EXPERIMENTAL INVESTIGATION ON PERVIOUS CONCRETE

A PROJECT REPORT

Submitted by

KIRUTHIGA S (621818103002)

PALPANDI K (621818103003)

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

CIVIL ENGINEERING

PGP COLLEGE OF ENGINEERING AND TECHNOLOGY

NAMAKKAL - 637 003

ANNA UNIVERSITY: CHENNAI 600 025

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BONAFIDE CERTIFICATE

This is certify the project report titled **"EXPERIMENTAL INVESTIGATION ON PERVIOUS CONCRETE"** is the bonafide record of work done by **KIRUTHIGA S (621818103002),** and **PALPANDI K (621818103003),** who carried out the project work under my supervision. Certified further that to the best of my knowledge the work reported herein does not from part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

We thank God almighty for his blessing he had showered on us for successful completion of our project "**EXPERIMENTAL INVESTIGATION ON PERVIOUS CONCRETE**".

We are grateful to our **Parents** for their everlasting inspiration and support without which this project would not have been a success.

With pleasure we express my sincere gratitude to our beloved Chairman **Dr.PALANI G.PERIYASAMI, M.A., PH.D (USA),** and also to our beloved and adored Correspondent **Mr.M.GANAPATHI**, IFS for his moral support and deeds in bringing out the project successfully.

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ABSTRACT

Pervious concrete made from uniform graded material consisting of Portland Pozzolana Cement aggregate, Admixtures and Water. Because pervious concrete contains no fine aggregates such as sand, it is sometimes referred to as "no fines" concrete. It is a special type of concrete having a high void content of about 30%,and is becoming popular nowadays due to its potential of reduce water runoff of the drainage systems which can provide a water flow around 0.34cm/second. In this project, detailed various literature has been under taken to fully understand the properties and applications of pervious concrete. An alternate has been made to develop a mix of pervious concrete and compare with that of the conventional concrete. The strength properties of hardened concrete include compressive strength of cube, split tensile strength of cylinder, flexural strength of prism, load deflection behavior of beam for various mix proportions have been studied. Based on the results of the experimental study, some important conclusions have been drawn.

Key words: Permeability concrete, Sika plast, Water absorption.

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A_{st} - Area of tensile steel mm

A_{sc} - Area of compressive steel in mm

A_{sv} - Total cross sectional area of stirrups in mm

M_u - Bending moment

V- Shear force

D - Overall depth of slab /beam in mm

d - Effective depth of slab/beam in mm

d_c - Effective cover

L_x- Length of shorter span

L_y - Length of longer span

L_e- Effective length in mm

f_{ck}- Characteristic compressive strength of concrete in n/m

f_y - Characteristic strength of steel in n/mm

P_t - Percentage of steel S - Spacing of stirrups

W_u - Ultimate permissible shear stress of concrete in n/mm

r_v - Nominal shear stress due to transverse shear in n/mm

E_{min} - Minimum eccentricity in mm

CHAPTER 1

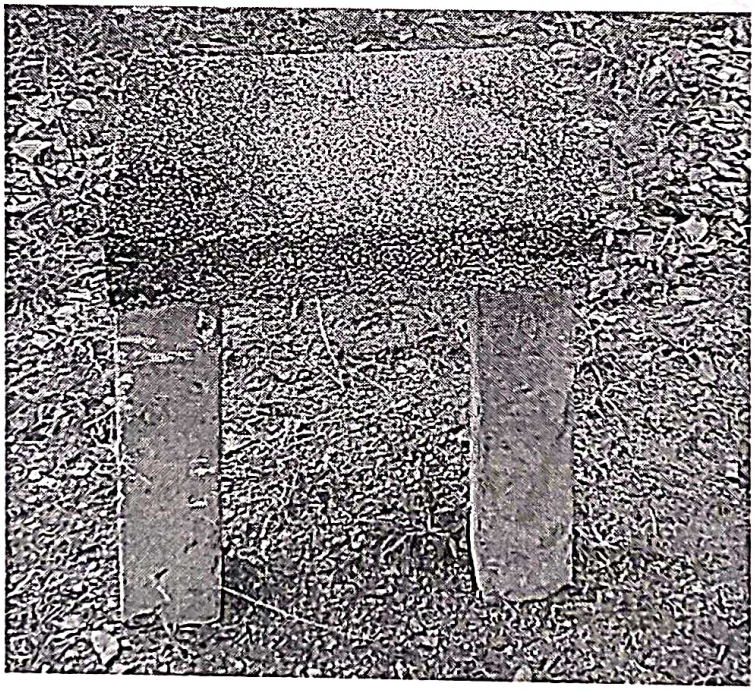
1. INTRODUCTION

1.1. GENERAL

Concrete is a construction material composed of cement, commonly Portland cement as well as other cementations materials such as fly ash and slag cement, coarse aggregate, fine aggregate, fine aggregate such as sand, water and chemical admixtures. Both the fine and coarse aggregate bind together with the fluid cement that hardened over time most concrete used are limited based concrete such as Portland cement concrete or concretes made with other hydraulic cements.

1.2. PERVIOUS CONCRETE

Pervious concrete is a special type of concrete with a high porosity used for concrete Flatwork applications that allows water from precipitation and other sources to pass through it, thereby reducing the runoff from a site and recharging ground water levels.



The void content can range from 18 to 35% with compressive strengths of 400 to 4000psi. The infiltration rate of previous concrete with fall into the range of 2 to 18 gallons per minute per square foot 980 to 720 liters per square meter). Typically pervious concrete has little to no fine aggregate interconnectivity of the voids. There are a number of alternate names foe porous concrete including permeable concrete, porous pavement and pervious concrete. All of the names basically mean the same thing which is porous concrete is a form of concrete is a form of concrete which is permeable.

1.3. USES OF PERVIOUS CONCRETE

Some of the uses of previous concrete are listed below; Pervious concrete is traditionally used in parking areas, areas with light traffic, pedestrian walkways, and green houses. Pervious concrete is an important application for sustainable construction. Porous concrete which is designed to have many voids to trap water and allow it to penetrate through the concrete to the ground below. This concrete does not use fine aggregates in the mixture that why it has more voids than conventional concrete. It s very suitable for people who are concerned about uselessly into the ocean. Portland cement and water that allows for rapid infiltration of water overlays a stone aggregate reservoir. The water permeating, water-draining and water- retaining performances of this porous extension, as well as for plant bedding and permeable gutters. Porous concrete pavement can potentially infiltrate storm water at source which will allow the oils form car sand trucks to biodegrade safely, improve driving safety, reduce traffic noise and also reduce urban temperatures. There had been numerous studies through out others country on porous concrete and their application like road pavement, fishing bank and even for sidewalk.

1.4. ADVANTAGES OF PERVIOUS CONCRETE

The following are some of the advantages of previous concrete,

Porous concrete can help route storm runoff and rain directly into the soil where it can nourish gardens and flow downs into the water table.

It also can be made with recycled materials including recycled concrete rubble and recycling aggregates.

It an ecologically friendly and aesthetically pleasing building material.

We totally eliminate the use of fine aggregates in porous concrete.

1.4.1 BRIEF HISTORY :

Pervious Concrete has been around for hundreds of years. The Europeans recognized the insulating properties in structural pervious concrete for their buildings. Europe and have also used pervious concrete for paving. Stories passed down through the years tell us that soldiers didn't mind walking on pervious roads during World War II because it meant their feet would be dry.

Pervious was brought to the United States after World War II. It first showed up in Florida and other southern coastal states. Slowly migrated to the other states where it has met different successes. As with any new product, it has had to prove itself. Many well intended ready mix producers have produced and many well indented contractors have placed the product and many well intended contractors have placed the product. Some did well, others did not. As it is true with any material and construction techniques, there is a science to it and a best way to conduct the construction. Education and experience is the key to success. The

coastal states have experienced pervious concrete for over 20 years. The hesitation to move into the Midwest and Northern States was mainly due to freeze/thaw concerns. Now that those concerns are no longer considered problem.

In the 1990's the U.S. Environmental Protection Administration(EPA) came out with the Clean Water Act (CWA), that later led to other phases of implementation to preserve the water says from storm water borne pollutants. EPA identifies "storms water run off generated when precipitation from rain and snow malt events flow over land pervious surfaces and does not percolate into the ground. As the run off lows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediments or other pollutants that could adversely affect water quality the runoff is discharged untreated. The primary method to control storm water discharges is the use of best management practices (BMPs)" (EPA.gov). Pervious concrete one of many BMP'S recognized by the EPA as well as our local American Public Works Association (APWA) and the Mid America Regional Council (MARC). Basically, it requires the developer owner to keep as much storm water on property as possible If storm water leaves the property it must leave cleaning and detainment of storm water.

1.5. MAJOR APPLICATIONS PF PERIOUS CONCRETE:

- Low-volume pavements
- Residential roads, alleys, and driveways
- Sidewalks and pathways
- Parking areas
- Low water crossings
- Tennis courts

- Sub base for conventional concrete pavements
- Slop stabilization
- Well linings
- Hydraulic structures
- Swimming pool decks
- Pavements edge drains and Tree grates in sidewalks Groins and seawalls
- Noise barriers
- Walls (including load-bearing)

1.5.1. General Properties of Pervious Concrete:

The plastic pervious concrete mixture is stiff compared to traditional concrete. Slumps, when measured, are generally less than 20 mm, although slumps as high as 50 mm have been used. However, slump of pervious concrete has no correlation with its work ability and hence should not be specified as an acceptance criterion. Typically densities and void contents are on the order of 1600 kg/m^3 and 20 to 25% respectively. The infiltration rate (permeability) of pervious concrete will vary with aggregate size and density of the mixture, but will fall into the range of 80 to 720 liters per minute per square meter. A moderate porosity pervious concrete pavement system will typically have a permeability of 143 liters per minute per square meter. Perhaps now here in the world wide one see such a heavy rainfall. In contrast the steady in filtration rate of soil ranges from 25 mm/hr.

This clearly suggests that unless the pervious concrete is severely clogged up due to possibly poor maintenance it is unlikely that the permeability of previous concrete is the controlling factor in estimating runoff (if any) from a previous concrete pavement. For a given rainfall intensity the amount of runoff from a previous concrete pavement system is

controlled by the soil infiltration rate and the amount of water storage available in the previous concrete and aggregate base (if any) under the previous concrete.

Generally forgiven mixture proportion strength and permeability of previous concrete are a function of the concrete density. Greater the amount possible to duplicate the in-place consolidation levels in a pervious concrete pavement one has to be caution in interpreting the properties of pervious concrete specimens prepared in the laboratory. Such specimens may be adequate for quality assurance namely to ensure that the supplied concrete meets specifications. Core testing is recommended or knowing the in-place properties of the pervious concrete pavement. The relationship between the w/cm can result in the paste flowing from the aggregate and filling the void structure. A low w/cm can result in reduced adhesion between aggregate particles and placement problems. Flexural strength in pervious concretes generally ranges between about 1 MPa and 3.8 MPa. Numerous successful project have been successfully executed and have lasted several winters in harsh Northern climates. This impossibly because pervious concrete is unlikely to remain saturated in the field.

The freeze that resistance of pervious concrete can be enhanced by the following measures.

- Use of fine aggregates to increase strength and slightly reduce voids content to about 20%.
- Use of air-entertainment of the paste.
- Use of a perforated PVC pipe in the aggregated base to capture all the water and let it drain away below the pavement. Abrasion and raveling could be a problem. Good curing practices and appropriate w/cm (not too low) is important to reduce raveling. Whereas serve raveling's

unacceptable some loose stones on a finished pavement is always expected. Use of snow ploughs could increase raveling. A plastic or rubber shield at the base of the plough blade may help to damage to the pavement.

1.5.2 Benefits of Pervious Concrete:

Pervious concrete pavement systems provide a valuable storm water management tool under the requirements of the EPA Strom Water phase II Final Rule Phase II regulations provide programs and practices to help control the amount of containments in our waterways. Impervious pavement particularly parking lots collect oil, anti-freeze, and other automobile fluids that can be washed into streams, lakes, and oceans when it rains. EPA Strom Water regulations set limits on the levels of pollution in our streams and lakes. To meet these regulations, local officials have considered two basic approaches. They are

- Reduce the overall runoff from an area
- Reduce the level of pollution contains in runoff

Efforts to reduce runoff include zoning ordinances and regulations that reduce the amount of impervious surfaces in new developments (including paring and roof areas), increased green space requirements, and implementation of "storm water utility districts" that levy an impact fee on a property owner based on the amount of impervious area. Efforts to reduce the level of pollution from storm water include requirements for develops to provide system that collect the "first flush" of rainfall, usually about 25 mm, and "treat" the pollution prior to release. Pervious concrete pavement reduces or eliminates runoff and permits " treatment" of pollution: two studies conducted on the long-term pollutant removal in porous pavements suggest high pollutant removal rates. By capturing the first flush of rainfall

and allowing it to percolate into the ground , soil chemistry and biology are allowed to "treat" Furthermore, by collecting rainfall and allowing it to infiltrate, ground water and aquifer recharge is increased, peak water flow through drainage channels is reduced and flooding is minimized. In fact, the EPA named pervious pavements as a BMP for storm water pollution prevention (EPA 1999) because they allow fluids to percolate into the soil. Another important factor leading to renewed interest in pervious concrete is an increasing emphasis on sustainable construction. Because of its benefits in controlling storm water runoff and pollution prevention, pervious concrete has the potential to help earna credit point in the U.S. Green Building Council's Leadership in Energy Environmental Design(LEED)Green Building Rating System, increasing the chance to obtain LEED project certification. This credit is in addition to other LEED credits that may be earned through the use of concrete for its other environmental benefits, such as reducing heat island effects recycled content and regional materials. The light color of concrete pavements absorbs less heat from solar radiation than darker pavements, and the relatively open pore structure of pervious concrete stores less heat, helping to lower heat island effects in urban areas. Further reducing heat island effects. Pervious concrete pavement is ideal for protecting trees in a paved environment. (Many plants have difficulty growing in areas covered by impervious pavements, sidewalks and landscaping, because air and water have difficulty getting to the roots.) Pervious concrete pavements or sidewalks allow adjacent trees to receive more air and water and still permit full use of the pavement pervious concrete provides a solution for landscapers and architects who wish to use greenery in parking lots and paved urban areas. Although high-traffic pavements are not a typical use for pervious concrete, concretes surfaces also can improve safety during rainstorms by eliminating bonding (and glare at night), spraying, and risk of hydroplaning.

CHAPTER 2

2. LITERATURE REVIEW

1. Karthik H.Obla (2010) Investigated that Pervious concrete is a special high porosity concrete used for flatwork application that allows water from precipitation and other sources to pass through, thereby reducing the runoff from a site and recharging ground water levels. Its void content ranges from 18 to 35% with compressive strengths 28 to 281kg/cm^2.The pervious concrete will fall into the range 80 to 720 per minute per square meter. Typically, Pervious concrete has little or no fine aggregate and just enough cementations paste to coat the coarse aggregate particles while preserving the interconnectivity of the voids.

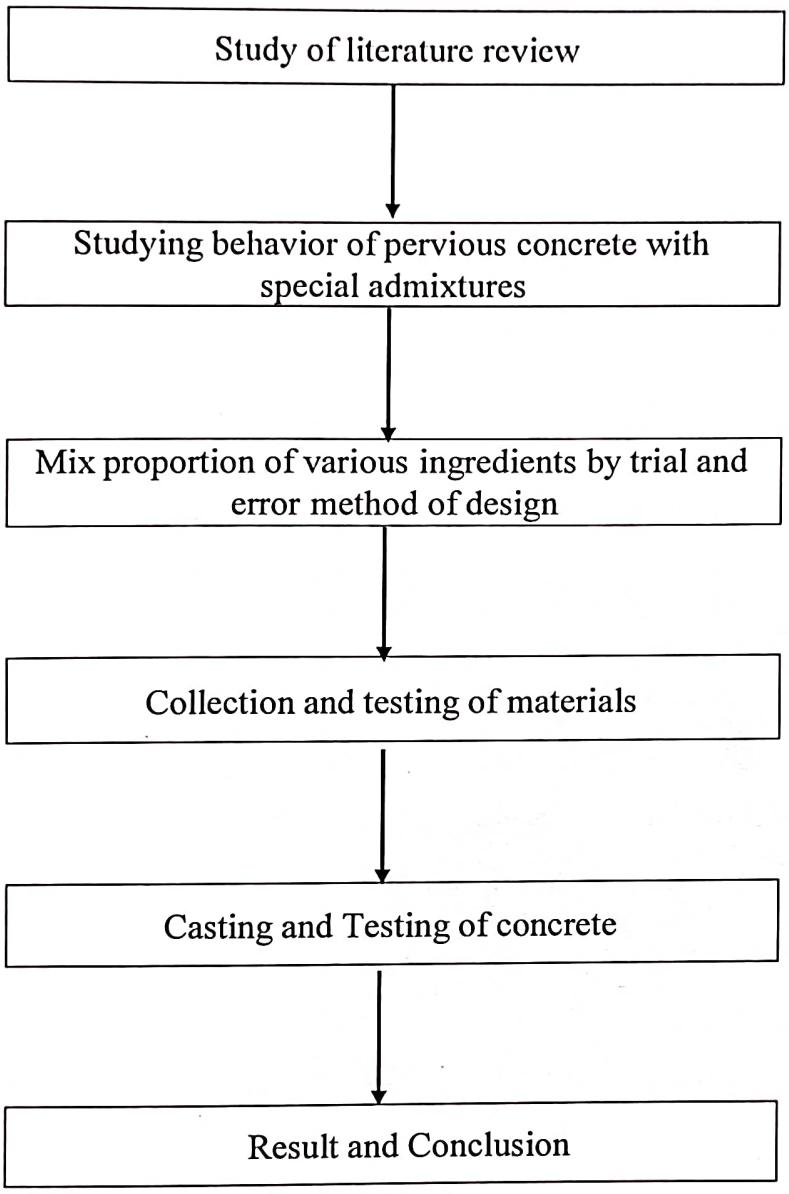
2. Baoshan huang(2009) studied the balance between permeability and strength properties of polymer – modified pervious concrete(PMPC). In addition to latex, natural sand and fiber were included to enhance the strength properties of pervious concrete. The test results indicate that it was possible to produce pervious concrete mixture with acceptable permeability and strength through the combination of latex and sand, pervious concrete has been increasingly used to reduce the amount of Run off water and improve the water quality near pavements and parking lots. However, due to the significantly reduced strength associated with the high porosity, pervious concrete mixtures currently cannot be used in highway pavement structures. A laboratory experiment was conducted in this study to improve the strength properties of pervious concrete through the incorporation of latex polymer.

