E.G.S PILLAY ENGINEERING COLLEGE (AUTONOMOUS)

NAGAPATTINAM-611002

NBA Accredited Programmers (CSE, EEE, ECE, IT, CIVIL, MECH/Accredited by NAAC WITH "A" Grad

(AN ISO 9001:2015 CERTIFIED INSTITUTION) / Approved by AICTE New Delhi

Affiliated to Anna University, Chennai

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SRISHTI-2021

[DEPARTMENT OF CIVIL ENGINEERING]

(June' 2020 - May' 2021)

DEDICATED TO OUR FOUNDER- CHAIRMANCHEV. Dr. G.S. PILLAY

MAGAZINE: JUNE' 2020-MAY'2021

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DEPARTMENT OF CIVIL ENGINEERING

VISION

To evolve as a centre of excellence by imparting qualitytechnical education and promoting research to meet the emerging challenges in the field of Civil Engineering.

MISSION

Civil Engineering department is committed to

M1: Provide quality education through innovative teaching and learning practices

M2: Encourage faculty and students to pursue higher education and carry out socially relevant innovative research thereby establishing centers of excellence in emerging areas of research

M3: Offer consultancy services using state of the art facilities fulfilling the needs of the industry and society.

M4: Enable our students and faculty to play leadership roles in a sustainable manner by adopting professional ethics, entrepreneurship activities, interpersonal skills and lifelong learning attitude.

ABOUT THE DEPARTMENT

The Department of Civil Engineering was established in the year 2011 with the intake of 60 students. The intake is increased to 120 students in the year of 2013 The department has well qualified and experienced teaching faculties and technical staff with state of the art laboratories to meet the quality education required for present challenging societal and industrial needs. Department is involved in Research & Consultancy activities in the areas of Structural Engineering, Environmental Engineering, Geotechnical Engineering, Concrete highway Engineering and Surveying with many national and international publications. Department is actively involved in co-curricular and extra-curricular activities with the association of professional bodies. ..

COURSES OFFERED:

B.E-Civil Engineering

Association Name: PEACE

PRECIOUS ENLIGHTENING ASSOCIATION OF CIVIL ENGINEERING

E.G.S PILLAY ENGINEERING COLLEGE, NAGAPATTINAM

(AUTONOMOUS)

Department of Civil Engineering

PROGRAMME OUTCOMES

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science, and engineering sciences
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusion
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6. **The engineering and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Professional engineering practice
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team,to manage projects and in multidisciplinary environments
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in Independent and life-long learning in the broadest context of technologic

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The civil engineering program aims at:

PEO1: Preparing graduates to become a successful Civil Engineer to meet the demand driven needs in the field of Civil Engineering and related professions or pursue higher study and research or become an entrepreneur.

PEO2: Developing core competence by analyzing and design of Civil engineering systems with social awareness and responsibilities.

PEO3: Building professionalism, ethical approach, communication skills, teamwork in their profession and adapting to modern trends by engaging in lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After successful completion of the programme, students will be able to

PSO1: Analyze the effects of natural calamities like Tsunami, storms, earthquakes, landslides etc. in the design of stable structures.

PSO2: Use eco-friendly materials and mechanisms for sustainable and life-line infrastructures.

E.G.S PILLAY ENGINEERING COLLEGE, NAGAPATTINAM (AUTONOMOUS)

Department of Civil Engineering

ACTION PLAN AND ACHIEVEMENTS

S.NO	PLAN OF ACTIVE	ACHIEVEMENTS
1	Planned to send at least two faculty membersto go for research oriented higher studies.	5 Faculty members are doing higherstudies.
2	Planned to send at least three faculty membersto take part in the International and National Conferences, Workshops and Seminars.	All the faculty members attended the International Conference.
3	Planned to send all the faculty members to publish papers in the reputed National andInternational Journals.	All the faculty members published papersin reputed International Journals.
4	Planned to send the proposals to obtain assistance from Government bodies such as UGC, AICTE and other funding agencies formajor and minor projects.	We have proposed and are trying to get funding from government bodies and we received funds from TNCST and TNSDC.
5	We motivate all the students to take part in theworkshops, seminars, symposiums held in other colleges.	Our students participated in various workshops, paper presentations and symposiums in other colleges.
6	We have planned to improve the department-wise results at least 15%compared to earlier semesters.	We increased our results by 10% when compared to the last semester.
7	Though a proper system of teaching, we will increase the subject-wise results to 90% andabove.	Subject wise results increased 90% andabove in five subjects.
8	**Planned to conduct at least one guest lecturerand one industrial visit this year.**	**We conducted guest lecturers for 5 subjectsand visited one industry per year.**

MESSAGES:

FROM SECRETARY DESK

This is indeed a happiness showered on me to know that the department of civil Engineering is organizing a national level technical symposium SRISHTI-2K21. Sky is thelimit for one's excellence and perfection, but an attempt to reach the acme is praiseworthy.

As a secretary of this institution, I consider it my duty to motivate and congratulatethe organizer who has been strenuously planning to make the national level technical

Symposium a grand success.

SHRI S.
PARAMESHWARAN.,

SECRETARY,EGSPEC

PRINCIPAL MESSAGE

Empowerment of students for their all- round development through education is our cherished motto. Today education means much more than merely acquiring knowledge. It is acquisition of knowledge and skills, building character and improving employability of our young talent, this future leadership. I am sure, being stars and their painstakingly and gainfully developed EGSPEC culture, we inherited a strong foundation to march achieve thewithin mentioned education objectives for a stronger and brighter India.

It gives me immense pleasure to pen a few words as prologue to our in-house magazine SRISHTI-2K21 exclusively meant for churning out the latent writing talent which bears immense potentiality of sharpening your communication skills as part of your overall personality development. I congratulate all the contributors and the editorial board for bringing out such a beautiful magazine.

Wishing you all the best…!

Dr.S.RAMABALAN.

PRINCIPAL, EGSPEC

HOD'S MESSAGE

It gives me immense pleasure to encourage the department of civil engineering,which is organizing a symposium on 17th February, 2021. This kind of symposium provides a platform for the students to have interactions that are taking place in the outside world.

I have great pleasure in wishing the release of the magazine SRISHTI-2K21a great success.

Dr.V.MOHAN.,
HOD/EEE

I am very glad to wish a grand success for the symposium SRISHTI-2K21 arranged by the department of civil engineering, it is a fantabulous occasion wherethe students are interestingly performing all the activities, I wonder about their creativity and wish to be a part of it.

Dr.G.GURUMOORTHI,

HOD/MECH

Its gives me pride and pleasure to wish the civil engineering department symposium a grand success I hope that you will enjoy exploring the symposium andI appreciate the interest in enhancing the creative potential of inviduals.

The symposium is creating an environment where teaching and scholarship complement each other at all levels of educating the students to conceptualize andexpress ideas analytically and creatively and to reason critically.

Dr. B. PADMANABAN

HOD/ECE

On behalf of Science and Humanities, I wish all the faculty members and students of Civil Department for their outstanding performance in academic activities. Also I convey my hearty wishes for the grand success of the symposium“SRISHTI-2K21”.

Dr.A.R.Deepa

HOD/S&H

I am very happy to meet you through SRISHTI-2K21. Education is not an act of`acquiring knowledge but learning a skill to lead life and forming one’s personality. This is an ennobling process of growth. I can boldly say that we have excellent in every initiative that we undertook and we have understood together in facing the challenges in providing quality education to students. It gives me great pleasure to see the birth of our college magazine. I congratulate all the contributorsand the editorial board for making this happens.

