponsors of a batch of minimum 35 students. The duration of the training is for 5 days / 30 sessions. The training **fee is Rs.3000/- + Service tax @ 15 %.(Total Rs.3450/-) subject to be revised as per Corporate Office orders.**

The fee is to be remitted in advance by cash or DD drawn on any Nationalized / Scheduled Bank in favour of Accounts Officer (cash), O/o the PGMT, BSNL, Ernakulam payable at Ernakulam.

It is requested that wide publicity may please be given among the students so that they can avail of this opportunity to enhance their skills. A copy of an application form is enclosed herewith.

For any further queries the following officer can be contacted.

Name	Designation	e-mail ID	Tel. Number	Mobile Number
Roja R	SDE Training	sdelegal123@gmail.com	(O) 0484-2375151 Fax-0484-2378282	9446466655

Yours sincerely

G Muraleedharan, ITS
Principal General Manager Telecom
BSNL, Ernakulam

INDUSTRIAL TRAINING AT KELTRON (15/06/2017-29/06/2017)

Keltron is a multi-product multi-centric organization based in Kerala producing a wide of products starting from discrete electronics components to complex equipment and systems. The mission of Keltron is to transform itself to one of the Navratna corporations of the country. To achieve this mission, the organization has set a clearly defined strategy in motion encompassing its core strengths: experienced human resources, robust infrastructure for high quality manufacture, commitment to quality, and continuous research and development. Students were made familiarized with different branches of KELTRON all over Kerala and their products. That were introduced to functioning of different machineries used for the production, like lathe,shaping machines, cutter etc. The group was lead by MrJayrajan. They also familiarized the SECURITY & SURVEILLANCE SYSTEMS and got introduced to various types of cctv and their working. Different

types of CCTV like IR CCTV ,Imobile CCTV ,Rotating CCTV etc were introduced.They were provided knowledge onPCB soldering, testing facility and sea mine development facilityshowing the complete production of a high power inverter that was under production at the facility. The inverter is used for huge factories and power plants.The transformer winding section was also shown.

Report on Intership Programme

at

BMW EVM Autokraft, Kalamassery, Kochi

Prepared by

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Semester II
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EVM AUTOKRAFT INDIA PRIVATE LIMITED • KALAMASSERY

For EVM Autokraft India Private Limited

Authorized Signatory

Report on Intership Programme at
BMW EVM Autokraft, Kalamassery, Kochi

1. Introduction

BMW EVM Autokraft at Kalamassery are dealers of all BMW models. Housed in a facility of nearly 45,000 square feet with the showroom and the service center built on an area of 16,500 square feet. it offers the customers an entire range of display of all BMW models besides a selective display of BMW M Sedans and Coupes. The opportunity to undergo an internship at EVM autokraft to understand the technologies that makes BMW stand apart in the automotive field was indeed a worthwhile experience.

1.1 History of BMW

BMW is a German multinational company which produces automobiles and motorcycles. The company was founded in 1916 as a manufacturer of aircraft engines, which it produced from 1917 until 1918 and again from 1933 to 1945.

1.2 General View

Automobiles are marketed under the brands BMW, Mini and Rolls-Royce, and motorcycles are marketed under the brand BMW Motorrad. In 2015, BMW was the world's twelfth largest producer of motor vehicles, with 2,279,503 vehicles produced.

BMW is headquartered in Munich and produces motor vehicles in Germany, Brazil, China, India, South Africa, the United Kingdom, and the United States.

Motto: Sheer Driving Pleasure (worldwide) ; The Ultimate Driving Machine (US, UK, Australia) ; The Ultimate Driving Experience (Canada)

The current model lines of BMW automobiles are:

- The **1 Series** (F40) is the entry level to BMW's current model range. Compared to its predecessor it is only produced as a 5-door hatchback body style. A 4-door sedan variant (F52) is also sold in China and Mexico
- The **2 Series** (F22/F23) is BMW's entry level coupes and convertibles. The 2 Series range also consists of the "Active Tourer" (F45) and "Gran Tourer" (F46) body styles, which are 5-seat and 7-seat MPVs respectively..
- The **3 Series** (G20/G21) range is produced in sedan and wagon body styles.

- The **4 Series** (F32/F33/F36) range is produced in 2-door coupe, 2-door convertible and 5-door fastback ("Gran Coupe") body styles.
- The **5 Series** (G30/G31) range is produced in sedan and wagon body styles. A long-wheelbase sedan variant (G38) is also sold in China
- The **7 Series** (G11/G12) range is produced in the 4-door sedan and long-wheelbase sedan body styles.
- The **8 Series** (G14/G15/G16) range is produced in 2-door coupe, 2-door convertible and 4-door fastback ("Gran Coupe") body styles.
- The **X models** consist of the X1 (F48), X2 (F39), X3 (G01), X4 (G02), X5 (G05), and X7 (G07).
- **i models:** The BMW i is a sub-brand of BMW founded in 2011 to design and manufacture plug-in electric vehicles.
- **M models:** BMW produce a number of high-performance derivatives of their cars developed by their BMW M GmbH (previously BMW Motorsport GmbH) subsidiary. Some models have "M" appearance packages that are not performance-enhanced.

*** The letters 'F' and 'G' used above represent the generation of automobiles. 'G' is the latest of them.**

1.3 Technologies that makes BMW different from other leaders of automotive field.

Some of the innovative technologies adopted by BMW are: High Precision Injection, Brake Energy Regeneration and many other intelligent solutions designed to reduce fuel consumption and CO2 emissions.

1.3.1 Brake Energy Regeneration.

With Brake Energy Regeneration, BMW Efficient Dynamics points the way to a more energy-efficient future. As soon as you brake or take your foot off the accelerator, the kinetic energy is captured and fed to the battery. This reduces the amount of power the battery takes from the engine and hence lowers fuel consumption. When the driver presses the accelerator, on the other hand, the alternator is decoupled from the drive train. With fewer components drawing power from the drive train, more of the engine's output can go into accelerating the car.

1.3.2 Intelligent Lightweight Construction.

An intelligent lightweight construction reduces fuel consumption and improves performance. It is an excellent example of how efficient driving combines perfectly with

dynamic driving. Our engineers use lightweight materials such as aluminium in, for example, the front end and the body shell, which reduces the weight and guarantees extremely high torsional stiffness. The engines and power trains contain ultra-modern magnesium alloys, which not only saves up to 24% in weight, but also improves the dynamic vehicle behaviour thanks to a balanced weight distribution between front and rear axle.

Acknowledgement:

I offer my acknowledgement and thanks to the team EVM autocraft and offer my special thanks to Mr. Benson Baby Augustin, Manager- HR and Mr. Rupesh.