3. **Ming- JuLee, Ming-Gin Lee Yishuo Huang, and Chia-Liang Chiang in** "Purification Study of Pervious Concrete Pavement studied by capturing storm water and allowing it to seep into the ground, previous concrete is instrumental in recharging groundwater, reducing storm water runoff, and meeting U.S . Environmental Protection Agency storm water regulations. In this research, water quality and pollutants leached from pervious concrete pavement was investigated. This project mainly aims to study the pervious concrete pavement by pollutants such as acid rain, sea water or waste lubricating oil. The results show that pollutant and water purification of pervious concrete pavement both significantly improved in the acid rain, sea water or waste motor oil test. A diluted sulfuric acid solution (PH value 2) after the pervious concrete pavement system could significantly enhance its PH value to 6.5 above. This study demonstrates that implementing pervious concrete pavement is valuable for road design and hydrologic consideration. Two tests has been seen here

- Strength and water Penetration Testing.
- Pervious Pavement Test Box and Water pollutant test variables

CHAPTER 3

3. METHODOLOGY



CHAPTER 4

4. MATERIALS

4.1 COARSE AGGREGATES:

Aggregates were first considered to simply be filler for concrete to reduce the amount of cement required. However, it is now known that the type of aggregate used for concrete can have considerable effects on the plastic and hardened state properties of concrete. They can form 80% of the concrete mix so their properties are crucial to the properties of concrete. Aggregates can be broadly classified into four different categories: these are heavyweight, normal weight, lightweight and ultra-lightweight aggregates. However inmost concrete practices only normal weight and lightweight aggregates are used. The other types of aggregates are for specialist uses, such as nuclear radiation shielding provided by heavyweight concrete and thermal insulation using light weight concrete.

4.1.1 Classification Of Aggregates:

The alternative used in the manufacture of good quality concrete, is to obtain the aggregate in at least two size groups, i.e.:

- Fine aggregate often called sand which are less than 4.75mm in size.
- Coarse aggregate, which comprises material greater than 4.75mmin size.

On the other hand, there are some properties possessed by the aggregate but absent in the parent rock: particle shape and size, surface texture, and absorption. All these properties have a considerable influence on the quality of the concrete, either in fresher in the hard understate. It has been found that

aggregate may appear to be unsatisfactory on some count but no trouble need be experienced when it is used in concrete

4.1.2 Aggregate Properties:

By selecting different sizes and types of aggregates and different ratios of aggregate to cement ratios, a wide range of concrete can be produced economically to suit different requirements. Important properties of an aggregate which affect the performance of a concrete are discussed as follows:

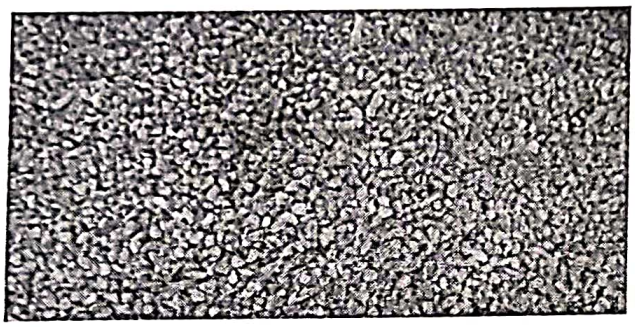


Fig 4.1 10mm coarse aggregates

Sampling:

Samples shall be representative and certain precautions in sampling have to be made. No detailed procedures can be laid down as the conditions and situations involved in taking samples in the field can vary widely from case to case. Nevertheless, a user can obtain reliable results bearing in mind that the sample taken is to be representative of the bulk of the material. The main sample shall be made up of portions drawn from different parts of the whole. In the case of stock piles, the sample obtained is variable or

segregated, a large number of increments should be taken and a larger sample should be dispatched for testing. Particle shape and texture:

Roundness measures the relative sharpness or angularity of the edges and corners of a particle. Roundness is controlled largely by the strength and abrasion resistance of the parent rock and by the amount of wear to which the particle has been subjected. In the case of crushed aggregate, the particle shape depends not only on the nature of the parent rock but also on the type of crusher and its reduction ratio, i.e. the ratio of these size of material fed into the crusher to the size of the finished product. Particles with a high ratio of surface area to volume are also of particular interest for a given workability of the control mix. Elongated and flaky particles are departed from equip-dimensional shape of particles and have a larger surface area and pack in an isotropic manner.

Flaky particles affect the durability of concrete, as the particles tend to be oriented in one plane, with bleeding water and air voids forming underneath. The flakiness and elongation tests are useful for general assessment of aggregate but they do not adequately describe the particle shape. The presence of elongated particles in excess of 10 to 15% of the mass of coarse aggregate is generally undesirable, but no recognized limits are laid down. Surface texture of the aggregate affects its bond to the cement paste and also influence the water demand of the mix, especially in the case of fine aggregate. The shape and surface texture of aggregate influence considerably the strength of concrete. The effects of shape and texture are particularly significant in the case of high strength concrete.

The full role of shape and texture of aggregate in the development of concrete strength is not known, but possibly a rougher texture results in a larger adhesive force between the particles and the cement matrix. The shape

and texture of fine aggregate have a significant effect on the water requirement of the mix made with the given aggregate. If these properties of fine aggregate are expressed indirectly by its packing, i.e. By the percentage voids in a loose condition, then the influence on the water requirement is quite definite. The influence of the voids in coarse aggregate is less definite. Flakiness and shape of coarse aggregates have an appreciable effect on the workability of concrete.

4.1.3. Bond of aggregate:

Bond between aggregate and cement paste is an important factor in the strength of concrete, but the nature of bond is not fully understood. Bond is to the inter locking of the aggregate and the hydrated cement paste due to the roughness of the surface of the former. A rougher surface, such as that of crushed particles, results in a better bond due to mechanical interlocking; better bond is not usually obtained with softer, porous, and minor logically heterogeneous particles. Bond is affected by the physical and chemical properties of aggregate. For good development of bond, it is necessary that the aggregate surface be clean and free from adhering clay particles .The determination of the quality of bond of aggregate is difficult and no accepted tests exist. Generally, when bond is good, a crushed specimen of normal strength concrete should contain some aggregate particles broken right through, in addition to the more numerous ones pulled out from their sockets. An excess of fractured particles, might suggest that the aggregate is too weak.

4.1.4. Strength of aggregate:

The compressive strength of concrete cannot significantly exceed that of the major part of the aggregate contained. If the aggregate under test leads to a lower compressive strength of concrete, and in particular if numerous individual aggregate particles appear fractured after the concrete specimen has been crushed, then the strength of the aggregate is lower than the nominal compressive strength of the concrete mix. Such aggregate can be used only in a concrete of lower strength. The influence of aggregate on the strength of concrete is not only due to the mechanical strength of the aggregate but also, to a considerable degree, to its absorption and bond characteristics. In general, the strength of aggregate depends on its composition, texture and structure. Thus a low strength may be due to the weakness of constituent grains or the grains may be strong but not well knit or cemented together. A test to measure the compressive strength of prepared rock cylinders used to be prescribed. However, the results of such a test are affected by the presence of planes of weakness in the rock that may not be significant once the rock has been reduced to the size used in concrete. In essence the crushing strength test measures the quality of the parent rock rather than the quality of the aggregate as used in concrete. For this reason the test is rarely used. Crushing value testBIS:812-1990, measures the resistance to pulverization. There is no obvious physical relation between this crushing value and the compressive strength, but the results of the two tests are usually in agreement.

4.1.5. Deleterious Substances Of Aggregate:

For satisfactory performance, concrete aggregate should be free of deleterious materials. There are three categories of deleterious substances that may be found in aggregates: impurities, coatings and weak or un sound particles.

4.1.6. Grading Of Fine and Coarse Aggregate:

The actual grading requirements depend on the shape and surface characteristics of the particles. For instance, sharp angular particles with rough surfaces should have a slightly finer grading in order to reduce the possibility of interlocking and to compensate for the high friction between the particles

4.1.7. Maximum Aggregate Size:

Extending the grading of aggregate to a larger maximum size lowers the water requirement of the mix, so that, for a specified workability and cement content, the water cement ratio can be lowered with a consequent increase in strength. Experimental results indicated that above the 38.1mm maximum size the gain in strength due to the reduced water requirement is offset by the detrimental effects of lower bond area of discontinuities introduced by the very large particles. In structural concrete of usual proportions, there is noadvantage in using aggregate with a maximum size greater than about 25 or 40mmwhen compressive strength is a criterion.

The standard type aggregate for use in pervious concrete is typically crushed stone or river gravel. Typical sizes are from 10mm to 25mm. (Tennis et al 2004). Fine aggregates are either used sparingly or removed altogether from the mix design. It has been shown that using smaller aggregates increases the compressive strength of pervious concrete by providing a tighterbond between coarse aggregate and cement. Using fine aggregates in the mix design of pervious concrete will also decrease the void space (Tennis et al 2004). Increasing the percent amount of larger aggregates will increase the void ratio in pervious concrete, but will decrease the compressive strength. Using recycled aggregates has also been researched. Four mix designs were studiedusing 15%, 30%, 50%, and 100% recycled aggregates and compared to the

virgin pervious concrete samples. It was found that samples containing 15% or less recycled aggregates exhibited almost identical characteristic to the virgin sample.

The size of the aggregate also has an important role in pervious concrete. While a 20mm aggregate size allows for greater void space, a 20mm aggregate improves the workability. The use of 10mm aggregate can decrease settling and work ability. Recent studies have also found that pervious concrete with smaller aggregates had higher compressive strength. It was noted that the smaller aggregate sizes allowed for more cementations material to bind around the aggregate and hence allowed for greater contact between the aggregate/binder

4.1.8. Description

Silka plats ® -5201NS is the latest development of super plasticizer for concrete. It meets the requirements for high range water reducing super plasticizer.

4.1.9. Uses

- Silka plast®- 5201NS is a unique malty purpose super plasticizer that is particularly suitable for the production if ready mixed concrete.
- Additionally it provides high water reduction and improved fresh concert characteristics.

- With it is outstanding cast/ performances silka plast®- 5201NS is used for the following a wide range of application where excellent work – ability is requested.
- Concrete with high water reduction. High efficient concrete applications.

Fig 4.2 Concrete Mixing

CHAPTER 5

5. CHARACTERISTICS AND ADVANTAGES

- Silkaplast®- 5201NS is a power full super plasticizer based on advanced technology which gives the following advantages.
- Strong water reduction, resulting in high density, high strength and reduced permeability.
- Less sensitive against variations in aggregate and /or different cement types.
- High efficiency even at low does aggregates.
- Extended workability in conduction with sub/sequent strength development.
- Superior plasticizing effect, resulting in impounds flow, placing compaction characteristics.
- Reduced shrink age during curing and reduced creep when hardened.

MIX PROPORTION:

By using trial and error method we can take as ratio as1:7

1=Cement

7= Coarse Aggregate (10 mm)

CHAPTER 6

6. COLLECTION OF MATERIALS

In this chapter various materials which were used in project are explained along with its properties and method of conducting the test was discussed in detail.

6.1 MATERIAL USED

- Coarse Aggregate
- Cement

Fig 6.1:Portland pozzolana cement

ADMIXTURE

- Super Plasticizer (Silica Plast 5231NS)

CHAPTER 7

7. CASTING AND TESTING OF CONCRETE

7.1 MATERIAL CALCULATION FOR CUBE

volume=3.375*10^-3 m^2 1 m^3=1*1/7*1.54*1440

1m^3=316.8 kg/m^3

Cement=1.0665kg

Coarse aggregate=6.329kg

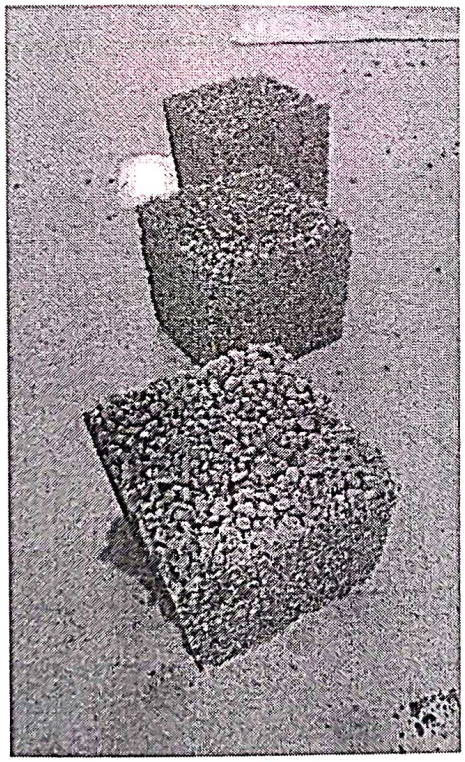


Fig 7.1: Cube

7.2 MATERIAL CALCULATION FOR PRISM

Volume =5*10^-3

=1*1/7*1.54*14401m^3

=316.8kg/m^3

Cement =1.584 kg

Coarse aggregate =9.504kg

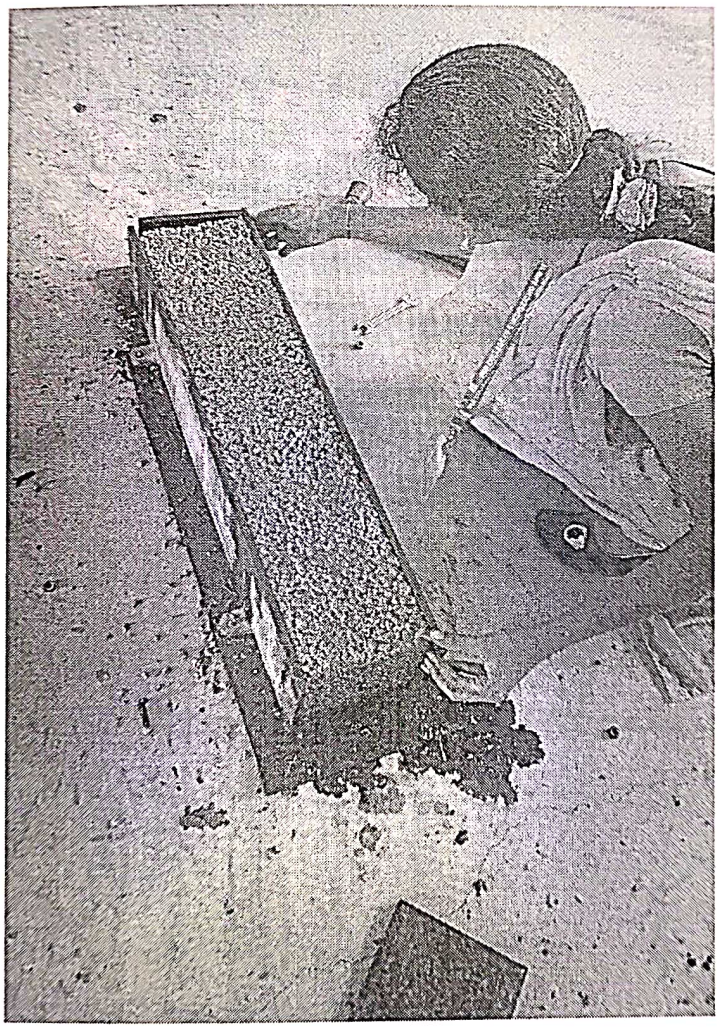


Fig 7.2: Prism

CHAPTER 8

8. CALCULATION

SPECIMEN	CEMENT	COARCE AGGREGATE	WATER CEMENT RATIO	ADMIXTURE
CUBE	1.065kg	6.329kg	0.57	–
PRISM	1.58kg	9.50kg	0.57	–

Table 8. 1: sample 1

SPECIMEN	CEMENT	COARCE AGGREGATE	WATER CEMENT RATIO	ADMIXTURE
CUBE	1.065kg	6.329kg	0.47	2%
PRISM	1.58kg	9.50kg	0.47	2%

Table 8.2: sample 2

ompressive Strength

Cube area =150*150 mm^2

Load =184.94KN

Strength = load /area

=182.94*10^3/22500

=18.13N /mm^2

Concrete Mix	7 Days Load N/M		Strength (N/Mm2)
		m^2	
Conventional Pervious Concrete	289.10	12.84	12.93
	293.19	13.12	
	297.31	13.21	
Pervious Concrete with superplasticiser	320.14	14.22	14.31
	324.12	14.40	
	322.16	14.31	

Table 8.3 Compressive Strength of Concrete

Concrete Mix	14 Days Load N/M		Strength (N/Mm2)
		m²	
Conventional Pervious Concrete	374.21	16.63	16.72
	378.25	16.81	
	376.40	16.72	
Pervious Concrete with superplasticiser	396.11	17.60	17.70
	414.16	18.40	
	385.21	17.12	