Dr.J.Vantha,

HOD/MCA

Greeting to Civil Department for wonderful and great coordination for organizing National Level Technical Symposium (SRISHTI-2K20).

Engineering is the way of delivering multi-disciplinary project and environment to create young talent and skills. Knowledge, Skill and Attitude arethe importance for producing and talent, future leaders. I wish and congratulate

faculty members and students for your wonderful support. I pray to god for creating asuccessful event.

Mr. Dr.Manikandan

HOD/IT

STAFF'S MESSAGES:

SEISMIC WAVES:

Seismic waves are caused by the sudden movement of materials within the Earth, such as slip along a fault during an earthquake. Volcanic eruptions, explosions, landslides, avalanches, and even rushing rivers can also cause seismic waves.

Types of seismic waves:

Body waves

Primary waves

Secondary waves

Surface waves

Rayleigh waves

Love waves

Stoneley waves

Normal modes

P and S waves in Earth's mantle and core.

BODY WAVE:

A body wave is a seismic wave that moves through the interior of the earth, as opposed to surface waves that travel near the earth's surface. P and S waves are body waves. Each type of wave shakes the ground in different ways.

PRIMARY WAVE:

A P wave (primary wave or pressure wave) is one of the two main types of elastic body waves, called seismic waves in seismology. P waves travel faster than other seismic waves and hence are the first signal from an earthquake to arrive at any affected location or at a seismograph.

SECONDARY WAVE:

Secondary waves (S-waves) are shear waves that are transverse in nature. Following an earthquake event, S-waves arrive at seismograph stations after the faster-moving P-waves and displace the ground perpendicular to the direction of propagation.

SURFACE WAVE:

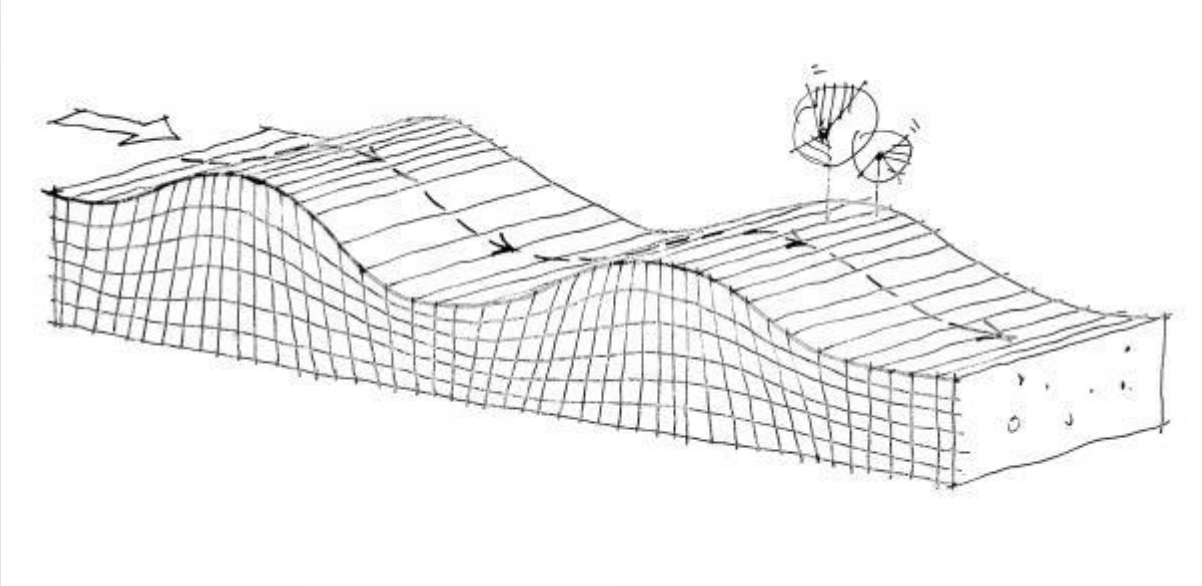
Surface waves are typically generated when the source of the earthquake is close to the Earth's surface. As their name suggests, surface waves travel just below the surface of the ground.

RAYLEIGH WAVES:

Rayleigh waves, also known as ground roll, spread through the ground as ripples, similar to rolling waves on the ocean. Like rolling ocean waves, Rayleigh waves move both vertically and horizontally in a vertical plane pointed in the direction in which the waves are travelling.

Eyewitnesses have claimed to observe Rayleigh waves in large open spaces, such as car parks, where they described the vehicles moving up and down like corks floating on the ocean.

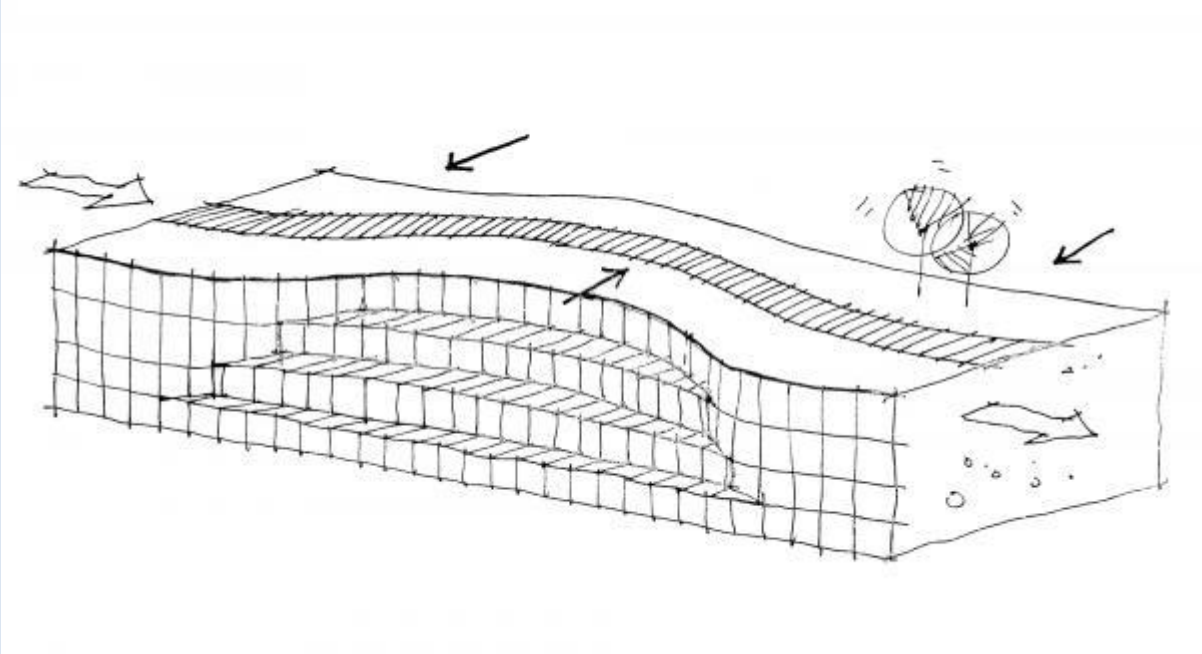
Rayleigh waves are slower than body waves and typically travel at a speed that is 10% slower than S-waves.