Table 8.4 Compressive Strength of Concrete

Concrete Mix	28 Days Load N/M		Strength (N/Mm2)
		m²	
Conventional Pervious Concrete	445.50	19.80	20.27
	433.30	19.25	
	490.12	21.78	
Pervious Concrete with superplasticiser	472.15	20.98	21.07
	489.26	21.74	
	472.17	20.98	

Table 8.5 Compressive Strength of Concrete

Flexural Strength

Modulus of rupture MR = PL (bd^2)

Strength =load /area

=25.64*600/(100*200)^2

=3.82N/mm^2

Concrete Mix	7 Days Load N/M		Strength (N/Mm2)
		m²	
Conventional Pervious Concrete	7.25	0.0015	0.00158
	8.62	0.00178	
	7.14	0.00148	
Pervious Concrete with superplasticiser	9.14	0.00189	0.00213
	10.65	0.00220	
	10.11	0.00230	

Table 8.6 Flexural Strength of Concrete

Concrete Mix	14 Days Load N/M		Strength (N/Mm2)
		m²	
Conventional Pervious Concrete	10.18	0.00211	0.00229
	11.34	0.00235	
	11.68	0.00242	
Pervious Concrete with superplasticiser	12.74	0.00264	0.00272
	13.84	0.00287	
	12.90	0.00267	

Table 8.7 Flexural Strength of Concrete

Concrete Mix	28 Days Load N/M		Strength (N/Mm2)
		m²	
Conventional Pervious Concrete	15.09	0.00312	0.00293
	14.28	0.00296	
	13.15	0.00272	
Pervious Concrete with superplasticiser	17.21	0.00350	0.00350
	16.44	0.00340	
	17.40	0.00360	

Table 8.8 Flexural Strength of Concrete

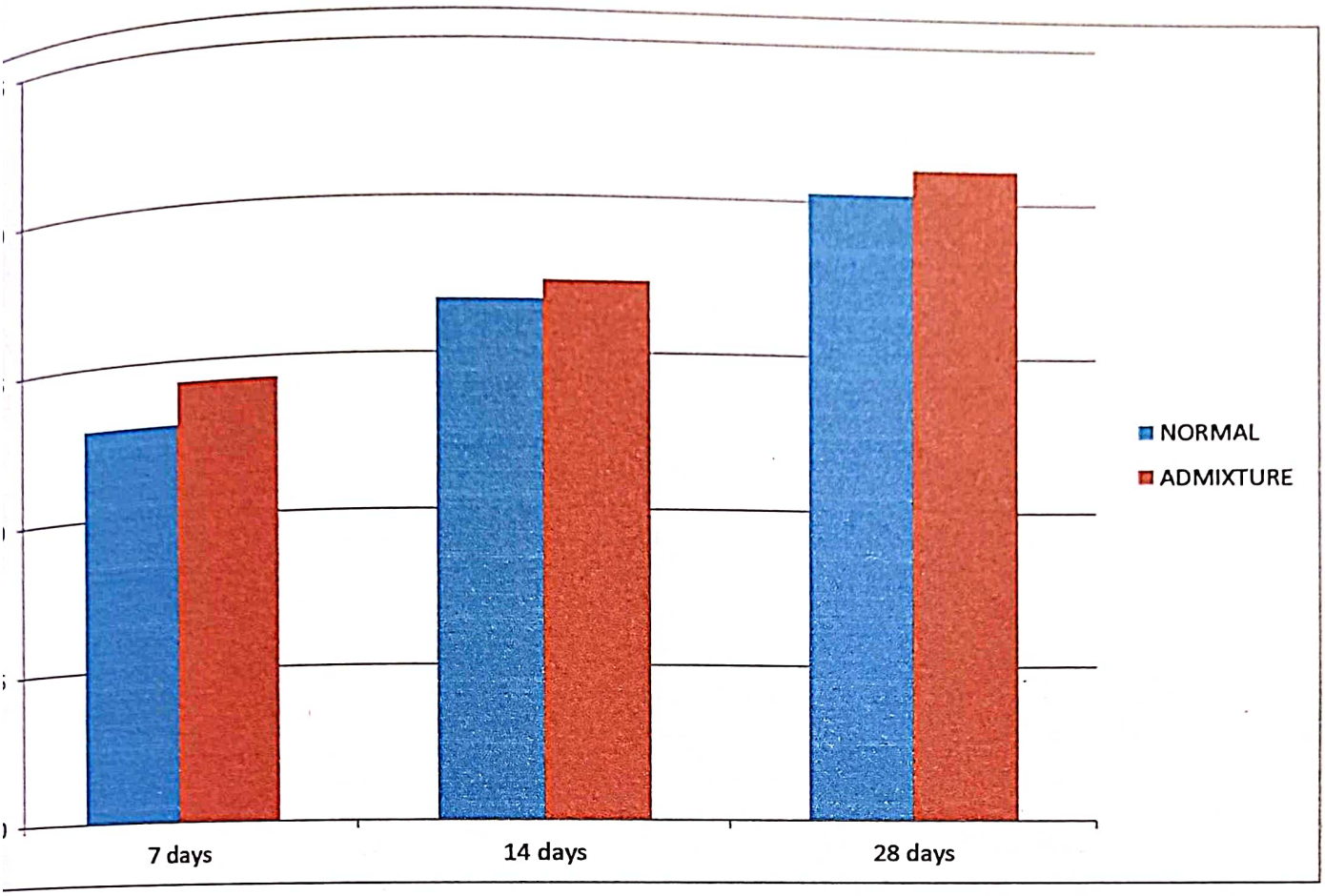


Fig 8.1 Compressive Strength of ordinary pervious concrete VS superplasticiser mixed pervious concrete

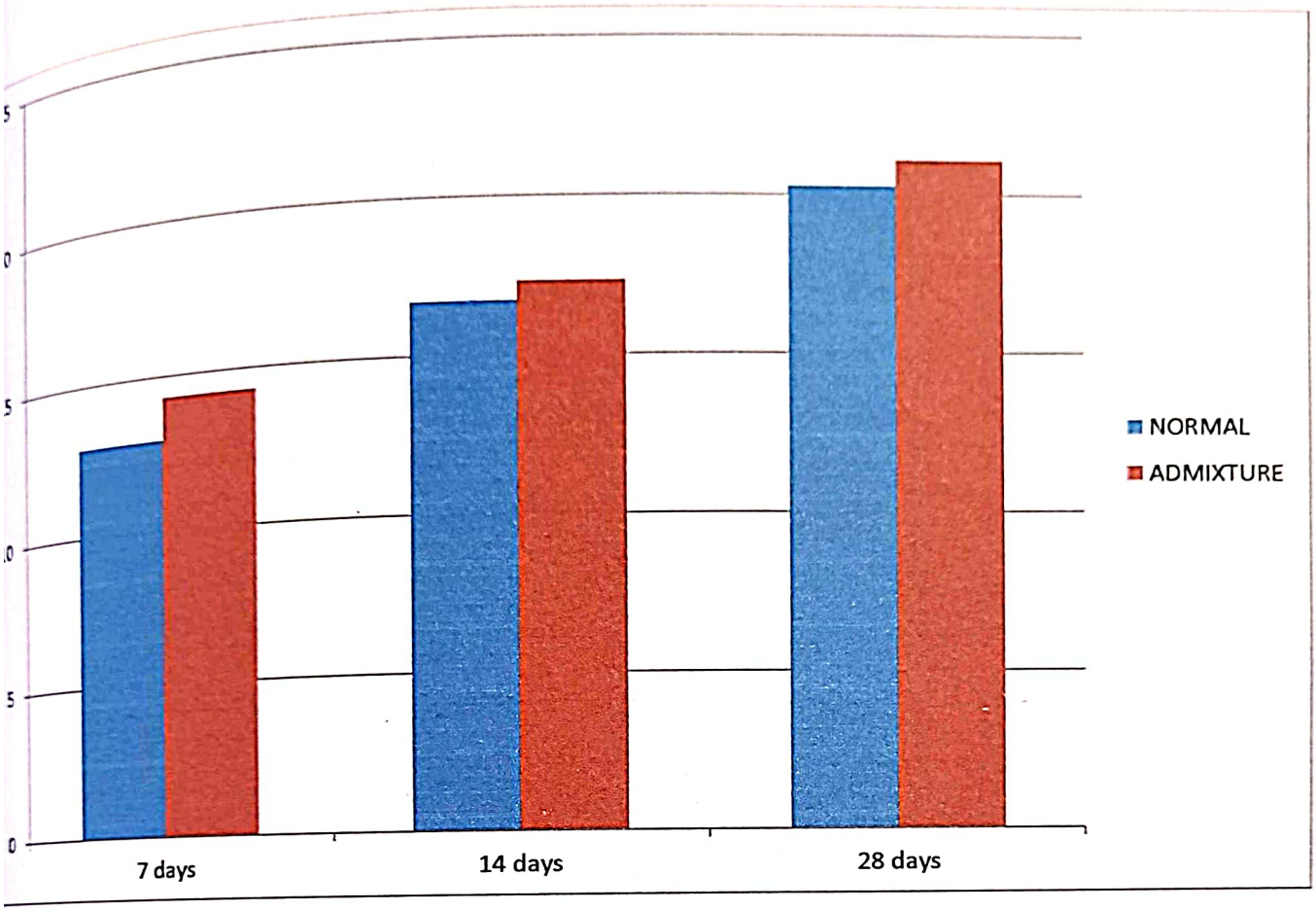


Fig 8.2 flexural Strength of ordinary pervious concrete VS superplasticiser mixed pervious concrete

CHAPTER 9

9. RESULTS AND CONCLUSION

9.1. General

The pervious concrete which when tested by adding the admixtures gives desirable values in certain parameters which is discussed below. Based on the values and after testing in various aspects, the values are compared normal normal pervious concrete and the admixtures mixed pervious concrete.

S.NO	DESCRIPTION	NORMAL PERVIOUS CONCRETE (28 DAYS STRENGTH N/mm²)	ADMIXTURE MIXED PERVIOUS CONCRETE (28 DAYS STRENGTH N/mm ²)	Percentage increase
1.	COMPRES SIVE STRENGTH	13.12	20.28	55%
2.	FLEXU RAL STRENGTH	5.05	8.13	61%

Table 9.1: final results of admixture used and normal pervious and percentage increase

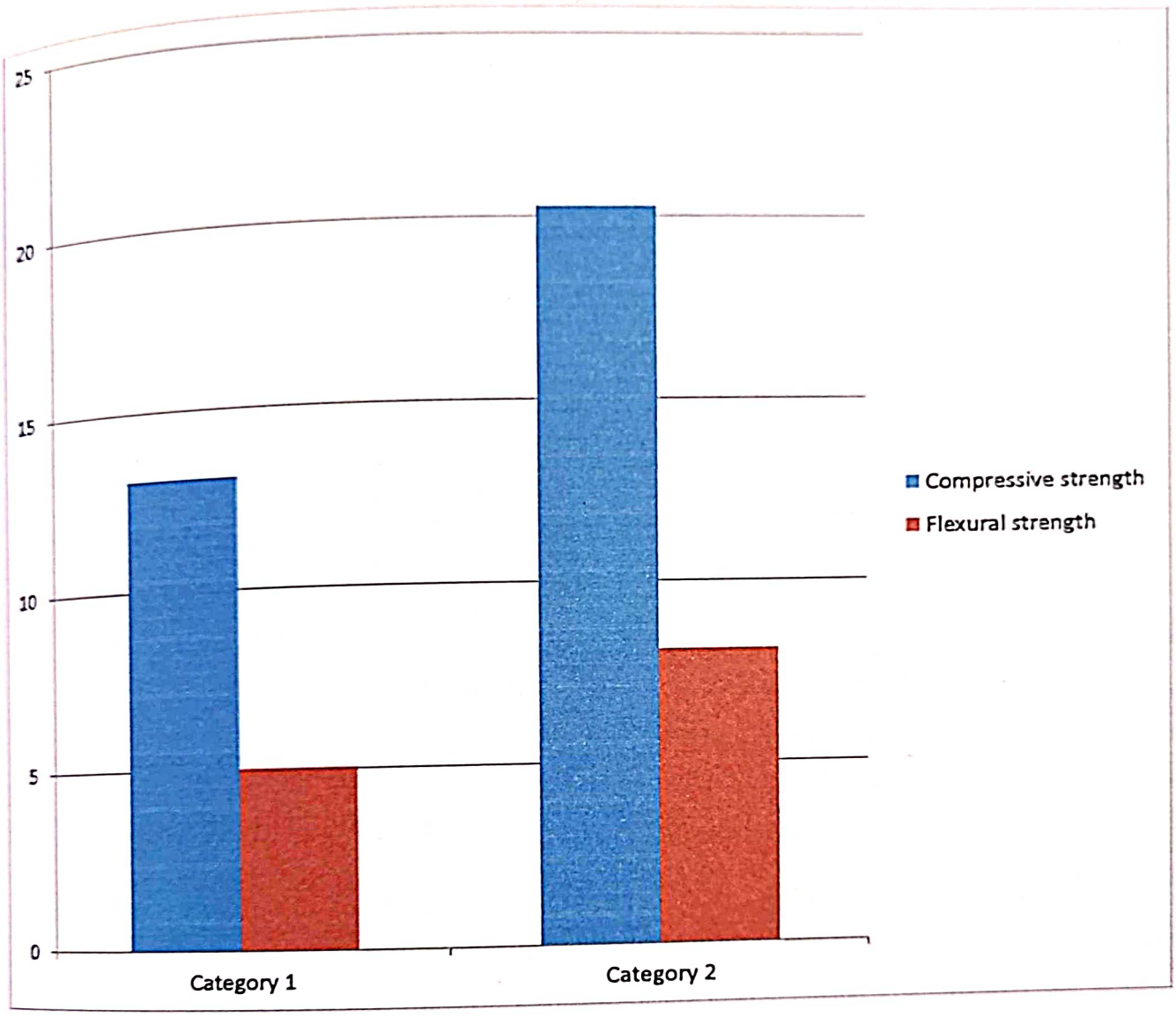


Fig 8.1: Total comparison of strength increase by mixing

The Compressive strength, Flexural strength, Split tensile strength had increased by adding admixtures such silka plast 0.5%. By using these admixtures the above strengths are increased when compared to Normal Pervious Concrete. The Compressive strength has increased by 55%, Flexural strength has increased by 61%, and Split Tensile strength has increased by 40%.

- Achieved greater flexural strength comparing to the normal pervious concrete.
- It also reduces the emission of CO_2 which is produced from the cement because of partial replacement by the silka plast.
- Silka plast is the mineral admixtures which increase the compressive strength in certain aspect and PVA which is the chemical admixture increases the flexural strength in pervious concrete by small amounts.
- These can also be used as sound absorbing walls in classrooms, auditorium etc. This can also be used at railway platforms. This will help in reducing water accumulation on railway tracks, parking lots etc.

9.2 Scope for Further Research

- The strength characteristics of previous concrete can be further studies by taking into account the following parameters:
- By varying the water cement ratio.
- By varying the amount of silica fume and addition of super plasticizers.
- By using some little amount of fine aggregates.
- By using recycled coarse aggregates in the concrete mix as replacement of coarse aggregates.
- Using the super plasticizers in the mixes only by removing silica fume.
- Using different aggregates size and mix ratio.

9.3 Scope for Future Work:

- In the past due to the scarcity of cement, the pervious concrete has been used extensively.
- The pervious concrete has lost its importance after successful production of cement in large quantities.
- But now-a-days, the usage pervious concrete has gained its popularity due to many advantages.
- The urban areas all over the world have become CONCRETE JUNGLES. The discharge of storm water is very difficult problem in the present conditions.
- By using the pervious concrete we can able to recharge the ground water table and the storm water disposal can also be done.
- So, in future to tackle afore said problems and to protect people from flood prone areas, the pervious concrete is one effective solution.

9.4 CONCLUSION

9.4.1 From The Test The Following Conclusions Were Made.

Compressive strength of concrete attained at an age of 7 days is about 60-75% of the compressive strength of the concert attained at an age of 28 days.

The strength can be further increased by adding super plasticizer Sika plast 520 INS when the super plasticizer is added at a rate of 1.5% of the weight of cement.

It was observed that there is an increment in compressive flexural and tensile strength of pervious concrete with super plasticizer when couponed with plain pervious Concrete Mix.

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THE BEHAVIOUR OF REINFORCED CONCRETE BEAM-COLUMN JOINTS UNDER CYCLIC LOADING

PROJECT REPORT

Submitted by

BHAVITHRA DEVI B **621820413001**

In partial fulfillment for the award of the degree of

MASTER OF ENGINEERING

In

STRUCTURAL ENGINEERING

NOV DEC 2021

DEPARTMENT OF CIVIL ENGINEERING

P.G.P COLLEGE OF ENGINEERING AND TECHNOLOGY,

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BONAFIDE CERTIFICATE

Certified that this project report **"THE BEHAVIOUR OF REINFORCED CONCRETE BEAM-COLUMN JOINTS UNDER CYCLIC LOADING"** is the bonafide work of **"BHAVITHRA DEVI B (REG NO: 621820413001)"** who carried out the work under my supervision.

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INTERNAL EXAMINER 4/1/22

EXTERNAL EXAMINER 4/1/22

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ABSTRACT

In recent times, reinforced concrete buildings have become common in India. Earthquakes are considered to be the main causes for structural failure. As far as a framed structure is considered, one of the chief aspects is the vulnerability to the lateral loads like seismic loads and wind load. The other aspect that has to be looked upon is the necessity for suitable strengthening of these structures. This project investigates the behaviour of reinforced concrete beam column joints under the application of high intensity cyclic loading.