Rayleighwaves propagate through the ground as ripples

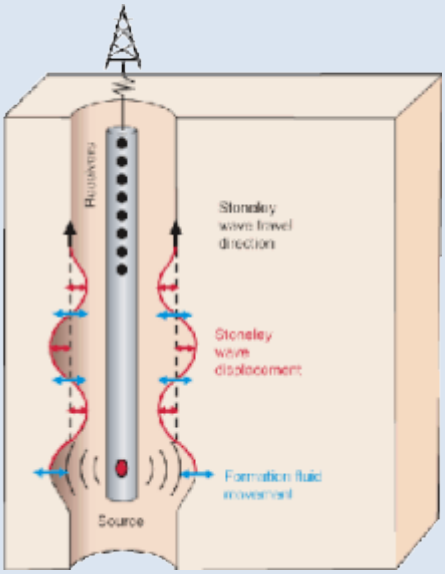
LOVE WAVES:

Love waves have the same motion as S-waves but without the vertical displacement. They move the ground from side to side in a horizontal plane but at right angles to the direction of propagation. Love waves are particularly damaging to the foundations of structures because of the horizontal ground motion they generate. Love waves can also cause horizontal shearing of the ground. They usually travel slightly faster than Rayleigh waves, at a speed that is usually about 10% slower than S-waves, but like S-waves, they cannot spread through water.



Love waves are particularly damaging to the foundations of structures

Stoneley wave



The motion of the stoneley wave

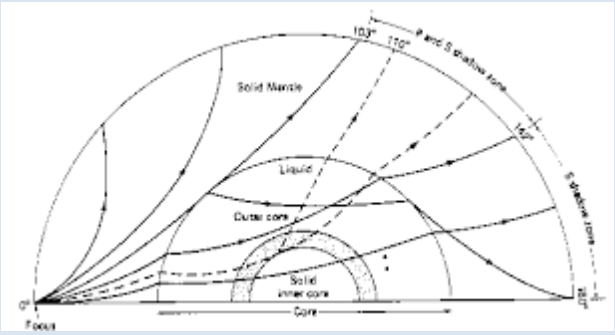
A Stoneley wave is a boundary wave (or interface wave) that typically propagates along a solid-solid interface.When found at a liquid-solid interface, this wave is also referred to as a Scholte wave.The wave is of maximum intensity at the interface and decreases exponentially away from it. It is named after the British seismologist Dr. Robert Stoneley (1894–1976), a lecturer in the University of Leeds, who discovered it on October 1, 1924.

NORMAL MODES:

Normal modes are stationary waves that are created from the constructive interference of body and surface waves circling the earth multiple times. Free oscillations of the Earth have very large periods and they can be recorded with long period seismometers.

P AND S WAVES IN EARTH'S MANTLE AND CORE:

Seismic waves move more slowly through a liquid than a solid. Molten areas within the Earth slow down P waves and stop S waves because their shearing motion cannot be transmitted through a liquid. Partially molten areas may slow down the P waves and attenuate or weaken S waves.



G.PRAKASH

REPAIR AND REHABILITATION:

Repair is the technical aspect of rehabilitation. It refers to the modification of a structure, partly or wholly which is damaged in appearance or serviceability.

The following factors to be considered repair of concrete structures:

The cause of damage

Type, shape and function of the structure

The capabilities and facilities available with builders

The availability of repair material

1.Stages of concrete repair

Repair of concrete structures is carried out in the following stages:

Removal of damaged concrete

Pre treatment of surfaces and reinforcement

Application of repair material

Restoring the integrity of individual sections and strengthening of structure as a whole

2. Repair procedure

A repair procedure may be selected to accomplish on or more of the following objectives:

To increase strength or restore load carrying capacity

To restore or increase stiffens

To improve functional performance

To provide water tightness

To improve durability

To prevent access of corrosive material to reinforcement

3 TYPES AND CLASSIFICATION OF REPAIR TYPES OF REPAIR:

Cosmetic treatments on surfaces

Partial replacement of surface and subsurface material

Additional of reinforcements and bonding materials to strengthen the element

Total replacement of the structural element

Classification of repair:

Class of damage	Classification of repair	Repair reqirements
1.	Superficial	Cement mortar bonding by trowelling
2.	General	Non structural or minor structural ;restoring cover to rebars
3.	Principal	Significant loss of concrete strength; shotcreting for slabs and beams, jacketing for columns etc
4.	Major	Demolition and recasting required.

Classification of repair : Repair reqirements

Superficial : Cement mortar bonding by trowelling

General : Non structural or minor structural ;restoring cover to rebars

Principal : Significant loss of concrete strength; shotcreting for slabs and beams, jacketing for columns etc

Major : Demolition and recasting required.

4. METHODS OF REPAIRS:

The following considerations are to be taken care of and observed:

Determination of extent, location and width of cracks

Classification of cracks as structural and non-structural

Dormant cracks:

Dormant cracks are caused by some event in the part, which is not expected to recur. They remain constant in width, and may be repaired by filling then with a rigid material.

Active cracks:

Do not remain constant in width, but open and close as the structure in loaded, or due to thermal and hydras changes in the concrete.

Growth cracks:

Increase in width becomes the original reason for their occurrence persists.

5 .APPLICATIONS:

The repair of cracks can be achieved with the following techniques:

Resin injection

Routing and Sealing

Stitching

External stressing

Bonding

Blanketing

Overlays

Dry pack

Vacuum impregnation

Polymer impregnation

6. REHABILITATIONS:

The success of repair activity depends on the identification of the root cause of the deterioration of the concrete structures. The repairs can be done for the improvement of strength and durability, thus extending the life of the structure, is not difficult to achieve.

It is the processes of restoring the structure to service level, once it had and now lost, strengthening consists in endowing the structure with a service level, higher than that initially planned by modifying the structure not necessarily damaged area.

The following steps are generally used in the rehabilitation of distressed concrete structure:

Support the structural members properly as required.

Remove all cracked, spalled and loose concrete.

Clean the exposed concrete surfaces and steel reinforcement

Provide additional reinforcing bars, if the loss in reinforcement is more than 10%

Apply protective coatings over the exposed/repaired surface

APPLICATIONS:

Shotcrete/Gunite

Resin injection

Dry pack and Epoxy-bonded dry pack

Slab jacking Technique

Sprayed concrete

CAUSES OF DETERIORATION:

a) DESIGN AND CONSTRUCTION FLOWS

Design of concrete structures governs the performance of concrete structures. Well-designed and detailed concrete structure will show less deterioration in comparison with poorly designed and detailed concrete, in this similar condition. The beam-column joints are particularly probe to defective concrete, if detailing and placing of reinforcement is not done properly.

B) ENVIRONMENTAL EFFECTS

Micro-cracks present in the concrete are the source of access of moisture and atmospheric carbon-di-oxide into the concrete, which attack reinforcement and react with various ingredients of concrete. In aggressive environment, concrete structures will deteriorate faster and strength/life of concrete structures will be severely reduced.

C) USAGE OF POOR QUALITY MATERIAL

Quality of materials to be used in construction, should be ensured by means of various tests, as specified in the IS codes. Alkali-aggregate and Sulphate attack results in early deterioration. Clayed materials in the fine aggregates may weaken the mortar-aggregate bond, and reduce the strength.

D) QUALITY OF SUPERVISION

Construction work should be carried out as per the specifications. Adherence to specified water-cement ratio controls strength, permeability and durability of concrete. Insufficient vibration may result in porous and honey-combed concrete, whereas excess vibration may cause segregation.

E) DETERIORATION DUE TO CORROSION

Spalling of concrete cover

Cracks parallel to the reinforcement

Spalling at edges

Swelling of concrete

Dislocation

N.R.VEDHAMOORTHY

REPAIR AND REHABILITATION OF STRUCTURE:

In the current scenario of Building Research, Repair and Rehabilitation plays a vital role as it serves important purposes in building applications. It acts as an inevitable solution in maintaining the Integrity of Structures, in case of Heritage structures. Repair and Rehabilitation of heritage buildings has become a concern of greater importance over the world, notably in the developed countries. The major defects reported are discussed and a suitable and economical solution for a particular defect is identified by a trade off between cost, lifetime and adaptability of the solution.