The experiments, which were carried out on specimens with a beam framing in on only one side of the joint , were conducted to investigate the amount of transverse reinforcement required for confinement and shear resistance in the joint and column regions, in order to establish the ductility available in the column, when subjected to simulated seismic loading.

One unit were tested during the experimental program, the design parameters being;

I. The amount of transverse reinforcement in the joint.
II. The method of anchoring the beam flexural steel in the joint.
III. The amount of transverse reinforcement in the column.

The type of failure mechanism, and the cause of degradation in stiffness in the post elastic range, is examined for each specimen leading to a critical appraisal of the joint detail.

From the results obtained during testing, recommendations have been suggested for the design of reinforced concrete joints, including ways in which detailing could be improved to enable the load resisting capacity to be sustained during post elastic cycles.

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CHAPTER 1

INTRODUCTION

1.1 GENERAL

Five story building is considered and a weak column beam joint is taken and analysed by using STADD pro. The section is reduced to 1:3 ratio and casted the specimen and tested in cyclic loading frame and find out the loads for each deflections by forward and reverse loading method.

The task of designing earthquake resistant structures has come under close scrutiny during the last decade as the effect of earthquake loading on structural behaviour becomes more apparent. Recent observations have that many buildings, even though they have not been designed for the shown purpose , have the ability to resist earthquakes without undergoing any major structural damage due to the interent safety incorporated in traditional design methods. However the failure of many other buildings subjected to seismic excitation, and the increase knowledge of the earthquake behaviour of such structures in order to establish adequate seismic design criteria.

Prior to this, the design of structures insured that allowable stresses were not exceeded in the elastic range . However, modern earthquake resistant structures are designed on the assumption that, although the large lateral forces induced by a major earthquake in the post elastic range may cause local overstressing, adequate ductility is available to dissipate the energy of the earthquake motions. Thus it is the aim of the more recent design methods to ensure that sufficient post elastic deformation can take place to enable the structure to survive without collapse.

The concept of ductility in reinforced concrete entails much revision of the traditional design procedures which basically depended on concrete for its strength. It does however, lead to more effort and economical

use of construction materials , and increased confidence by engineers in their ability to design structures able to resist the large post-elastic deformations imposed by a severe earthquake.

The behaviour of reinforced concrete moment resisting frame structures in recent earthquakes all over the world has highlighted the consequences of p oor performance of beam column joints. Beam column joints in a reinforced concrete moment resisting frame are crucial zones for transfer of loads effectively between the connecting elements (i.e. beams and columns) in thestructure. In the analysis of reinforced concrete moment resisting frames, the joints are generally assumed as rigid. In Indian practice, the joint is usually neglected for specific design with attention being restricted to provi sion of sufficient anchorage for beam longitudinal reinforcement. This may be acceptable when the frame is not subjected to earthquake loads. There havebeen many catastrophic failures reported in the pastearthquakes, in particular with Turkey and Taiwan earthquakes occurred in 1999, which have been attributed to beamcolumn joints. The poor design practice of beam column joints is compounded by the high demand imposed by the adjoiningflexural members (beams and columns) in the event of mobilizing the inelastic capacities to dissipate seismic energy. Unsafe design and detailing within the joint region jeopardize the entire structure, even if other structural members conform to the design requirements. Since past three decades, extensive research has been carried out on studying the behavior of joints under seismic conditions through experimental and analytical stu dies. Various international codes of practices have been undergoing perio dic revisions to incorporate the research findings into practice. In RC buil dings, portions of columns that are common to beams at their intersec tions are called beam

column joints. Since their constituent materials have limited strengths, the

joints have limited force carrying capacity. When forces larger than these arcapplied during earthquakes, joints are severely damaged. Repairing damaged joints is difficult, and so damage must be avoided. Thus, beam column joints must be designed to resist earthquake effects. Under earthqua ke shaking, the beams adjoining a joint are subjected to moments in the sa me (clockwise or counterclockwise) direction. Under these moments, thetop bars in the beamolumn joint are pulled in one direction and the botto m ones in the opposite direction. These forces are balanced by bond stress d eveloped between concrete and steel in the joint region. If the column is not wide enough or if the strength of concrete in the joint is low, there is insuff icient grip of concrete on the steel bars. In such circumstances, the bar slips inside the joint region, and beams lose their capacity to carry load. Further , under the action of the above pullpush forces at top and bottom ends, joint s undergo geometric distortion; one diagonal length of the joint elongates and the other compresses. If the column crosssectional size is insufficient, t he concrete in the joint develops diagonal cracks.

Types of joints in frames:

The joint is defined as the portion of the column within the depth of the dee pest beam that frames into the column1. In a moment resisting frame, three t ypes of joints can be identified viz. interior joint, exterior joint and corner jo int. Whenfour beams frame into the vertical faces of a column, the joint is c alled as an interior joint. When one beam frames into a vertical face of th e column and two other beams frame from perpendicular directions into the joint, then the joint is called as an exterior joint. When a beam each frames into two adjacent vertical faces of a column, then the joint is called as a corner joint. The severity of forces and demands on the performan ce of these joints calls for greater understanding of their seismic

behaviour. These forces develop complex mechanisms involving bond and shear within the joint.

(i) Interior joint (ii) Exterior joint (iii) Corner Joint

1.2 BEHAVIOUR OF REINFORCED CONCRETE FRAMES:

The recommendations pertaining to ductility in reinforced concrete structures were first proposed by Blume, Newmark and Corning in 1961, which eventually lead to the section in the S.E.A.oc 1968 Revision off "Recommended Lateral Force Requirements" which state that " building more than 160ft. in height shall have ductile moment resisting space frames. The necessary ductility shall be provided by a frame of structural stee or by a reinforced concrete frame. Consequently the behaviour of reinforced concrete frames has been a topic of considerable interest.

Reinforced concrete frames designed as ductile moment-resisting space frames may, depending on the intensity of the earthquake, be subjected to several post – elastic cycles throughout its duration. With each cycle, the accumulation of damage in the failure region means a degradation in stiffness, and since ductility is determined by the ratio of deflection at ultimate to the deflection at first yield, this loss of stiffness tends to increase the apparent ductility of the structure. However the ability for absorption, as indicated by the area under the load-deflection curve, is generally not enhanced due to a loss in load-resisting capacity. Conventional theories based on maintaining the ultimate strength of the structure cannot, therefore, be forgotten in the need to satisfy ductility requirements.

Since energy absorption in reinforced concrete is best achieved by yielding of the flexural reinforcement, care must be taken to ensure that other stress requirements are not underestimated. If a "brittle failure", occurs-that is, one due primarily to bond, shear or compression-little or no ductility is available for post-elastic deformations and collapse of the structure is a likely

outcome. The beam-column joint is a region where shear and bond stresses are critical, and since the strength and ductility of the members cannot be achieved without an adequate connecting detail, the performance of this region can be a decisive factor in determining the overall behaviour of the structure.

1.3 CYCLIC LOADING:

The continuous and repeated application of a load (fluctuating stresses, strain, forces, tensions, etc) on a material or on a structural component that causes degradation of the material and ultimately leads to fatigue. Cyclic loading causes materials to deteriorate due to fatigue, often at lower loads and after a short time than normally expected. An accumulation of plastic strain in then vicinity of the foundation (cyclic creep) which is often accompanied by hardening (in normally consolidation clays or loose sand) or softening of the soil.

1.4 EARTHQUAKE DESIGN PHILOSOPHY:

a) Under minor but frequent shaking, the main members of the building that carry vertical and horizontal forces should not be damaged; however building parts that do not carry load may sustain repairable damage.

b) Under moderate but occasional shaking, the main members may sustain repairable damage, while the other parts of the building may be damaged such that they may even have to be replaced after the earthquake; and

c) Under strong but rare shaking, the main members may sustain severe (even irreparable) damage, but the building should not collapse.

1.5 SCOPE OF THIS PROJECT:

The original purpose of this series of tests was to determine the amount of transverse reinforcement necessary to provide sufficient ductility and energy absorption in the column region immediately adjacent to the joint, by subjecting different specimens to high intensity cyclic loading. For this reason it was necessary to absorb the energy by yielding of the column flexural steel, and therefore the ultimate flexural capacity of the beam was designed to be greater than that of the column, but other requirements for shear, bond and confinement as specified by the code were considered in the design.

The intention was to test specimens with differing amounts of transverse reinforcement in the column, increasing the steel content from nominal ties until the required ductility achieved.

CHAPTER 2
LITERATURE REVIEW

2.1.GENERAL

Park and Paulay (1975) recommends the detailing of joints for the earthquake resistance structures using bent-up bars, stub-beam with bent-up bars and mechanical anchorage for serving as anchorage as well as effective ties for confinement in the joint core of the exterior beam-column joints.

Morita & Fujii (1984), Kanada etal(1985) tests were carried out at the University of Kyoto with the aim of investigating the effect of stirrups in the joint and the influence of different beam bars anchorage types, and some of the following observations were made: The joints with bars bent out of the core (Type 2) had poorer behaviour than the specimen with 90°hooks bent in (Type 1); the presence of stirrups increases the ultimate capacity of the joint; and specimens with anchorage shorter than the column depth exhibited a lower shear capacity. To quantify the influence of the length of such anchorages, it was proposed that the effective depth of the joints should be limited to the length of the anchorage, ldh, instead of the depth of the column, hc.

Minami & Nishimura (1985) tests were carried out at the University of Osaka to investigate the influence of the shape of beam bar anchorage, length of straight

anchorage, axial load in the column and stirrups in the joint on joint shear capacity. It was concluded that axial load and stirrups in the joint have a positive effect on joint shear capacity. The length of the straight anchorage of the beam bars within the joint panel was found to have an important role which cannot be replaced by a longer bending tail.

Ueda et al (1986) the development of a computer model that can predict the loaded end deformation and anchorage length requirements for reinforcing bars extending from beams into exterior columns and subjected to 14 large inelastic loadings is reported. The model integrates six basic elements such as local bond stress-slip relationship, stress-strain relationship for the steel, continuity condition between steel and concrete, modification for unconfined concrete, failure criterion and equivalent embedment length criterion for a hooked bar. The results of the model are shown to be in good agreement with the results of tests on straight and 90 degree hooked bars anchored within specimens simulating conditions for exterior column-beam connections.

Bolong & Yuzhou (1991) the three full-scale reinforced concrete beam-column joint specimens subjected to one- and two-directional reversed loading are presented in this paper. The influences on a seismic behaviour of beam-column joints with different loading systems and monolithic slabs have been analysed. Also Chinese design code for reinforced concrete structures have been checked

by test results.

Kaku & Asakusa (1991) bond and anchorage performances of longitudinal bars in reinforced concrete beam-column joints be summarized based on the investigations performed in the United States, New Zealand, and 15 suggested that the use of crossed inclined bars in the joint core region was one of the most effective ways to improve the seismic resistance in exterior joints.

Tsonos et al (1995) conducted an experimental investigation to compare the response of beam-column joints subjected to seismic type loading under constant and variable axial load. A total of fourteen ductile exterior beam-column connections were tested to study various parameters (i.e., varying axial load, P-Delta effect, and joint shear stress level). A comparison of the seismic performance of specimens tested under constant axial load and other specimens with variable axial load levels indicated that axial load changes during seismic loading produces significant deterioration in the beam-column joint earthquake resistance. P-Delta effects did not significantly affect the overall joint behaviour and therefore they can be ignored in detailing beam-column connections.

Clyde et al (2000) & Pantelides et al (2002) four exterior joints with non-seismic detailing according to 1960s American standards were tested by Clyde et al, under cyclic loading and two different axial load levels (10% and 20% of Ac ·fc). The

following conclusions were made: Specimens with higher axial load level exhibited higher joint shear strength; and the energy dissipation and ductility decreased with increasing axial load. Similar results were obtained by the six tests by Pantelides etal where it was confirmed that the presence of higher axial load is beneficial in terms of the joint strength, but detrimental for displacement, ductility and energy dissipation.

Le- Trung et al (2010) this paper presented the experimental study to strengthen the shear capacity of non-seismic joints using Carbon Fiber Reinforced Plastic (CFRP) materials. For that eight numbers of exterior RC 21 beam–column joint specimens including a non-seismic, seismic specimen and six retrofitted specimens with different configurations of CFRP sheets was developed and tested to find out an effective way to improve the seismic performance of the joints in terms of the lateral strength and ductility. Used the following different configurations of CFRP sheets considered were the T shape, L-shape, X-shape and strip combinations. The research focused on the effect of using CFRP sheets for enhancing strength and increasing ductility of the non-seismic beam-column joints. The test results showed that appropriately adding CFRP composites to the non-seismic specimen significantly improved the lateral strength and well ductility of the test specimens. Especially, the X-shaped configuration of wrapping, the strips on the column and two layers of the CFRP sheets resulted in a better performance in terms of ductility and strength.

Masi et al (2013) this paper is focused on the analysis of test results of RC beam-column joints Cyclic tests on full scale joint specimens having different earthquake resistant design levels was performed by Masi et al (2013)., applying different values of axial force, the test results of specimens have been analysed and compared with the results of numerical simulations based on an accurate finite element modelling using the DIANA code, Numerical simulations was used to evaluate the stress distribution in the joint panel since a function of the axial load and to quantify the beam rebar deformations and reasons for the specimens' global failure. Cotsovos (2013) the work presented in this is concerned with an investigation of the behaviour of reinforced-concrete two-storey frames under both static (monotonic and cyclic) loading and seismic excitation in an attempt to assess the effect of cracking suffered by the beam-column joints on the overall structural response of the frames. The behaviour of the structural forms investigated is established via nonlinear three-dimensional finite element analysis.

Dan Palermo, Frank J. Vecchio (2007) presented on recent criticism has questioned the practicality, reliability, and robustness of the finite-element method due to perceived complexities involved in developing the model and interpreting the results. A series of analyses are presented on reinforced concrete structural walls of varying height-to-width ratio, varying wall cross section, and varying levels of reverse cyclic loading to demonstrate that the finite-element procedure is capable of providing quick and reliable simulations, while employing simple modelling techniques. Behavioural aspects such as ultimate

strength, displacements, post peak ductility, energy dissipation, and failure mechanisms are well simulated. The analyses provided simulations that were in substantial agreement with the observed behaviours, including peak strength, post peak response, ductility, energy dissipation, and failure mechanisms. The only noticeable discrepancy was related to the displacement corresponding to the peak lateral load. However, upon further investigation, the analyses of walls that seemed to suggest gross errors were not as noteworthy. Such walls demonstrated flat-top load-deformation responses and the degradation of the lateral load for a significant portion of the response was minimal, suggesting that the displacement corresponding to peak lateral load can lie within a range of displacements. **Konstantinos K. Antoniade et al (2005)** investigate on the behaviour of six 1:2.5-scale reinforced concrete cantilever wall specimens having an aspect ratio of 1.5, tested to failure and subsequently repaired and strengthened using fibre reinforced polymer FRP sheets is investigated. Specimens were first repaired by removing heavily cracked concrete, lap splicing the fractured steel bars by welding 12 new short bars, placing new hoops and horizontal web reinforcement, and finally casting non-shrink high-strength repair mortar. In addition to different arrangements of steel and FRP reinforcement in the walls, a key parameter was the way carbon FRP strips added for flexural strengthening were anchored; steel plates and steel angles were used to this effect. Steel plates were anchored using U-shaped glassFRP and GFRP strips or bonded metal anchors. Test results have shown that by using FRP reinforcement, the flexural and shear strength of the specimens can be increased. From the anchorage systems tested, metal plates combined with FRP strips appear to be quite efficient. The effectiveness of the bonded metal anchors used was generally less than that of the combination of plates and GFRP strips. In all cases, final failure of the FRP anchorage is brittle, but only occurs after the peak strength is attained and typically follows the fracture of steel reinforcement in critical areas, hence the overall behaviour of the strengthened walls is moderately ductile.

CHAPTER 3
METHODOLOGY

3.1 PRESENT DESIGN PROCEDURES:

The concept of designing for ductility in reinforced concrete structures was initiated by Blume, Newmark and Corning and its acceptance was such that it is now a basic design procedure incorporated in the design codes of the majority of earthquake prone countries. It is well organised that, should failure occur, the flexural yielding should preferably be enforced in the horizontal rather than the vertical members. Therefore it is stipulated that the ultimate moment capacity of the column must be greater than that of the beam, where they frame into the joint.

However even though the column is designed to be stronger than the beam there are factors which in practice can greatly influence the relative strengths of the members. The most significant of these is when the direction of the earthquake is at 45° to the axes of the building. At any beam-column joint the column is subjected to the full earthquake of the building effect while the beams need only resist the component of the earthquake along their longitudinal axes. This mean that the column must be designed more than 40% stronger than the beams. If, in addition to this, the variability in material strengths of both concrete and steel in the members combine unfavourably, then it is obviously impractical to design the column stronger than the beam for every situation. Therefore it is specified that, although the column should not attain its ultimate flexural strength, it shall be provided with sufficient transverse reinforcement so that if it does so, it will have adequately ductility to survive the earthquake.

The importance of joint integrity during earthquake response is basic. Should a joint fail, the capacity of all members framing into the joint is reduced or eliminated.

3.2 REVIEW OF THE PREVIOUS WORK:

The analysis and design of structures has become increasingly theoretical due presumably to the continued sophistication of the electronic computer, the speed and accuracy of which is unattainably the usual design procedures. However , owing to the assumptions and simplifications which must be imposed to enable the program to be adaptable, the accuracy of the results obtainable are limited by the applicability of these restriction. Because the properties of many structural materials, particularly reinforced concrete are unpredictable to the required degree of accuracy, there is a need for experimental work it be performed whereby the structure, or a model therefore, is subjected to forces from a simulated earthquake in order to understand the behaviour of the actual structure since much of the information revealed by tests of this sort are obtained in the post-elastic range it is impractical to perform any experiments on existing structures.

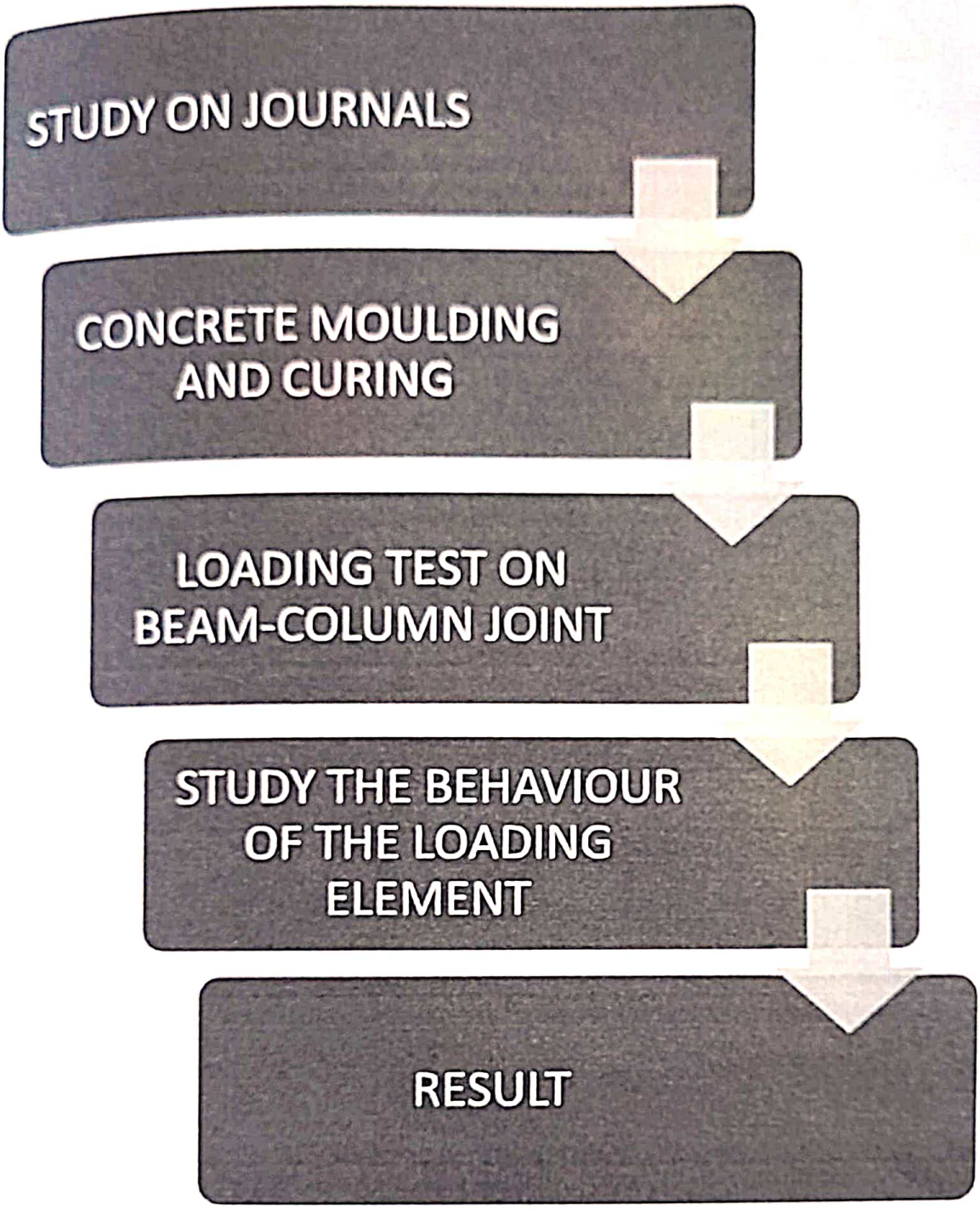
The recommendations developed from the results of tests on small scale specimens are not in many cases applicable to large building members. Therefore the need for tests on full scale component parts of structures become evident and may, in some circumstances, provide the only reliable source of information.

Most of the research has been done on ductility of columns has involved testing of members subjected to flexure and axial load. When large shear force are also present the problem becomes more acute. This is the situation at a beam-column joint where these three forces are all present. The work which has been done to determine the behaviour of interior beam-column joint cannot be extended to apply to exterior joints because of the

special provisions required in particular where no spandrel beams frame into the joints to provide extra confinement.

The most significant work on exterior joints to be attempted was per formed in the P.O.A. laboratories, a review of which is published by the A.S.C.E. Results from this paper indicate that for the identical specimens which were designed with the column weaker than the beam, with different column axial loads; the greater column was more favourable for attainment of the theoretical ultimate capacity. Even so the ability of the specimen to maintain its ultimate capacity was diminished significantly after the first post-elastic cycle. The fact that the results from there two specimens did not appear to affect the conclusions to any extent, even though specimen. If did not at any stage at its theoretical ultimate capacity, indicates that the authors placed little emphasis on the performance of these specimens. The outer test specimens and subsequent tests showed that the code requirements for these beam-column joints are conservative with regard to transverse reinforcement. It is apparent that a joint, detailed according to accepted design practice, will provide sufficient ductility and energy absorption to survive a series of post-elastic load cycles.

Therefore it is obvious that much work is yet to be done in this field to establish ana adequate mechanism for resistance in exterior joints and it is with this purpose that the experiments reviewed herein have been under taken.


STUDY ON JOURNALS
CONCRETE MOULDING AND CURING
LOADING TEST ON BEAM-COLUMN JOINT
STUDY THE BEHAVIOUR OF THE LOADING ELEMENT
RESULT

CHAPTER 4

TEST SPECIMENS

4.1 INTRODUCTION

The philosophy behind the design of the specimens is described in this chapter. Restriction from code requirements are outlined in an attempt to show the reasons upon which many of the decisions are based.

Theoretical predictions of the behaviour of the specimens are also formulated so that, subsequently, a comparison can be made with the actual behaviour.

4.2 DESIGN OF SPECIMEN:

4.2.1 Overall Specifications:

Details of specimen:

The test specimen was reduced to 1/3 th scale to suit the loading arrangement and test facilities. Prototype specimen having beam dimension of 150mm×150mm and column dimension of 150mm*150mm. For testing model the dimension of the beam is 120*170kk without slab thickness and beam length of 1000mm and the column size was 150*150mm. height of the column was 900mm.

4.2.2 Size and Flexural Reinforcement of Member:

4.2.2.1 Column:

The dimensions of the column were the most important criteria when selecting representative sizes and a 150 x 150mm square column was considered to be the optimum size.

4.2.2.2 BEAM :

It was decided that the beam should have an ultimate moment of resistance 20% greater than that of the columns to allow for variations in material strengths.

4.2.3 Transverse Reinforcement:

4.2.3.1 Joint Ties:

The transverse reinforcement in the joint is provided to resist both bursting forces from the concrete and shear forces. Using in diameter hoops, five were required for confinement within the joint.

4.2.3.2 Column Test:

The original intention of the research was to provide only suffi0ient column ties to resist the shear force, and to increase the number of ties in succeeding specimens until adequate ductility was obtained from, the plastic hinges.

4.2.3.3 Beam Stirrups:

The minimum shear reinforcement in flexural members means i in. diameter stirrups must be provided at 6 in. spacing. In all specimens, stirrups were provided at 4 in spacing close to the joint, to fit conveniently between the demeo studs on the flexural bars. The spacing increased to the maximum spacing of 11 in. beyond the demeo studs.

4.2.4 THEORETICAL BEHAVIOUR:

4.2.4.1 Elastic Range:

Much of the information concerning behaviour of the specimens in 12 14 the elastic range is determined from equilibrium and strain compatibility after the material properties have been established. The calculations are presented in

with the specific results for each specimen included in the relevant chapter.

4.2.4.2 Flexural Crackings:

Cracking first occurs in the beam then in the column. The loads at which cracking should theoretically occur are calculated and the effects are shown on the load-deflection relationships.

4.2.4.3 Yield Load:

Once had been established for each specimen, the load at which first yield should occur was determined. In fact, yield, which occurs in the column flexural bars, was observed the theoretical yield load is tabulated for each specimen in along with the actual. loads obtained.

4.2.4.4 Rotations and Deflections:

The elastic rotation of the column is calculated for both the uncracked and cracked sections and compared. Deflection at the end of the beam is considered to be contributed to by rotation of the column and bending of the beam. This is shown on the load-deflection relationships. The theoretical deflected shapes at the peaks of the elastic load runs are shown diagrammatically in each chapter and compared with the actual i shapes obtained. Joint distortion, which can have a considerable effect on the deflection of the structure was not considered in the theoretical pre dictions. Its effect then becomes apparent when theoretical and actual values of deflection are compared.

4.2.4.5 Steel Strains:

The strains in the flexural reinforcement are calculated by elastic theory for the first run of loading in each direction and compared with the recorded strains on the figures of strain distribution in each chapter.

4.2.5 Post-Elastic Range:

Although do not yield in flexure, the response to the applied load is similar to what would be expected and although not strictly correct it is convenient to refer to the "elastic" and -"post-elastic" portion of each load run.

4.2.5.1 Ultimate Load:

The ultimate loads for each specimen are calculated in, and tabulated in for comparison with actual maximum loads obtained.

4.2.5.2 Rotational Ductility:

For the design specimen the ductility available can be determined from consideration of the rotations at ultimate and at first yield. It has been suggested that although the ultimate concrete strain is generally taken as 0.003, for confined concrete a more realistic figure would be 0.01. This means that provided the concrete is well confined the theoretical maximum rotational ductility factor attainable is given, by , as However the performance of the specimens, with the exception of slowed that this 'is not applicable if the concrete is not sufficiently confined. The ductility factors for post-elastic load runs are computed using the method outland tabulated in each chapter.

4.3 EARTHQUAKE LOADING REPRESENTATION

4.3.1 Rate of Load Application:

Statio cyclic loading was applied to the end of the beam by means of screw jacks to simulate the high intensity reversals imposed by an earthquake. Although earthquake loadings are dynamic in character, it has been shown that the strength and energy absorption characteristic of reinforced concrete members are increased with increased speed of loading, and, that static tests can satisfactorily predict the structural response of reinforced concrete structures to

earthquakes. Consequently it appears conservative to use static loading as a basis for testing seismic specimens.

4.3.2 Loading Sequence:

The load sequence applied was adjusted slightly depending on the performance of the individual specimens.

CHAPTER 5

EXPERIMENTAL WORKS

5.1 Details of specimen:

The test specimen was reduced to 1/5 th scale to suit the loading arrangement and test facilities. Prototype specimen having beam of 305 X 460 including slab thickness and column dimension of 150 X 150. For testing model the dimension of beam was 150 X 150 mm without slab thickness and beam length of 1000mm and that column size was 150 X 150 mm Height of the column was 900mm.

5.1.1.Description of the formwork and reinforcement:

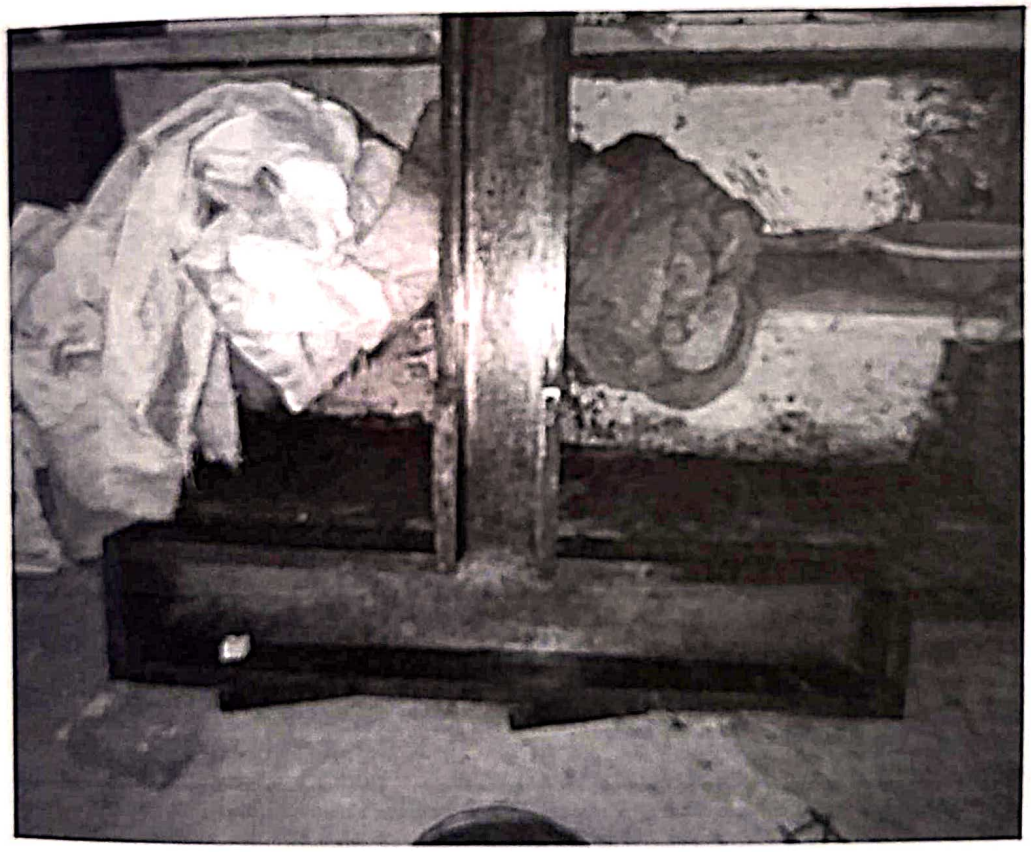


Fig 1: Mould of Beam-Column Joint

5.1.2.Reinforcement details:

The reinforcement details of beam column joint are shown in fig.2. Main reinforcement provided in the beam was 10 mm diameter bars, 3 No's at top an d 3 No's at bottom. The stirrups are 6 mm diameter bars at 100 mm c/c for a distance of 2d, i.e. 300 mm and face of the column and at 60 mm c/c for remaining length of the beam. The longitudinal reinforcement provided in the column was 8 No's of 8 mm diameter bars equally distributed along four sides of column. The column confinements are 6 mm diameter bars at 30 mm c/c for a distance of 150 mm from the face of the column and at 60 mm c/c for remaining length of the column.

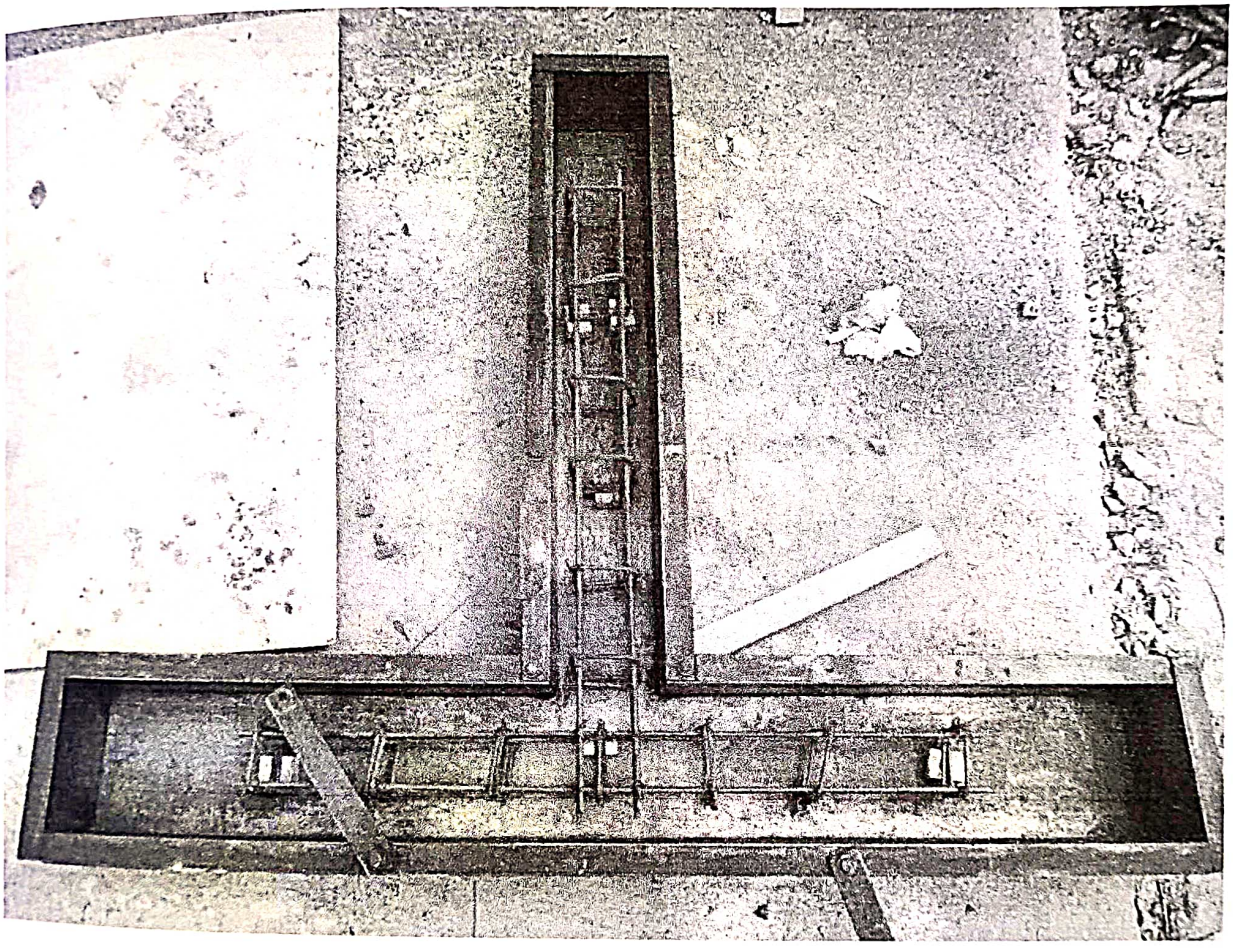


Fig 2: Reinforcement of Beam-Column Joint

5.1.3. Casting and curing:

The mould is arranged properly and placed over a smooth surface. The sides of the mould exposed to concrete were oiled well to prevent the side walls of the mould from absorbing water from concrete and to facilitate easy removal of the specimen. The reinforcement cages were placed in the moulds and cover between cage and form provided was 20 mm. Concrete mix designed for M30 (1:1:2.5) and water cement ratio is 0.40. Cement mortar b lock pieces were used as cover blocks. The concrete contents such as cement, and, aggregate and water were weighed accurately and mixed. The mixing was done till uniform mix was obtained. The concrete was placed into the mould immediately after mixing and well compacted. Control cubes and cylinders were prepared for all the mixes along with concreting. The test specimens were remoulded at the end of 24 hours of casting. They were marked identifications. They are cured in water for 28 days. After 28 days of curing the specimen was dried in air and white washed.