INTRODUCTION:

Repair and Rehabilitation is an Art of Civil Engineering work which enables to extend the service life of a structure. Repair and Rehabilitation is defined as the process of achieving the original state of structure when it undergoes any sort of defects or deterioration or

destruction. Restoration of structure is an ultimate aim of Repair and Rehabilitation where it plays a major role by maximizing the functional utility of the structure. Repair and Rehabilitation technique is also used to modify a structure to meet new functional and other requirements. Many structures may need Repair and Rehabilitation for one of the following reasons

Deterioration due to Environment effect.

New functional or loading requirements entering modifications to a structure.

DAMAGE DUE TO ACCIDENTS:

Repair and Rehabilitation includes several systematic approaches that are lined up with various strategies to promote a desired level in attaining maximum life of the structure. Generally, life of a structure depends on geography of location, Building material, Technology and Workmanship. Geography of location includes various aspects such as type of strata, water table, earthquake or wind or cyclone or flood or snow, pollutant, landslide and tree location with respect to building. Building materials includes cement, lime, fine sand, coarse sand, quality of water, bamboo or wood, brick. Technology includes various aspects such as architectural design, construction methods, and quality practices. Finally one of the major factor workmanship includes various aspects such as structural work, finishing work, waterproofing work, maintenance of building. The basic process flow employed in Repair and Rehabilitation includes ¬identification of the building that should be rehabilitated, history of the building, preliminary survey which includes preliminary tests that are performed, identification of problems, and suitable solution for the problem which should be feasible to the building topography conditions.

Selection building or model creation.

Data collection.

Identification problem.

Selection of suitable solutions for problems.

Feasible or not, concrete can be made from sand consisting of rounded grains as good as form that in which the grains or granular.

Materials

Cement

Cement of 53 grades shall be used for the work. Initial and final setting time of the cement was 30 minutes and 600 minutes.

FINE AGGREGATE:

The fine aggregate used will locally available river sand without any organic impurities and conforming to IS: 383 – 1970. The fine aggregate was tested for its physical requirements such as gradation, fineness modulus, specific gravity and bulk density. A concrete can be made from sand consisting of rounded grains as good as form that in which the grains or granular.

COARSE AGGREGATE:

Coarse aggregate for structures consists of material within the range of 5mm to 150mm size. Rocks having water absorption value greater than 3% or specific gravity of less than 2.5 are not considered suitable for mass concrete. However, in practice mixes of same work-ability for round shaped aggregates required less water than angular shaped aggregates.

Water

Water is an important ingredient of concrete as it activity participates in the chemical reaction with cement and potable water available in laboratory with pH value of not less than 6.5 and not more than8.5 ,conforming to the requirement of IS 456 2000 were used for mixing concrete and curing the specimen. The water which is fit for drinking should be used for making concrete.

REPAIR MATERIALS:

The most common material in the repair of damages are of various types including cement and steel. In most situations non-shrinking cement or an admixture like aluminum powder in the ordinary Portland cement is admissible. Steel can be required in many forms, like bolts, channels, angles, rods. For providing temporary supports and scaffolding timber and bamboo are the most commonly used, and they are required in the form of sleepers, planks, rounds etc. There are other methods of repair also which gives good results in repair and strengthening works.

SHOTCRETE:

Shotcrete is a method in which combination of sand and Portland cement are applied on the required area. This sand and cement is mixed pneumatically and then conveyed in dry state itself to the nozzle of a pressure gun, where water gets mixed and the hydration takes place just before the expulsion. By this technique the material bonds perfectly to prepared surface. While application on irregular or curved surfaces, its high strength and good physical characteristics, make it an ideal means to achieve added structural capability in walls and other elements of building. With this there are some of minor restrictions to the technique as clearance, thickness, direction of application etc.

EPOXY RESINS:

Epoxy resins are excellent binding agents which are used as repair material. The use of epoxy resins gives high strength in the repair works. Epoxy resins are composed of chemicals with

proportions which when changed gives results as per requirement. These epoxy components are mixed just prior to their application. The product formed by the addition of epoxy resin has low viscosity and it can be injected in small cracks also. The epoxy resins having higher viscosity could be used for the purpose of surface coating or for filling the larger cracks or holes also. The strength of epoxy mixture depends upon the temperature of curing. Lower the temperature higher will be the strength achieved.

EPOXY MORTAR:

In case of larger void spaces, epoxy resins of either low viscosity or higher viscosity are combined with sand or aggregate to form epoxy mortar. This mixture of epoxy mortar has much higher strength than the Portland cement concrete. Thus the mortar is not a stiff material for replacing reinforced concrete. It has also been reported that the epoxy is a combustible material. Therefore, the epoxy material is not used alone. The epoxy mortar formed from mixing of sand and aggregates gives a heat sink for heat generated and with this it also provides increase in modulus of elasticity

GYPSUM CEMENT MORTAR:

Gypsum cement mortar has very limited use regarding its structural application. This gypsum cement mortar has lowest strength at the failure among other materials of repair.

QUICK-SETTING CEMENT MORTAR:

This quick setting cement mortar was actually manufactured for the use as a repair material for reinforced concrete floors that are adjacent to steel blast furnaces. This mortar is a non-hydrous magnesium phosphate cement with two components, a liquid and a dry; these are mixed in similar way of Portland cement concrete.

MECHANICAL ANCHORS:

Mechanical type of anchors gives wedging action to provide anchorage. Some of the anchors provide shear and tension resistance both. In the purpose of achieving strength these types of manufactured anchors are used. Alternatively, for chemical anchors bonded in drilled holes' polymer adhesives are used.

EXPERIMENTAL WORK

REBOUND HAMMER TEST:

Rebound Hammer test is a Non-destructive testing method of concrete which provides a convenient and rapid indication of the compressible strength of the concrete. The rebound hammer is also called a Schmidt hammer that consists of a spring controlled mass that slides on a plunger within a tubular housing.The operation of rebound hammer is shown in the figure. When the plunger of the rebound hammer is pressed against the surface of concrete, a spring controlled mass with a constant energy is made to hit the concrete surface to rebound back. The extent of rebound, which is a measure of surface hardness, is measured on a graduated scale. This measured value is designated as Rebound Number (rebound index). A concrete with low strength and low stiffness will absorb more energy to yield in a lower rebound value.

Figure: Rebound Hammer Test

COMPRESSION TEST ON CONCRETE:

Compression test is the most common test conducted on hardened concrete, partly because it is an easy test to perform, and partly because most of the desirable characteristics properties of concrete are qualitatively related to its compressive strength. The compressive test is carried out on specimen cubical or cylindrical in shape. Sometimes, the compression strength of concrete is determined using parts of a beam tested in flexure. The end parts of beam are left intact after failure in flexure and since the beam is usually of square cross section,this part of the beam could be used to find out the compressive strength.

Figure: Compressive Test on Concrete

CONCLUSION:

Every building has some life span after time passes certain problems arises like paint deuteriation, corrosion, seepage problems, deflections in beams etc. Buildings will become unstable due to all these problems. So, repair works should be done in order to gain the strength of the structure. Repair and Rehabilitation is necessary to save hazardous failure of structures. It is recommended for old buildings which have some signs like cracks, corrosion

of embedded materials, etc. Therefore, timely maintenance of structures is required. Most of the olden structures are given strength by doing process of repair and rehabilitation like Charminar.The selection of technique is used as per cost, location of site and other factors. Thus for proper maintenance the techniques likewise should be employed.