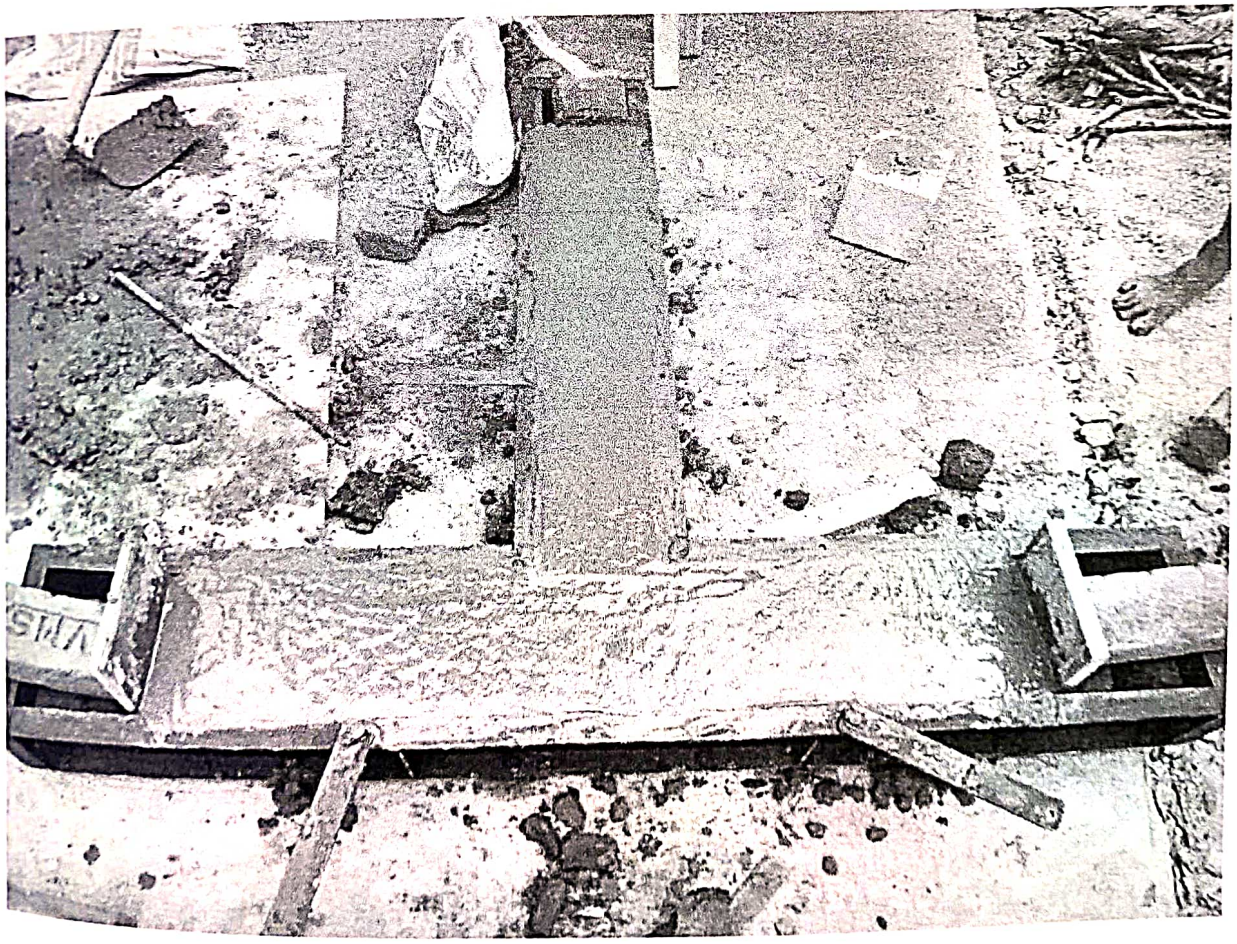


Fig 3 Casting of beam column joint

CHAPTER 6

CONCLUSION

6.1 CONCLUSION:

As the casting is done according to the design parameters for beam-column joint. Based on the observation of the results, the following conclusions are below.

The material properties and the design parameters are investigated to model and cast the reinforcement beam-column joint. The element are casted and placed for curing. The result of deflection, strain, crack of beam-column joint will be done in phase II project work.

WORK IN PHASE II:

- The entire test of casted element to be done
- Analyses the deflection and crack.
- Comparison of the cracks in forward and backward load.

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ONLINE VOTING SYSTEM

PROJECT REPORT

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERNG

in

COMPUTER SCIENCE AND ENGINEERING

PGP COLLEGE OF ENGINEERING AND TECHNOLOGY

NAMAKKAL-637207

JUNE - 2022

PGP COLLEGE OF ENGINEERING AND TECHNOLOGY

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On 21-06-2022

Internal Examiner

External Examiner

ACKNOWLEDGEMENT

Behind every Achievement lies an unfathomable sea of gratitude to those who actuated it, without them it would never have into existence. To them we lay the world of gratitude imprinted within us.

We would like to express our gratitude to our honorable Chairman **Dr. PALANI G. PERIASAMY M.A., Ph.D., (USA)** and Vice Chairman **Mrs. VISALAKSHI PERIASAMY** for giving us all the facilities required to complete our project.

We wish to express our sincere thanks to our respected Principal **Dr. V. KAVITHA M.E., Ph.D.,** for all her blessing and help providing during the period of project work.

We express our profound gratitude to our Head of the Department of Computer Science and Engineering **Dr. G. MOHANA PRABHA M.E., Ph.D.,** for the help she has rendered us whenever we are in need of.

We would like to extend our warmest thanks to our Project Guide **Mrs. M PREETHA M.E.,** Department of Computer Science and Engineering.

We would like to extend our warmest thanks to our Chief Mentor **Mrs. M RAJAMANI M.E.,** Department of Computer Science and Engineering and all our Lab technician for helping us in this venture.

We are very grateful to all staff members and classmates who directly and indirectly helped us to do this project. We would like to take this opportunity to express our gratitude and to extend my wishes to who guided, inspired, motivated during this project.

ABSTRACT

The word 'VOTE' means to choose a person or an object from a list, to select the best one. The main goal of voting is to come up with leaders of the people's choice. Some of the problems involves include ridging votes during election, insecure or inaccessible polling stations, inadequate polling materials. The existing voting methods like vote in polling station, postal voting is more time consuming and they reduce the security and privacy of individual, because physically challenged voters may not be able to come up to polling station for voting and government faculty may should avail on-duty during the election. The project is mainly aimed at providing a secured and user-friendly Online Voting System. The problem of voting is still critical in terms of safety and security. This system deals with the design and development of a web-based voting system using Aadhar card, Voter Id and Mobile number in order to provide a high performance with high security to the voting system. The voting system is managed in a simpler way as all the users must login by Aadhar card number, Voter Id number, Mobile number and click on his/her favorable candidates to cast the vote by using a button click, it provides enough security which reduces the dummy votes.

EXTENDED RENTAL SERVICE TO ENHANCE INDOOR SPORTS FOR CAREER DEVELOPMENT USING WEB APPLICATION

PROJECT REPORT

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in

COMPUTER SCIENCE AND ENGINEERING

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Behind every achievement lies an unfathomable sea of gratitude to those who actuated it, without them it would never have existed. To them we lay the word of gratitude imprinted within us.

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We are deeply indebted to our project guide **Mr.P.SIVA.MCA.,** PGP College of Engineering and Technology, for his unwavering moral support at every stage of project.

We are very grateful to all staff members and classmates who directly and indirectly helped us to do this project. We would like this opportunity to express our gratitude and to extend our wishes to those who guided, inspired, motivated during this project.

ABSTRACT

Sports are very important in life for physical fitness, skills and improving careers. sports play a major role in present and future life. Each and every sport has different specifications. Few sports do not have ground facilities and kit requirements. Some sports kits are very costly and many people do not have the facility to buy these types of sports kits. So they can't show their talent. To overcome this problem , provide a sports ground and kits for rental service in online mode. Some kits are not available online. So that they can easily purchase the kit on this website online. This project gives extra information about matches & coaches for particular sports. So this web application is very useful for sports persons.

ON ROAD VEHICLE BREAKDOWN ASISTANCE FINDER

A PROJECT REPORT

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Secure Cloud Access Using a Temporary Distribute Key Search

A THESIS

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I wish to covey our profound thanks to our project guide **Mr.M.MOHANRAJ, M.E.,** for his skillful guidance during the project work.

ABSTRACT

Temporary keyword search on confidential data in a cloud environment is the main focus of this research. The cloud providers are not fully trusted. So, it is necessary to outsource data in the encrypted form. In the attribute-based keyword search (ABKS) schemes, the authorized users can generate some search tokens and send them to the cloud for running the search operation. These search tokens can be used to extract all the ciphertexts which are produced at any time and contain the corresponding keyword. Since this may lead to some information leakage, it is more secure to propose a scheme in which the search tokens can only extract the ciphertexts generated in a specified time interval. To this end, in this paper, I introduce a new cryptographic primitive called key-policy attribute-based temporary keyword search (KPABTKS) which provide this property. To evaluate the security of My scheme, I formally prove that My proposed scheme achieves the keyword secrecy property and is secure against selectively chosen keyword attack (SCKA) both in the random oracle model and under the hardness of Decisional Bilinear Diffie-Hellman (DBDH) assumption. Furthermore, I show that the complexity of the encryption algorithm is linear with respect to the number of the involved attributes. Performance evaluation shows our scheme's practicality.

PLANT LEAF DISEASE DETECTION USING DEEP LEARNING TECHNIQUES

A PROJECT REPORT

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We are very grateful to all staff members and classmates who directly and indirectly helped us to do this project. We would like this opportunity to express our gratitude and to extend our wishes to those who guided, inspired, motivated during this project.

ABSTRACT

An economy depends on productivity in agriculture. The quantity and quality of the yield is greatly affected by various hazardous diseases. Early-stage detection of plant disease will be very helpful to prevent severe damage. Automatic systems to detect the changes in the plants by monitoring the abnormal symptoms in its growth will be more beneficial for the farmers. Plant diseases are generally caused by pest, insects, pathogens and decrease the productivity to large scale if not controlled within time. It becomes tedious to the cultivators to monitor the crops regularly when the cultivated area is huge that is in acres. This proposed system will help to identify the diseases in the earlier stage through machine learning technique. To identify the plant disease machine learning technique applied in this application in three species. Banana, tomato and brinjal plant diseases are analyzed through the machine learning for predicting the diseases. K-means Clustering algorithm and CNN algorithm is used to forecast the diseases. This proposed system will give the accurate prediction data of plant diseases with the dataset in the dynamic manner. The major advantages of the proposed system are the accuracy of prediction 93.18% for three different species with twelve different diseases.

STACK MARKET ANALYSIS USING DEEP LEARNING TECHNIQUES

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MARCH - 2022

PGP COLLEGE OF ENGINEERING AND TECHNOLOGY, NAMAKKAL

BONAFIDE CERTIFICATE

Certified that this Report titled **"STOCK MARKET ANALYSIS USING DEEP LEARNING TECHNIQUES"** is the bonafide work of **Manimegalai M [621821405009]** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Submitted for the PHASE I PROJECT examination held on 29/03/2023

INTERNAL EXAMINER

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompanies the successful completion of any task that would be incomplete without acknowledging the people who responsible for completion of the project. We would like to thank our college chairman **Dr.PALANI G.PERIYASAMY, M.A., Ph.D., (USA)**who had encouraged us in all activities.

Here I like to record our deep sense of gratitude to our beloved Principal **Dr.V.KAVITHA,Ph.D.,** for providing us the required facility to complete our project successfully.

I extend our sincere thanks and gratitude to our Head Of the Department and my project guide **Dr.G.MOHANAPABHA,M.E.,Ph.D.,** Department of Computer Science and Engineering for her excellent guidance throughout the project.

It is pleasure to acknowledge the contribution made by my project coordinator **Mr.P.SATHISHKUMAR, M.E.,** Assistant Professor, Department of Computer Science and Engineering for her efforts to complete our project successfully.

I'm very much thankful to our parents, friends and all faculty members of Department of Computer Science and Engineering, who helped us in the successful completion of the project.

ABSTRACT

The project aims to provide retail investors with a third-party investment mobile application to navigate through the stock market. This is achieved through the use of machine learning and mobile web technologies. Several stock price prediction approaches and models are developed including dense, feedforward neural networks, recurrent neural networks, simple linear regressions, and linear interpolations. Model architectures and hyperparameters are optimized and automatically searched by evolution algorithm. Promising results are found for trend prediction. The project serves as a foundation for democratizing machine learning technologies to the general public in the context of discovering investment opportunities. It paves the way for extending and testing out new models, and developing AutoML in the financial context in the future.

An Efficient Data Energy Management Using Secure Sharing Across Nearest Location Data Centers

A THESIS

Submitted by

M.KALAIPRIYA (621819405002)

in partial fulfilment for the award of the degree of

MASTER OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

PGP COLLEGE OF ENGINEERING AND TECHNOLOGY

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Certified that this project Report titled "**AN EFFICIENT DATA ENERGY MANAGEMEN USING SECURE SHARING ACROSS NEAREST LOCATION DATA CENTERS**" is the bonafide work of **M.KALAIPRIYA (621819405002)** who carried out the work under my supervision.

PROJECT GUIDE

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Project work report submitted or University project Viva-Voce Examination held on 20/03/2021

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EXTERNAL EXAMINER

ACKNOWLEDGEMENT

Behind every achievement lies an unfathomable sea of gratitude to those who actuated it, without them it would never have into existence. To them we lay the word of gratitude imprinting within us.

I express our profound gratitude to our honourable chairman **Dr.PALANI G.PERIASAMY, M.A., M.A., Ph.D., (USA)** for providing all the necessary facilities for the successful completion of this project.

I have immense pleasure in expressing our sincere gratitude to our beloved Dean **Dr.K.PERIYASAMY, Ph.D.,** for his support in all our activities.

I wish to express my sincere thanks **Dr.V.KAVITHA, M.E., Ph.D.,** Principal for all the blessing and help provide during the period of project work

I wish to express my sincere thanks to **Dr.S.DHANABAL, ME., Ph.D.,** Head of the Department of Computer Science and Engineering, for the Continuous help over the period of project work.

I wish to covey our profound thanks to our project guide, **Dr.S.DHANABAL, M.E., Ph.D.,** Head of the Department of Computer Science and Engineering for his skilful guidance during the project work.

ABSTRACT

An efficient data centre energy cost can be effectively reduced in the wholesale electricity market via cooperative power procurement. I use cooperative game theory to model the cooperative electricity procurement process of tenants as a cooperative game, and show the cost saving benefits of aggregation. Then, a cost allocation scheme based on the marginal contribution of each tenant to the total expected cost is proposed to distribute the aggregation benefits among the participating tenants. Besides, I propose proportional cost allocation scheme to distribute the aggregation benefits among the participating tenants after realizations of power demand and market prices. Finally, numerical experiments based on real-world traces are conducted to illustrate the benefits of aggregation compared to non-cooperative power procurement.

DNN BASED STOCK MARKET PREDICTION SYSYTEM

PROJECT REPORT
PHASE I

Submitted by

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This is to certify that this report titled **"DNN BASED STOCK MARKET PREDICTION SYSYTEM"** is the bonafide work of **"JERALDIN AMALAPRIYA J (621821405007)"** in partial fulfillment of the requirement for the award of the degree- **Master of Engineering in Computer Science and Engineering** during the year 2021-2022.

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Project work report submitted for University Project Viva Voce examination held on 29.3.23.....

INTERNAL EXAMINER

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Certified that this report titled "**DNN BASED STOCK MARKET PREDICTION SYSTEM**", for the phase -I of the project , is a bonafide work of **Ms. JERALDIN AMALAPRIYA J(621821405007)**, who carried out the work under my supervision, for the partial fulfillment of the requirements for the award of the degree of Master of Engineering in computer science and Engineering . Certified further that do the best of my knowledge and belief , the work reported here in does not form part of any another thesis or dissertation on the basis of which a degree or an award was conferred on an earlier occasion.