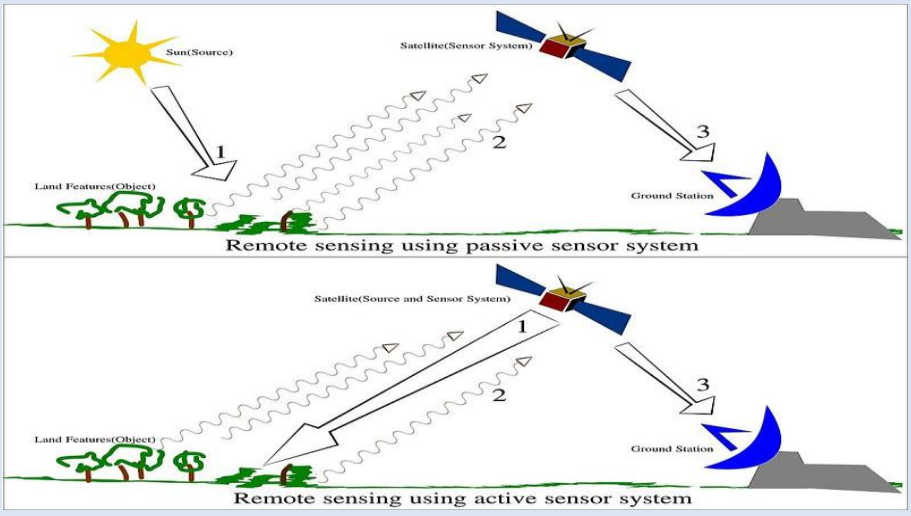
T.ADHAVANATHAN

REMOTE SENSING AND GIS:

Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance (typically from satellite or aircraft). Special cameras collect remotely sensed images, which help researchers "sense" things about the Earth.

Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object, in contrast to in situ or on-site observation. The term is applied especially to acquiring information about the Earth and other planets. Remote sensing is used in numerous fields, including geography, land surveying and most Earth science disciplines (for example, hydrology, ecology, meteorology, oceanography, glaciology, geology); it also has military, intelligence, commercial, economic, planning, and humanitarian applications, among others.

In current usage, the term "remote sensing" generally refers to the use of satellite or aircraft-based sensor technologies to detect and classify objects on Earth. It includes the surface and the atmosphere and oceans, based on propagated signals (e.g. electromagnetic radiation). It may be split into "active" remote sensing (when a signal is emitted by a satellite or aircraft to the object and its reflection detected by the sensor) and "passive" remote sensing (when the reflection of sunlight is detected by the sensor).



TYPES OF DATA ACQUISITION TECHNIQUES:

The basis for multispectral collection and analysis is that of examined areas or objects that reflect or emit radiation that stand out from surrounding areas. For a summary of major remote sensing satellite systems see the overview table.

APPLICATIONS OF REMOTE SENSING:

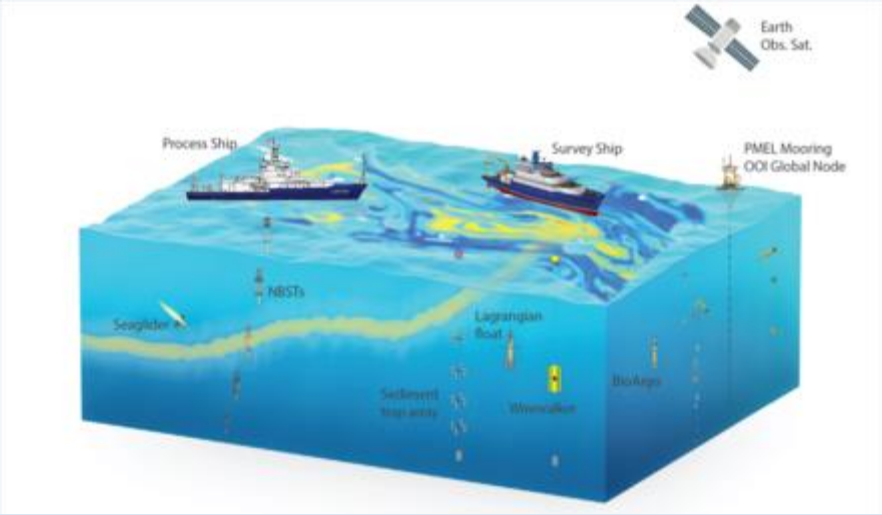
Conventional radar is mostly associated with aerial traffic control, early warning, and certain large-scale meteorological data. Doppler radar is used by local law enforcements' monitoring of speed limits and in enhanced meteorological collection such as wind speed and direction within weather systems in addition to precipitation location and intensity. Other types of active collection includes plasmas in the ionosphere. Interferometric synthetic aperture radar is used to produce precise digital elevation models of large scale terrain (See RADARSAT, TerraSAR-X, Magellan)

Laser and radar altimeters on satellites have provided a wide range of data. By measuring the bulges of water caused by gravity, they map features on the seafloor to a resolution of a mile or so. By measuring the height and wavelength of ocean waves, the altimeters measure wind speeds and direction, and surface ocean currents and directions.

Ultrasound (acoustic) and radar tide gauges measure sea level, tides and wave direction in coastal and offshore tide gauges.

Light detection and ranging (LIDAR) is well known in examples of weapon ranging, laser illuminated homing of projectiles. LIDAR is used to detect and measure the concentration of various chemicals in the atmosphere, while airborne LIDAR can be used to measure the heights of objects and features on the ground more accurately than with radar technology. Vegetation remote sensing is a principal application of LIDAR.

Radiometers and photometers are the most common instrument in use, collecting reflected and emitted radiation in a wide range of frequencies. The most common are visible and infrared sensors, followed by microwave, gamma-ray, and rarely, ultraviolet. They may also be used to detect the emission spectra of various chemicals, providing data on chemical concentrations in the atmosphere.



Examples of remote sensing equipment deployed by or interfaced with oceanographic research vessels.

Radiometers are also used at night, because artificial light emissions are a key signature of human activity.[12] Applications include remote sensing of population, GDP, and damage to infrastructure from war or disasters.

Radiometers and radar onboard of satellites can be used to monitor volcanic eruptions.

Spectropolarimetric Imaging has been reported to be useful for target tracking purposes by researchers at the U.S. Army Research Laboratory. They determined that manmade items possess polarimetric signatures that are not found in natural objects. These conclusions were drawn from the imaging of military trucks, like the Humvee, and trailers with their acousto-optic tunable filter dual hyperspectral and spectropolarimetric VNIR Spectropolarimetric Imager.

Stereographic pairs of aerial photographs have often been used to make topographic maps by imagery and terrain analysts in trafficability and highway departments for potential routes, in addition to modelling terrestrial habitat features.

Simultaneous multi-spectral platforms such as Landsat have been in use since the 1970s. These thematic mappers take images in multiple wavelengths of electromagnetic radiation (multi-spectral) and are usually found on Earth observation satellites, including (for example) the Landsat program or the IKONOS satellite. Maps of land cover and land use from thematic mapping can be used to prospect for minerals, detect or monitor land usage, detect invasive vegetation, deforestation, and examine the health of indigenous plants and crops (satellite crop monitoring), including entire farming regions or forests. Prominent scientists using remote sensing for this purpose include Janet Franklin and Ruth DeFries. Landsat images are used by regulatory agencies such as KYDOW to indicate water quality parameters including Secchi depth, chlorophyll density, and total phosphorus content. Weather satellites are used in meteorology and climatology.

Hyperspectral imaging produces an image where each pixel has full spectral information with imaging narrow spectral bands over a contiguous spectral range. Hyperspectral imagers are used in various applications including mineralogy, biology, defence, and environmental measurements.

Within the scope of the combat against desertification, remote sensing allows researchers to follow up and monitor risk areas in the long term, to determine desertification factors, to support decision-makers in defining relevant measures of environmental management, and to assess their impacts.

GEODETIC:

Geodetic remote sensing can be gravimetric or geometric. Overhead gravity data collection was first used in aerial submarine detection. This data revealed minute perturbations in the Earth's gravitational field that may be used to determine changes in the mass distribution of the Earth, which in turn may be used for geophysical studies, as in GRACE. Geometric remote sensing includes position and deformation imaging using InSAR, LIDAR, etc.

ACOUSTIC AND NEAR-ACOUSTIC:

Sonar: passive sonar, listening for the sound made by another object (a vessel, a whale etc.); active sonar, emitting pulses of sounds and listening for echoes, used for detecting, ranging and measurements of underwater objects and terrain.

Seismograms taken at different locations can locate and measure earthquakes (after they occur) by comparing the relative intensity and precise timings.

Ultrasound: Ultrasound sensors, that emit high-frequency pulses and listening for echoes, used for detecting water waves and water level, as in tide gauges or for towing tanks.

To coordinate a series of large-scale observations, most sensing systems depend on the following: platform location and the orientation of the sensor. High-end instruments now often use positional information from satellite navigation systems. The rotation and orientation are often provided within a degree or two with electronic compasses. Compasses can measure not just azimuth (i. e. degrees to magnetic north), but also altitude (degrees above the horizon), since the magnetic field curves into the Earth at different angles at different latitudes. More exact orientations require gyroscopic-aided orientation, periodically realigned by different methods including navigation from stars or known benchmarks.

DATA CHARACTERISTICS:

The quality of remote sensing data consists of its spatial, spectral, radiometric and temporal resolutions.

Spatial resolution

The size of a pixel that is recorded in a raster image – typically pixels may correspond to square areas ranging in side length from 1 to 1,000 metres (3.3 to 3,280.8 ft).

SPECTRAL RESOLUTION:

The wavelength of the different frequency bands recorded – usually, this is related to the number of frequency bands recorded by the platform. Current Landsat collection is that of seven bands, including several in the infrared spectrum, ranging from a spectral resolution of 0.7 to 2.1 μm. The Hyperion sensor on Earth Observing-1 resolves 220 bands from 0.4 to 2.5 μm, with a spectral resolution of 0.10 to 0.11 μm per band.

RADIOMETRIC RESOLUTION:

The number of different intensities of radiation the sensor is able to distinguish. Typically, this ranges from 8 to 14 bits, corresponding to 256 levels of the gray scale and up to 16,384 intensities or "shades" of colour, in each band. It also depends on the instrument noise.

TEMPORAL RESOLUTION:

The frequency of flyovers by the satellite or plane, and is only relevant in time-series studies or those requiring an averaged or mosaic image as in deforesting monitoring. This was first used by the intelligence community where repeated coverage revealed changes in infrastructure, the deployment of units or the modification/introduction of equipment. Cloud cover over a given area or object makes it necessary to repeat the collection of said location.

How Does GIS Work?

The questions in the previous section rely heavily on geographic data and it is estimated that the vast majority of data handled by computers these days has and requires specific geographic parameters . Taking the example of the two restaurants as a starting point, they may look at different data sets:

The fast food joint may look at maximising their catchment area and accessibility: they will look at busiest roads, the best junction to place at, close to leisure areas such as shopping malls or other non-exclusive entertainment issues - efficiency and maximisation of profit.

The exclusive restaurant will look primarily at desirability and facilities that best reflect their image. Even though they too will be concerned with maximising their profit, they are less concerned with numbers and more concerned with image. They may appear near other exclusive restaurants, near theatres and other high-class leisure facilities.

Both may use GIS to find the ideal location and can access any number of websites to collect relevant data for their business plan. This information makes it easier to manage what we know and to extrapolate that which is most useful to us based on the widest variety of relevant data . In this respect, GIS is problem solving using geographic means and its co-operative method of sharing pure and unbiased raw data has made it the ideal candidate for everything that affects our environment or how our environment might affect us.

It helps better decision making and as most people prefer visual medium, there is no better visual communication medium than a map so long as you are making it clear what the person is looking at. Maps are immediately identifiable and engaging, and a flexible and universal method of communication within a discipline, between disciplines and to the public as a whole. How it is compiled comes in four elements which are data acquisition, storage & retrieval, transformation & analysis (which may include statistics and the production of models) and reporting (which will include the maps, tables and any associated reports) of data that may previously have been unrelated but will serve a useful function to someone, somewhere . Not everyone will be involved in all of these processes but most GIS technicians are charged with locating data that is collected by others and need to know how to acquire and manipulate the data as well as produce maps that are useful. It is a co-operative system limited only by the technology of the day.

A.PIRAKASHAM

Real World Example Applications of GIS

DISASTER MANAGEMENT:

Hurricane Katrina is seen by many as the first time that GIS was used a disaster management tool. Thanks to newly available technology, the first responders on the ground shared a great deal of data about street plans - particularly which streets were and were not accessible and the extent of the flooding. Despite that FEMA and the government came in for criticism, many agree that the efforts of data transmission both prior to and during initial relief efforts were vital to relief efforts .

2014 was a terrible year for drought for the SW United States. Increasingly, GIS is being used to manage environmental problems and specifically in disaster relief. Environmental experts have plotted the reporting of official droughts in most of these areas and shape files are now available of the affected region.

CRIME STATISTICS:

GIS is now vital to law enforcement and planning in terms of crime statistics. Though most police forces in the USA have used them for a long time, automated and digital mapping of reported crime has made the process much easier, especially when looking at different types of crime from different departments in larger cities. The ability to share maps and look for correlations between different types of crime can give police a much better idea of an overall picture of a wider region . The study cited here also permitted community leaders and the police to get a better understanding of each other, facilitating two-way dialogue.

ARCHAEOLOGY:

GIS is now critical to many elements of archaeology as it takes on more elements and characteristics of an environmental science. There are many applications in the field of historical research but none has been more beneficial than the prediction of historic site location . Several US universities recently plotted an area to the south of the Caucasus to identify prehistoric sites and areas that may have potential for future on-the-ground research, most notably of the migration route out of Africa in antiquity. The project successfully identified a number of potential new sites for future investigation.

CIVIC PLANNING:

GIS has been a superb tool for rural and urban planning for the last few decades, working out local tax rates, planning desirability and mapping social deprivation, where new roads could go or which should be prioritised for repair. It is now a vital part of our green future too . As with regular and previous methods of planning utilities, using the landscape is far more critical to planning. Cascade in Montana is a prime site for wind farms and there is a website that uses GIS data to plot wind speeds over the course of a year in order to best site the wind farms.

Health / Medical Resource Management

GIS is vital to the proper planning and analysis of the provision of cancer services for the UK socialised healthcare system, the NHS (National Health Service) . The package is

used to plan and examine a number of issues including catchment areas for GP surgeries. A study recently found that there was greater provision for cancer treatment in the midlands than the actual population. Such maps are used to better manage resources of the NHS.

Transport

One of the biggest public works in the UK right now is the planned High Speed 2 (HS2) rail connection between London and Manchester and then later beyond that. It plans to upgrade and revolutionise the rail network in the UK, arguably starved of much-needed modernisation since privatisation in the 1980s. Because of the massive amount of planning involved, including that many agencies have input into the project, it would have been a logistical problem with the massive amounts of data available and collected on a dedicated GIS site in order that the best decisions are made while respecting local infrastructures and the environment .

This above list is only a small selection of examples of GIS' functionality. Any industry or area of resource management where there may be a geographical element may benefit from the advantages of using GIS. It is increasingly vital in many jobs today.