Place: Namakkal

Date: 29-03-23

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ACKNOWLEDGEMENT

Behind every achievement lies an unfathomable sea of gratitude to those who actuated it, without them it would never have into existence. To them we lay the word of gratitude imprinted within us.

We would like to express our gratitude to our honorable Chairman **Dr.PALANI G.PERIASAMY, M.A., Ph.D., (USA)** for giving us all the facilities required to complete our project.

We are pleased to express our gratitude and thanks to our respectable principal **Dr.V.KAVITHA, Ph.D.,** PGP College of Engineering and Technology, for her blessings which enable us to do this project.

We express our profound gratitude to Our Head of the Department of Computer Science and Engineering **Dr.G.MOHANAPRABHA, M.E., Ph.D.,** for the help she has rendered us whenever we are in need of.

We are deeply indebted to our project guide **Mr.P.SATHISH KUMAR,ME.,** PGP College of Engineering and Technology, for her unwavering moral support at every stage of our project.

We are very grateful to all staff members and classmates who directly and indirectly helped us to do this project. We would like this opportunity to express our gratitude and to extend our wishes to those who guided, inspired, motivated during this project.

ABSTRACT

Stock market prediction and analysis are some of the most difficult jobs to complete. There are numerous causes for this, including market volatility and a variety of other dependent and independent variables that influence the value of a certain stock in the market. These variables make it extremely difficult for any stock market expert to anticipate the rise and fall of the market with great precision.

However, with the introduction of Machine Learning and its strong algorithms, the most recent market research and Stock Market Prediction advancements have begun to include such approaches in analyzing stock market data.This paper aims to study, construct and evaluate these investment strategies in order to predict future stock exchanges. Firstly, data mining techniques will be used to evaluate past stock prices and acquire useful knowledge through the calculation of some financial indicators. Next artificial intelligence strategies will be used to construct decision making trees and neural network for an accurate prediction.

STACK MARKET ANALYSIS USING DEEP LEARNING TECHNIQUES

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INTERNAL EXAMINER

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ACKNOWLEDGEMENT

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I'm very much thankful to our parents, friends and all faculty members of Department of Computer Science and Engineering, who helped us in the successful completion of the project.

ABSTRACT

The project aims to provide retail investors with a third-party investment mobile application to navigate through the stock market. This is achieved through the use of machine learning and mobile web technologies. Several stock price prediction approaches and models are developed including dense, feedforward neural networks, recurrent neural networks, simple linear regressions, and linear interpolations. Model architectures and hyperparameters are optimized and automatically searched by evolution algorithm. Promising results are found for trend prediction. The project serves as a foundation for democratizing machine learning technologies to the general public in the context of discovering investment opportunities. It paves the way for extending and testing out new models, and developing AutoML in the financial context in the future.

AUTOMATIC COVID-19 DISINFECTION FOR ROOMS USING UV-C LED

A PROJECT REPORT

Submitted by

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SOWMIYA K (621817106011)

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Internal Examiner **External Examiner**

AUTOMATIC COVID-19 DISINFECTION FOR ROOMS USING UV-C LED

Abstract

In today's pandemic situation healthcare facilities are havens for recovery and rehabilitation. Infection prevention technologies are of great challenge to a new era of covid-19 epidemic. However a standard cleaning by humans alone cannot reduce the number of microorganisms as there are many blindspots or unreachable areas such as walls and ceiling. Disinfecting those areas with chemical disinfectant often may seem a bit tedious task to perform each day. This risky situation can be handled cleverly by use of UVC radiation. Recently a type of ultra-violet (UV) is found to disinfectant room from the lingering micro-organisms. A wavelength of range of 200-280nm also known as C band of UV light or UV-C can eradicate the microorganisms particularly corona virus in this pandemic situation by sterilizing the bacteria and viruses by destroying its generic code. Once its genetic code has been corrupted, the pathogen is no longer able to replicate itself, quickly resulting in the death and elimination of viral and bacterial colonies. Hence an automatic UV disinfectant for rooms is designed using UVC led array and people counter circuit. The proposed system turns on the UV led automatically when no people is inside the room and sends message to required authority when the disinfection process begins.

ACKNOWLEDGEMENT

First and foremost, our thanks to almighty, the great architect of the universe, who has blessed us to accomplish this phase successfully.

At the outset, we express our heart-felt thanks to our beloved chairman of PGP Institution, **Dr. PALANI.G.PERIASAMY, M.A, M.A, Ph.D.,(USA)**.

Next we would like to extend our gratitude towards our correspondent sir **Mr. GANAPATHY** retired IFS for his overwhelming attitude to help his students.

Now we would like to thank our dean academic affairs **Dr. PERIASAMY** for having provident us with plethora of facilities to complete this project successfully.

We wish to express our sincere thanks to our respected Principal **Dr. V.KAVITHA., M.E, Ph.D.,** for all the blessings and help provided during the period of project work.

We would like to thank our beloved Head of the Department, Electronics and Communication Engineering, our project Supervisor **Dr. S.TAMILARASI., M.E Ph.D.,** for her excellent guidance and suggestion for successful completion of this project.

We would like to thank our project coordinator **Mr. P.PALANISAMY., M.E.,** for him excellent guidance and suggestion for successful completion of this project.

Our heartiest thanks to all our department faculty members and lab technicians for guiding us this venture.

We extend our genuine love and gratitude to our dear parents who have built up our profession and backed us up in difficulties.

Last but not the least; We thank our friends for their constant encouragement and help.

TABLE OF CONTENTS

EMOTION RECOGNITION USING HUMAN SPEECH AND FACIAL TECHNIQUE WITH MACHINE LEARNING APPROACHES

A PROJECT REPORT

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Certified that this project report "EMOTION RECOGNITION USING HUMAN SPEECH AND FACIAL TECHNIQUE WITH MACHINE LEARNING APPROACHES" is the bonafide work of "GURU PRASATH V, PRIYANKA E, PRIYADHARSHINI J", who carried out this project work under my supervision.

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ACKNOWLEDGEMENT

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We would like to thank our beloved Head of the Department, Electronics and Communication Engineering, our project Supervisor **Dr. S.TAMILARASI, M.E Ph.D.,** for her excellent guidance and suggestion for successful completion of this project.

We would like to thank our project coordinator **Mr.P.M. Vandhiyadevan., M.E.,** assistant professor who have valuable suggestion, excellent guidance and encouragement for successful completion of this project.

Our heartiest thanks to all our department faculty members and lab technicians for guiding us this venture.

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TABLE OF CONTENTS

EMOTION RECOGNITION USING HUMAN SPEECH AND FACIAL TECHNIQUE WITH MACHINE LEARNING APPROACHES

Abstract

Human Speech and Facial are the most significant information carriers for human cognitive-communication and recognizing human's identity and emotional status. With the further growth of computer processing capability and the increase of demand for intelligent living, recognition of emotion based on face and speech became the most significant in the applications of Human-Computer Interaction (HCI). In this project, Human Speech and Facial based emotion recognition technique using a KNN has been proposed for improving the performance of detection with multi-emotions .effectively. The obtained results of the proposed technique show that the average rate of recognition is higher than other recently existing techniques.

IMPROVED DESIGN OF 4-BIT VEDIC MULTIPLIER USING GDI LOGIC AND FINFET TECHNOLOGY

A PROJECT REPORT

Submitted by

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Certified that this project report**"IMPROVED DESIGN OF 4-BIT VEDIC MULTIPLIER USING GDI LOGIC AND FINFET TECHNOLOGY"** is the bonofide work of **"SATHYA RAJ A, KEERTHANA S, POONGODI N, VIJAYA SANTHI R"**, who carried out this project work under my supervision.

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Internal Examiner **External Examiner**

IMPROVED DESIGN OF 4-BIT VEDIC MULTIPLIER USING GDI LOGIC AND FINFET TECHNOLOGY

ABSTRACT

Multiplier is main building block of all processor, which is used to improve the speed of Digital Signal Processor (DSP). The main goal of this project is to design a multiplier in an efficient manner. A 4-bit Vedic multiplier is proposed by incorporating GDI logic and Fin FET technology. Here, the primary objective is to optimize the proposed multiplier circuitry. By this method the speed of computation process is increased and the processing time is reduced due to simplified and efficient design. Moreover, by implementing the Vedic multiplier circuit with the GDI technique, there will be a further reduction in number of transistors and propagation delay. So, here in this paper the Vedic multiplier circuit is implemented by using GDI technique and also 16nm Fin FET technology. The simulation is done using LTspice simulation tool and the results of the simulation prove that our proposed method minimizes the transistor count to nearly half when compared to traditional CMOS implementation. Also it is noted that there is a tremendous decrease in power consumption and delay.

ACKNOWLEDGEMENT

First and foremost, our thanks to almighty, the great architect of the universe, who has blessed us to accomplish this phase successfully.

At the outset, we express our heart-felt thanks to our beloved chairman of PGP Institution, **Dr. PALANI.G. PERIASAMY, M.A, M.A, Ph.D., (USA).**

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Now we would like to thank our dean academic affairs **Dr.PERIASAMY** for having provident us with plethora of facilities to complete this project successfully.

We wish to express our sincere thanks to our respected Principal**Dr.V.Kavitha., M.E, Ph.D.,** for all the blessings and help provided during the period of project work.

We would like to thank our beloved Head of the Department, Electronics and Communication Engineering, My project coordinator **Dr.S.TAMILARASI, M.E., Ph.D.,** for her excellent guidance and suggestion for successful completion of this project.

wewould like to thank our project supervisor of Electronics and Communication Engineering, **Mr. D. Rajkumar., M.E.,** Assistant Professor, Who have valuable suggestion, excellent guidance and encouragement for successful completion of project.

Our heartiest thanks to all our department faculty members and lab technicians for guiding us this venture.

We extend our genuine love and gratitude to our dear parents who have built up our profession and backed us up in difficulties.

Last but not the least; We thank our friends for their constant encouragement and help.

TABLE OF CONTENTS

DROWSINESS DETECTION FOR DRIVER'S TO AVOID ROAD ACCIDENTS

A PROJECT REPORT

Submitted by

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M.BHAVASRI	(621818106003)

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JUNE 2022

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Certified that this project **"DROWSINESS DETECTION FOR DRIVER'S TO AVOID ROAD ACCIDENTS"** is the bonafied work of **"BOOPATHI A, VISHAL A, JANSI S, BHAVASRI M"**, who carried out this project work under my supervision.

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21/6/22

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21/6/22

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ACKNOWLEDGEMENT

First and foremost, our thanks to almighty, the great architect of the universe, who has blessed to accomplish this phase successfully.

At the outset, we express our heart-felt thanks to our beloved chairman of PGP Institution, **Dr. PALANI G PERIYASAMY, M.A, M.A, Ph.D., (USA).**

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Now we would like to thank our dean academic affairs **Dr. PERIYASAMY** for having provident us with plethora of facilities to complete this project successfully.

We wish to express our sincere thanks to our respected Principal **Dr. V.KAVITHA., M.E, Ph.D.,** for all the blessings and help provided during the period of project work.

We would like to thank our beloved Head of the Department, Electronics and Communication Engineering, our project Supervisor **Mr. D. RAJKUMAR., M.E.,** For her excellent guidance and suggestion for successful completion of this project.

We would like to thank our project coordinator **MS. K.PRIYANKA., M.E,** For her excellent guidance and suggestion for successful completion of this project.

Our heartiest thanks to all our department faculty members and lab technicians for guiding us this venture.

We extend our genuine love and gratitude to our dear parents who have built up our profession and backed us up in difficulties. We also thank our friends for their constant encouragement towards the completion of project work.

DROWSINESS DETECTION FOR DRIVER'S TO AVOID ROAD ACCIDENTS

ABSTRACT

Detection of drowsiness of driver is a vehicle safety technology, which helps to put off accidents which caused by the driver being dozy. A variety of studies have recommended that around 20% of all road accidents are due to drowsiness of the driver. The developments of technologies for detecting or preventing drowsiness while driving is a major confront in accident evasion systems. Because of the peril of the tiredness while driving, different new methods need to be developed for counteracting the effect. The paper is based on a example for detection of drowsiness system . The intend of this paper is design of an automated system for safety of driver from improper driving. The system is designed such that it will precisely scrutinize the eye blink. In this paper, the eye blink of the driver is detected by using Raspberry pi-camera.

HOME AUTOMATION USING TELEGRAM CHATBOT WITH FIRE DETECTION AND DOOR LOCKING SYSTEM

A PROJECT REPORT

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Certified that this project report **"HOME AUTOMATION USING TELEGRAM CHATBOT WITH FIRE DETECTION AND DOOR LOCKING SYSTEM"** is the bonafide work of **"SELVA SUBRAMANIAN S, HARIHARAN S, MYTHILI E, VASUKI S"**, who carried out this project work under my supervision.

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HOME AUTOMATION USING TELEGRAM CHATBOT WITH FIRE DETECTION AND DOOR LOCKING SYSTEM

ABSTRACT

Home automation gives the power of accessing your home from any part of the world and, it has come a long way since its inception. While many of its functions were very basic in the past, in this project we are going to discuss a home automation system that not only controls your electrical appliances but also adds safety to your home and can be accessed using Telegram. Users can use telegram application and chat with the system to control their home appliances by choosing their corresponding bot.

ACKNOWLEDGEMENT

First and foremost, our thanks to almighty, the great architect of the universe, who has blessed us to accomplish this phase successfully.

At the outset, we express our heart-felt thanks to our beloved chairman of PGP Institution, **Dr. PALANI G PERIYASAMY, M.A, M.A, Ph.D., (USA).**

Next we would like to extend our gratitude towards our correspondent sir **Mr. GANAPATHY** retired IFS for his overwhelming attitude to help his students.

Next we would like to thank our dean academic affairs **Dr. PERIASAMY** for having provident us with plethora of facilities to complete this project successfully.

We wish to express our sincere thanks to our respected Principal **Dr. V. KAVITHA, M.E., Ph.D.,** for all the blessings and help provided during the period of project work.

We would like to thank our beloved Head of the Department, Electronics and Communication Engineering, My project coordinator **Mr. D. RAJ KUMAR, M.E.,** for his excellent guidance and encouragement for successful completion of project.

We would like to thank our project supervisor of Electronics and Communication Engineering, **Mrs. C. GAYATHRI M.E.,** Assistant Professor, who gave valuable suggestion, excellent guidance and encouragement for successful completion of project.

Our heartiest thanks to all our department faculty members and lab technicians for guiding us this venture.

We extend our genuine love and gratitude to our dear parents who have built up our profession and backed us up in difficulties.

Last but not the least: We thank our friends for their constant encouragement and help.

TABLE OF CONTENTS

LEAF DISEASE IDENTIFICATION USING CONVOLUTION NEURAL NETWORK ALGORITHM

A PROJECT REPORT

Submitted by

P. DHARANI	**(621818106005)**
M. DHIVYA SRI	**(621818106006)**
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P. SAKTHI SWETHA	**(621818106013)**

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

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ANNA UNIVERSITY: CHENNAI 600 025

JUNE 2022

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "**LEAF DISEASE IDENTIFICATION BY USING CONVOLUTIONAL NEURAL NETWORK ALGORITHM**" is the bonafide work of "**P. DHARANI, M. DHIVYA SRI, A. MATHAN GOPAL, P. SAKTHI SWETHA**", who carried out this project work under my supervision.

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Internal Examiner

External Examiner

LEAF DISEASE IDENTIFICATION BY USING CONVOLUTION NEURAL NETWORK ALGORITHM

ABSTRACT

Rice (Oryza sativa) is a principal cereal crop in the world. It is consumed by greater than half of the world's population as a staple food for energy source. The yield production quantity and quality of the rice grain is affecting by abiotic and biotic factors such as precipitation, soil fertility, temperature, pests, bacteria, virus, etc. For disease management, farmers spending lot of time and resources and they detect the diseases through their penniless naked eye approach which leads to unhealthy farming. The advancement of technical support in agriculture greatly assists for automatic identification of infectious organisms in the rice plants leaves. The convolutional neural network algorithm (CNN) is one of the algorithms in deep learning has been triumphantly invoked for solving computer vision problems like image classification, object segmentation, image analysis, etc. In our work, InceptionResNetV2 is a type of CNN model utilized with transfer learning approach for recognizing diseases in rice leaf images. The parameters of the proposed model is optimized for the classification task and obtained a good accuracy of 95.67%. This project describes the plant disease detect and classification using deep learning algorithm.

ACKNOWLEDGEMENT

First and foremost, our thanks to almighty, the great architect of the universe, who has blessed us to accomplish this phase successfully.

At the outset, we express our heart-felt thanks to our beloved chairman of PGP Institution, **Dr. PALANI G PERIYASAMY, M.A, M.A, Ph.D., (USA).**

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We would like to thank our beloved Head of the Department, Electronics and Communication Engineering, My project coordinator **Mr. D. RAJ KUMAR, M.E.,** for his excellent guidance and encouragement for successful completion of project.

We would like to thank our project supervisor of Electronics and Communication Engineering, **Mr. D. RAJ KUMAR, M.E.,** Assistant Professor, who gave valuable suggestion, excellent guidance and encouragement for successful completion of project.

Our heartiest thanks to all our department faculty members and lab technicians for guiding us this venture.

We extend our genuine love and gratitude to our dear parents who have built up our profession and backed us up in difficulties.

Last but not the least: We thank our friends for their constant encouragement and help.