Additional GIS Content Regarding Environmental Science:

Agricultural Science & GIS

Climate Science & GIS

Environmental Biology & GIS

Environmental Engineering & GIS

Environmental Microbiology & GIS

Environmental Planning & GIS

How Sustainability Uses GIS

N.KARTIHKA

PRESTRESSED CONCRETE:

INTRODUCTION:

.Prestressed concrete is a structural material that allows for predetermined, engineering stresses to be placed in members to counteract the stresses that occur when they are subject to loading. It combines the high strength compressive properties of concrete with the high tensile strength of steel.

In ordinary reinforced concrete, stresses are carried by the steel reinforcement, whereas prestressed concrete supports the load by induced stresses throughout the entire structural element. This makes it more resistant to shock and vibration than ordinary concrete, and able to form long, thin structures with much smaller sectional areas to support equivalent loads.

Prestressed concrete was patented by San Franciscan engineer P.H Jackson in 1886, although it did not emerge as an accepted building material until 50 years later when a shortage of steel, coupled with technological advancements, made prestressed concrete the building material of choice during European post-war reconstruction.

It is now commonly used for floor beams, piles and railways sleepers, as well as structures such as bridges, water tanks, roofs and runways. Generally, prestressed concrete is not necessary for columns and walls, however, it can be used economically for tall columns and high retaining walls with high bending stresses.

As a general rule, traditional reinforced concrete is the most economic method for a span of up to 6 m. Prestressed concrete is more economical when spans are over 9 m.

Between 6 and 9 m, the two options must be considered according to the particular requirements as to which is the most suitable option.

STEEL:

Steel used for prestressing may be in the form of wire or tendons that can be grouped to form cables. Solid bars may also be used.

Wire is made by cold-drawing a high carbon steel rod through a series of reducing dies. The wire diameter typically ranges from 3-7 mm and may be round, crimped or indented to give it better bond strength. Another form of tendon is strand which consists of a straight core wire around which is wound in helixes around further wires to give formats such as 7 wire (6 over 1) and 19 wire (9 over 9 over 1). Similar to wire tendons, strand can be used individually or in groups to form cables.

METHOD:

The process of prestressed concrete can be either through pre-tensioning or post-tensioning.

PRE-TENSIONING:

This process involves the stressing of wires or cables by anchoring them at the end of a metal form, which may be up to 120 m in length. Hydraulic jacks stress the wire as required, often adding 10% to accommodate creep and other pre-stress losses that may be incurred. Side moulds are then fixed and the concrete placed around the tensioned wires. The concrete hardens and shrinks, gripping the steel along its length, transferring the tension from the jacks to exert a compressive force in the concrete.

Once the concrete has reached the desired strength, the tensioned wires are released from the jacks. A typical concrete strength of 28 N/mm2 can be achieved by 24-hour steam curing, as well as using additives.

To create shorter members, dividing plates can be placed at any point along the member which, when removed, permit the cutting of the wires.

POST-TENSIONING:

This follows the reverse method to pre-tensioning, whereby the concrete member is cast and the prestressing occurs after the concrete is hardened. This method is often used where stressing is to be carried out on site after casting an insitu component or where a series of precast concrete units are to be joined together to form the required member. The wires, cables or bars may be positioned in the unit before concreting, but bonding to the concrete is prevented by using a flexible duct or rubber sheath which is deflated and removed when the concrete has hardened.

Stressing is carried out after the concrete has been cured by means of hydraulic jacks operating from one or both ends of the member. Due to the high local stresses at the anchorage positions it is common for a helical (spiral) reinforcement to be included in the design. When the required stress has been reached, the wire or cables are anchored to maintain the prestress. The ends of the unit are sealed with cement mortar to prevent corrosion due to any entrapped moisture and to assist in stress distribution.

Anchorages used in post-tensioning depend on whether the tendons are to be stressed individually or as a group. Most systems use a form of split cone wedges or jaws which act against a form of bearing or pressure plate.

There are many different post-tensioning systems. For example, the Freyssinet system enables the stressing strands to be tensioned simultaneously using centre hole tensioning jacks, anchored by tapered jaws. This is suitable for pre-stressing elements up to 50 m in length.

The Macalloy system on the other hand, involves applying stress to the concrete by means of a solid bar, usually with a diameter of 25-75 mm. The bar is anchored at each end by a special nut which bears against an end plate to distribute the load.

ADVANTAGES AND DISADVANTAGES:

The advantages of prestressed concrete include:

The inherent compressive strength of concrete is used to its fullest.

The special alloy steels used to form the prestressing tendons are used to their fullest.

Tension cracks are eliminated, reducing the risk of the steel components corroding.

Shear stresses are reduced.

For any given span and loading condition a reduction in weight can be achieved from using a component with a smaller cross section.

A composite member can be formed by joining individual precast concrete units together.

The disadvantages of prestressed concrete include:

A high degree of workmanship and control is required.

Special alloy steels are more expensive than traditional steels used in reinforced concrete.

Expensive equipment is needed and there are complex safety requirements.

Types of Pre-stressed Concrete

Pre-tensioned concrete

Bonded Post-tensioned concrete.

Unbonded Post-tensioned concrete

PRE-TENSIONED CONCRETE:

In this method, wires or tendons are tensioned at first and concrete is poured later. It creates a good bondage between the tendon and concrete. As a result, the tendons are protected from corrosion and tensions are transferred directly. Tendons are anchored and stretched and the stress is transferred to the concrete when it is hard. Then the tendon tries to get back to the original length, but resisted by the bond between the concrete hence it induces compressive force in it.

BONDED POST-TENSIONED CONCRETE:

Similar to pre-stressing but here concrete is poured first then tendons are tensioned. Tendons are placed at suitable places in the member and then casting is done. After the concrete becomes hard, the tendons are tensioned by hydraulic jacks against the concrete. When the tendons have tensioned sufficiently, according to design, they are fixed in position. After the jacks are removed, tension remains and it transfers pressure to the concrete. This method is widely used in building monolithic slabs for mega house construction projects where expansive soil sometimes creates problems. Moreover, post-tensioned concrete is also used in bridges.

UNBONDED POST-TENSIONED CONCRETE:

It is little different from bonded post-tensioned concrete. It allows freedom to move the cables. For this, each tendon is coated with grease and covered by plastic. Stress transfer to the concrete is achieved by the cables through anchors. There are some advantages to this like-

The ability to distress tendons before trying to repair work.

The ability to individually adjust cables

Also, there are some disadvantages like if damaged, one or more than cable can be distress itself and burst out of the slab.

A.ARJUNAN

GEOTECHNICAL ENGINEERING:

Geotechnical engineering is the branch of civil engineering concerned with the engineering behavior of earth materials. It uses the principles of soil mechanics and rock mechanics for the solution of its respective engineering problems.

Geotechnical engineers are involved in all stages of the design of structures, from concept to construction. Their work is essential in the design and planning process as they assess the integrity of soil, clay, silt, sand, and rock, prior to construction commencing.

Why do we study geotechnical engineering?

Geotechnical engineers and engineering geologists perform geotechnical investigations to obtain information on the physical properties of soil and rock underlying (and sometimes adjacent to) a site to design earthworks and foundations for proposed structures, and for the repair of distress to earthworks and structures.

What did you learn from geotechnical engineering?

During the coursework, students learn about several geological processes and examine the engineering behaviour of earth materials in order to understand the construction practices that involves measuring the chemical properties, evaluating the stability of the area and designing earthworks and laying the foundation.