TABLE OF CONTENTS

IMPLEMENTATION OF RIPPLE CARRY ADDER AND BORROW SAVE ADDERBY 16nm FINFET TECHNOLOGY

Submitted by

RAVIKUMAR. S

(621819419001)

In partial fulfilment for the award of the degree of

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ANNA UNIVERSITY CHENNAI-600 025

MARCH – 2021

ANNA UNIVERSITY, CHENNAI

BONAFIDE CERTIFICATE

Certified that this Report titled **"IMPLEMENTATION OF RIPPLE CARRY ADDER AND BORROW SAVE ADDER BY 16nm FINFET TECHNOLOGY"** is the bonafide work of **RAVIKUMAR. S (621819419001)** who carried out this work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an occasion on this or any other candidate.

Signature of the HOD with date	Signature of the Supervisor with date
Mrs. S. Tamilarasi., M.E.,(Ph.D.),	Mr. D. Rajkumar., M.E.,
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Internal Examiner **External Examiner**

ACKNOWLEDGEMENT

First and foremost, my thanks to almighty, the great architect of the universe, who has blessed me to accomplish this phase successfully.

At the outset, I express my heart-felt thanks to my beloved chairman of PGP Institution, **Dr. PALANI.G.PERIASAMY, M.A, M.A, Ph.D., NRI(USA).**

Next I would like to extend my gratitude towards my correspondent sir **Mr.GANAPATHY** retired IFS for his overwhelming attitude to help his students.

Now I would like to thank my dean academic affairs **Dr.PERIASAMY** for having provident me with plethora of facilities to complete this project successfully.

I wish to express my sincere thanks to my respected Principal **Dr.V.KAVITHA, M.E, Ph.D.,** for all the blessings and help provided during the period of project work.

I would like to thank my beloved Head of the Department, Electronics and Communication Engineering, and my project coordinator **Mrs. TAMILARASI., M.E., Ph.D** for her excellent guidance and encouragement for successful compilation of the project.

I would like to thank to my project supervisor of Electronic and Communication engineering, **Mr. D. RAJKUMAR., M.E.,** Assistant Professor, Who have valuable suggestion, excellent guidance and encouragement for successful completion of project.

My heartiest thanks to all my department faculty members and lab technicians for guiding me this venture.

I extend my genuine love and gratitude to my dear parents who have built up my profession and backed me up in difficulties.

Last but not the least; I thank my friends for their constant encouragement and help.

ABSTRACT

In computer ALU, the adders are the most important functional unit. Most of the MCU employs Binary adders for addition and subtraction operations as well as for floating point multiplication and division. Therefore, the designing of adder is a challenging aspect in the digital circuits. In this project a hardware adder implementation such as, the ripple-carry adder (RCA) and the borrow-save adder (BSA) are performed. Ripple-Carry Adders are common for adding numbers expressed in conventional binary arithmetic. They consist of Full-Adder (FA) cells connected sequentially with the carryout output of an FA driving the carry-in input of the subsequent one.

In order to speed up addition, a redundant radix-r digit set can be employed, which allows the existence of redundant representations. A radix-r digit set must comprise more that r digit values in order to be redundant. One such representation is radix-2 or borrow-save Encoding. In BSA pair of digits expressed in borrow save encoding is added using a 4-to-2 compressor, which consists of two FA cells, and it implements carry-free addition algorithm. It is found from the result that BSA achieves smaller worst-case maximum delay than RCA with an improvement of nearly 96.24%.

CONTENTS

MODELING OF AN ACTIVE VOLTAGE DOUBLER RESONANT DC – DC CONVERTER FOR WIDE RANGE DC DRIVE APPLICATIONS

A PROJECT REPORT

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APRIL 2021

MODELLING OF AN ACTIVE VOLTAGE DOUBLER RESONANT DC – DC CONVERTER FOR WIDE RANGE DC DRIVE APPLICATIONS

A PROJECT REPORT

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Certified that this project report titled **"MODELLING OF AN ACTIVE VOLTAGE DOUBLER RESONANT DC – DC CONVERTER FOR WIDE RANGE DC DRIVE APPLICATIONS"** is the bonafide work of **MANOJKUMAR S [621817105011]** who carried out the work under my supervision.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLEDGEMENT

Our most sincere salutation goes to our Honorable Chairman **Dr.PALANI G PERIASAMY., M.A., M.A., Ph.D., (USA)** and for his kind support to do the project in the college.

Our most sincere salutation goes to our Honorable vice Chairman **Mrs.VISALAKSHI PERIASAMY, B.B.A., M.T (USA)** and for her kind support to do the project in the college.

We are pleased to express our gratitude & thanks to our honorable Correspondent **Mr. M. GANAPATHY, IFS (Retd.)** to give valuable ideas and suggestions to make this project a successful one.

We are pleased to express our gratitude & thanks to our esteemed Principal **Dr. V. KAVITHA, ME., Ph.D.,** to make our project a successful one.

We would like to express our thanks to our Head of the Department, **Mr.S. KUMARESAN., M.E.,** to make our project a successful one.

We wish to dedicate our sincere thanks & gratitude to our Project Guide & Coordinator **Mr. F. MAX SAVIO, M.E.,** Asst. Professor of EEE Department for his excellent guidance & had been a source of encouragement for us in encouraging different stages in our project Endeavour.

We are very grateful to all staff members & classmates who directly or indirectly help us to finish the project successfully.

ABSTRACT

In this project, the solar power is used as a power generating and feeding unit to the dc drive system. A high efficient phase shift full bridge resonant converter for drive application is used. The proposed converter increases the input power to a higher range and the losses are minimized. The converter is triggered using fixed pulse width modulation foe simple design. The whole system is mathematically modeled using MATLAB Simulink and a prototype model has been built for a close loop system. The mathematical modeling for the solar panel using the solar equivalent circuit and the proposed converter is designed. The motor load is driven at loaded condition and the motor speed is controlled using PI controller. This controller is simple and cheap. The hardware model uses the PIC controller and the output of the proposed system is analyzed and compared both in simulation and hardware.

A GRID INTERFACED HYBRID SOLAR-WIND POWER SYSTEM FOR LOW LOSS DISTRIBUTED POWER GENERATION

A PROJECT REPORT

Submitted by

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A GRID INTERFACED HYBRID SOLAR-WIND POWER SYSTEM FOR LOW LOSS DISTRIBUTED POWER GENERATION

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APRIL 2022

ANNA UNIVERSITY:: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report titled **"A GRID INTERFACED HYBRID SOLAR-WIND POWER SYSTEM FOR LOW LOSS DISTRIBUTED POWER GENERATION"** is the bonafide work of **HEMA K [621818105002], PRATHAP S [621818105011] and SANTHOSH KUMAR E [621818105012]** who carried out the work under my supervision.

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21/6/22
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21/6
EXTERNAL EXAMINER

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Our most sincere salutation goes to our Honorable Chairman **Dr.PALANI G PERIASAMY., M.A., M.A., Ph.D., (USA)** and for his kind support to do the project in the college.

Our most sincere salutation goes to our Honorable vice Chairman **Mrs.VISALAKSHI PERIASAMY, B.B.A., M.T (USA)** and for her kind support to do the project in the college.

We are pleased to express our gratitude & thanks to our honorable Correspondent **Mr. M. GANAPATHY, IFS (Retd.)** to give valuable ideas and suggestions to make this project a successful one.

We are pleased to express our gratitude & thanks to our esteemed Principal **Dr. V. KAVITHA, ME., Ph.D.,** to make our project a successful one.

We would like to express our thanks to our HOD **Mr. S. KUMARESAN, M.E.,** to make our project a successful one.

We wish to dedicate our sincere thanks & gratitude to our project supervisor **Mrs. R. BANU PRIYA, M.E.,** Asst. Professor of EEE Department for her excellent guidance & had been a source of encouragement for us in encouraging different stages in our project endeavor.

We are very grateful to all staff members & classmates who directly or indirectly help us to finish the project successfully.

ABSTRACT

In this project, the interfacing of the dual input from a Hybrid Wind – Solar power is done to power a DC drive application. The key element uses a dc/dc converter that can operate without disturbing the dc link voltage. The dc link voltage variation is eliminated by a closed loop control of the PI controller. It is noted that the closed loop control has reduced almost 90% of the dc link variations. The variation is observed to be less than 40V. The speed variation values are observed to be 2 rpm (98% reduced) and settling time as 0.2 seconds (50% reduced). Therefore, the proposed converter is used with the hybrid solar-wind model for the DC drive system. The open loop and the closed loop structure were modeled and the closed loop showed the voltage boosted up to 68% more compared to the open loop system which has reduced the losses to 32%. Thus the power consumption and utilization are being effectively used in the closed loop control. Also, the motor drive speed variation is controlled as seen before. The mathematical modeling of the Solar-Wind HRE system of 1.5 kW is simulated using MATALB (2021a). A similar prototype model of the proposed system is designed and the results are discussed. From these results and design studies, it is found that the proposed system can be implemented in industrial applications.

AUTOMATIC VOICE-CONTROLLED HOME AUTOMATION SYSTEM FOR ENERGY EFFICIENCY IMPROVEMENT USING NODE MCU

A MINI PROJECT REPORT

Submitted by

ARUUNKUMAAR A.P [621820415001]

in the partial fulfilment for the award of the degree of

MASTER OF ENGINEERING

IN

POWER ELECTRONICS AND DRIVES

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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SEPTEMBER 2021

AUTOMATIC VOICE-CONTROLLED HOME AUTOMATION SYSTEM FOR ENERGY EFFICIENCY IMPROVEMENT USING NODE MCU

A MINI PROJECT REPORT

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SEPTEMBER 2021

BONAFIDE CERTIFICATE

Certified that this project report titled **"AUTOMATIC VOICE-CONTROLLED HOME AUTOMATION SYSTEM FOR ENERGY EFFICIENCY IMPROVEMENT USING NODE MCU"** is the bonafide work of **ARUUNKUMAAR A P [621820415001]**who carried out the work under my supervision.

14/9/21

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14/9/21

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

Our most sincere salutation goes to our Honourable Chairman **Dr.PALANI G PERIASAMY., M.A., M.A., Ph.D., (USA)** and for his kind support to do the project in the college.

Our most sincere salutation goes to our Honourable vice Chairman **Mrs.VISALAKSHI PERIASAMY, B.B.A., M.T (USA)** and for her kind support to do the project in the college.

We are pleased to express our gratitude & thanks to our honorable Correspondent **Mr. M. GANAPATHY, IFS (Retd.)** to give valuable ideas and suggestions to make this project a successful one.

We are pleased to express our gratitude & thanks to our esteemed Principal **Dr. V. KAVITHA, ME., Ph.D.,** to make our project a successful one.

We would like to express our thanks to our Head of the Department, **Mr.S. KUMARESAN, M.E.,** to make our project a successful one.

We wish to dedicate our sincere thanks & gratitude to our Project Guide & Coordinator **Mr.S. KUMARESAN, M.E.,** Head of EEE Department for his excellent guidance & had been a source of encouragement for us in encouraging different stages in our project Endeavour.

We are very grateful to all staff members & classmates who directly or indirectly help us to finish the project successfully.

ABSTRACT

The main objective of this project is to develop a home automation system using a Node Mcu board with WIFI being remotely controlled by any Android OS smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a most modern solution with smart phones. In order to achieve this, a Wi-Fi module is interfaced to the Node MCU board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified location on the GUI, the loads can be turned ON/OFF remotely through this technology. The loads are operated by Arduino board through opto-isolators and thyristors using triac's.

DESIGN AND ANALYSIS OF A SINGLE QUADRATIC DC-DC CONVERTER USING SOLAR POWER IN DRIVE APPLICATIONS

A THESIS

Submitted by

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MASTER OF ENGINEERING

IN

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DESIGN AND ANALYSIS OF A SINGLE QUADRATIC DC-DC CONVERTER USING SOLAR POWER IN DRIVE APPLICATIONS

A THESIS

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BONAFIDE CERTIFICATE

Certified that this project report titled "**DESIGN AND ANALYSIS OF A SINGLE QUADRATIC DC-DC CONVERTER USING SOLAR POWER IN DRIVE APPLICATIONS**" is the bonafide work of **SENGAVI [621820415002]** who carried out the work under my supervision.

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ACKNOWLEDGEMENT

Our most sincere salutation goes to our Honorable Chairman **Dr.PALANI G PERIASAMY., M.A., M.A., Ph.D., (USA)** and for his kind support to do the project in the college.

Our most sincere salutation goes to our Honorable vice Chairman **Mrs.VISALAKSHI PERIASAMY, B.B.A., M.T (USA)** and for her kind support to do the project in the college.

We are pleased to express our gratitude & thanks to our honorable Correspondent **Mr. M. GANAPATHY, IFS (Retd.)** to give valuable ideas and suggestions to make this project a successful one.

We are pleased to express our gratitude & thanks to our esteemed Principal **Dr. V. KAVITHA, ME., Ph.D.,** to make our project a successful one.

We would like to express our thanks to our HOD **Mr. S. KUMARESAN, M.E.,** to make our project a successful one.

I wish to dedicate our sincere thanks & gratitude to our Project Supervisor **Mr. S. KUMARESAN, M.E.,** Asst. Professor of EEE Department for his excellent guidance & had been a source of encouragement for us in encouraging different stages in our project Endeavour.

We are very grateful to all staff members & classmates who directly or indirectly help us to finish the project successfully.

ABSTRACT

Renewable Energy Systems (RES) are one of the top research fields over a long period. Many countries have developed and some are developing the power generation through RES. Among the RES, the Solar Power Generation is the most significant method of using power generation when compared to other methods. The solar power generation is easy in implementation and can be used for self-power generation. In the proposed work, a high-gain bidirectional quadratic dc–dc converter is proposed for solar power generation. In this work, 1.5kW solar PV panel is mathematically modelled to power a stand-alone dc motor drive. The solar panel is modeled for low voltage and later boosted with a suitable power modulator. The power modulator is chosen such that boosting factor is high to operate a motor load. The power modulator operates both in boost and buck operation in bidirectional conversion. The converter in buck operation is used for light loads and boost operation for motor load. In this work, the conventional converter is mathematically modelled for both boost and buck operation. The proposed system is mathematically modelled with solar panel as an input source and analyzed with R, RL and motor load. The motor load uses a BLDC motor whose speed is synchronized using Proportional Integral Controller. The proposed system is modeled using MATLAB Simulink 2021. An experimental setup is designed and the results are verified.

ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "**PNEUMATIC INJECTION MOULDING**" is the bonafide work of "**ARIVAZHAGAN M , PONMEGAN N , PRAKASH B , SARANRAJ S,** " who carried out the project work under my supervision.

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Project work report submitted for university project viva-voice examination held on 21.06.2022

21.6.22

INTERNAL EXAMINER

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

At this pleasing moment of having successfully completed our project, we wish to convey our sincere thanks and gratitude to the management of the institution and our specific heartfelt thanks and gratitude to our beloved chairman, **DR. PALANI G PERIYASAMY, M.A., Ph.D., (US)** who provided all the facilities to us.

We would like to express our sincere thanks to **DR.V.KAVITHA.,MCA.,M.E.,Ph.D., PRINCIPAL.,**PGP college of engineering & technology for forwarding us to do our project and offering adequate support in completing our project.

We are grateful to our head of the department & associate professor **Mr.T.PONNUSAMY.,M.TECH.,(Ph.D).,** PGP college of engineering and technology, for his constructive suggestions support and encouragement during our project.

We owe in great measure to my guide and philosopher, **Mr.T.PONNUSAMY.,M.TECH.,(Ph.D).,** Assistant professor, PGP college of engineering & technology, for his guidance inspiring suggestion, encouragement, and continuous help during the preparation of this project.

We extend earnest and sincere thanks and gratitude to **Mr.R.P.BALASUBRAMANIAN.,M.E.,** Our project coordinator, and Assistant professor, PGP college of engineering and technology, for his kind support, direction and guidance in completing the project successfully.

We would like to express our sincere thanks to all our department teaching, non-teaching faculty members and our parents.

ABSTRACT

The use of plastic is increased now days in many industries like automobile, packaging, medical, etc. The reason behind this is that the plastic made things are quiet easier to manufacture, handle and reliable to use. So the plastic goods manufacturing industries are striving hard to produce good quality products at large scale and cheaper cost. The hydraulically operated machines solve the problem, but they are too costlier for small scale and medium scale industries. This paper deals with design and fabrication of pneumatically operated injection molding machine. The manually operated machine is converted into pneumatically operated machine by applying proper design procedure.

CHAPTER-1

INTRODUCTION

The main principle is to compress the plastic material in a barrel and the compressing motion is developed by hydraulic motion. The heater surrounding the barrel the molten plastic is injected through the nozzle in barrel to the compressing force heats the plastic material.

1.1 FABRICATION TECHNIQUES:

The polymer material are converted in to plastics and used as tubes, sheets, foams, rods, adhesives etc. The theological properties, softening, tempering, stabilizing the size and shapes are important in describing the method. These methods are different for different kinds of plastics. Broadly speaking the methods may be discussed under the following headings.

- MOULDING PROCESS.
- FOAMING PROCESS.

1.2 WORKING PRINCIPLE

The Pneumatic injection-moulding process is best suited for producing articles made of thermoplastic materials. Here, the equipment cost is relatively high but the main attraction is the amenability of the pneumatic injection-moulding process to a high production rate. In pneumatic injection molding, a definite quantity of molten thermoplastic material is injected under pressure into a relatively cold mold where it solidifies to the shape of the mould.

The pneumatic injection – moulding machine is shown in the process consists of feeding the compounded plastic material as granules, pellets or powder through