MECHANICAL ANALYSIS:

The mechanical analysis, also known as particle size analysis, is a method of separation of soils in to different fractions based on particle size. It expresses quantitatively the proportions, by mass of various sizes of particles present in the soil. It is shown graphically in a particle size distribution curve. The mechanical analysis is done in two stages 1. Sieve analysis 2. Sedimentation analysis.

SIEVE ANALYSISIS:

This test is meant for coarse grained soils (particle size greater than 75 microns) which can easily pass through a set of sieves. The sieves used are 80mm, 40mm, 20mm, 10mm, 4.75mm, 2mm, 1mm, 600μ, 425μ, 212μ, 150μ, 75μ. The selection of the required number of sieves is done to obtain a good particle size distribution curve. The sieves are stacked one over the other, with decreasing size from top to bottom. A lid or cover is placed at the top and a pan, which has no opening, is placed at the bottom. Sieve analysis includes dry sieve analysis and wet sieve analysis.

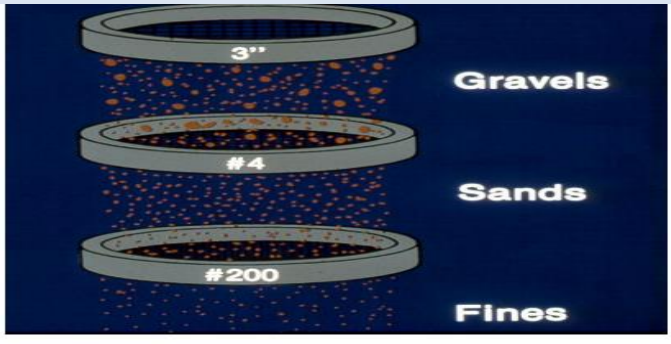


Fig: Set of IS Sieves

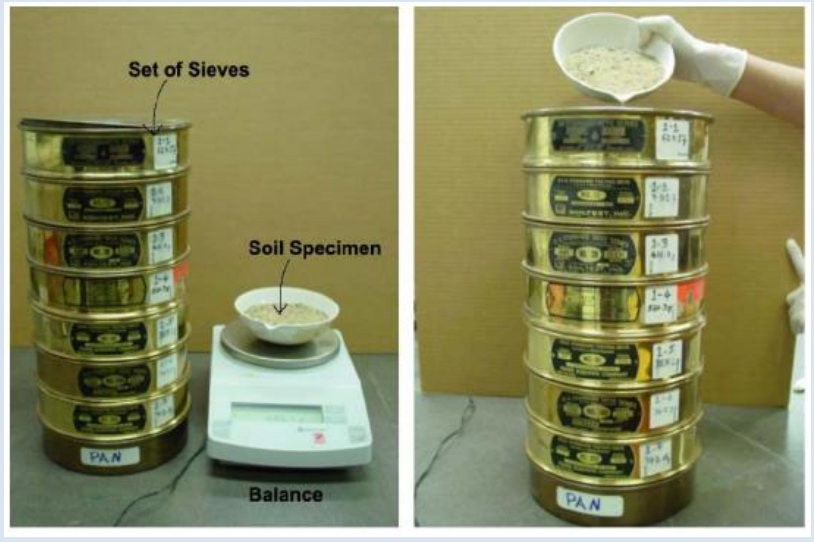


Fig: Illustrates Sieve Analysis test procedure

SEDIMENTATION ANALYSIS:

Sedimentation analysis is also known as wet analysis. it is used for particle size less than 75 microns. The analysis is based on Stoke's law. it includes preparation of suspension for the test. About 50g of soil is weighed and transferred to an evaporating dish. To have proper dispersion of soil, 100ml of a dispersion solution is added to the soil. The soil is washed into a 1000ml jar and enough water is added to make 1000ml suspension. it include Pipette method and Hydrometer analysis. Sedimentation analysis is also known as wet analysis. it is used for particle size less than 75 microns. The analysis is based on Stoke's law. it includes preparation of suspension for the test. About 50g of soil is weighed and transferred to an evaporating dish. To have proper dispersion of soil, 100ml of a dispersion solution is added to the soil. The soil is washed into a 1000ml jar and enough water is added to make 1000ml suspension. it include Pipette method and Hydrometer analysis.

COMBINED SIEVE AND SEDIMENTATION ANALYSIS

If the soil mass consists of both coarse grained and fine grained soils, a combined analysis is done. The slurry of the soil is made as mentioned in the wet analysis. The slurry is sieved through a 4.75mm IS sieve. The material retained on the sieve is oven dried and coarse sieve analysis is done. The material retained on 75mm IS sieve is also oven dried and the sieve analysis is done using the set of fine sieves. The suspension passing through 75 micron sieve is mixed with a deflocculating agent and the hydrometer test is performed on the suspension.

PARTICLE SIZE DISTRIBUTION CURVE:

The particle size distribution curve also known as a gradation curve represents the distribution of particles of different sizes in the soil mass. The percentage finer 'N' is plotted as the ordinate and the particle size as abscissa. From the graph, the soil can be classified as gap graded (skip graded), well graded and uniform soils.

RELATIVE DENSITY:

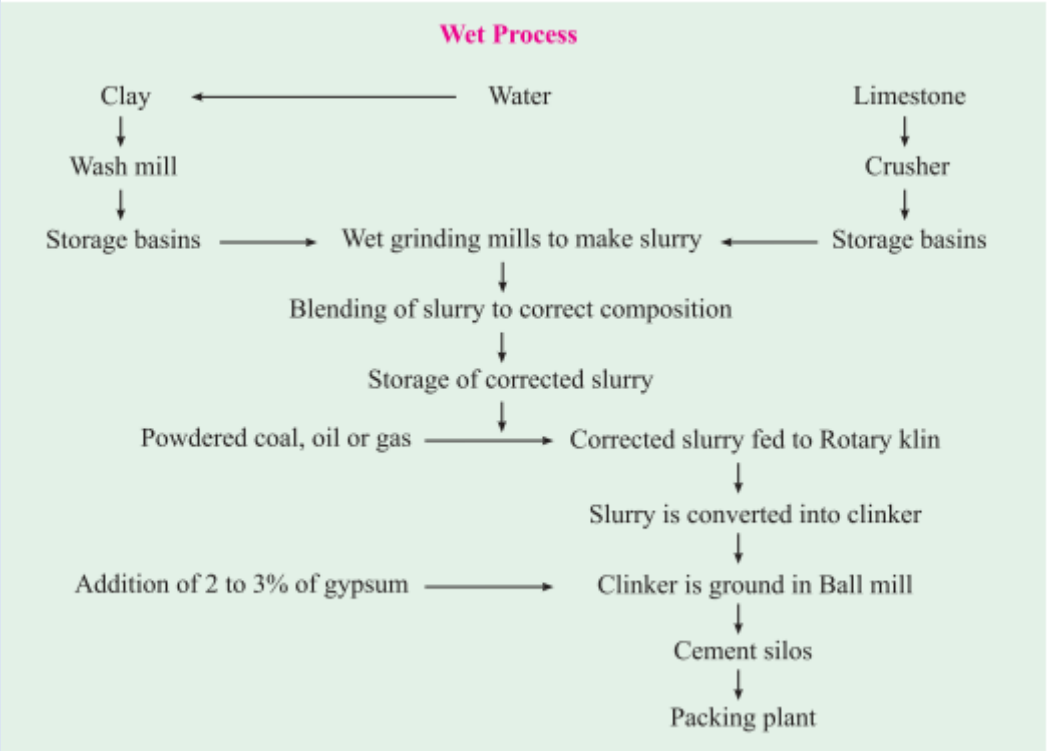
The most important index aggregate property of a cohesionless soil is its relative density (Dr), is also known as density index (ID). The relative density is defined as, Dr = [(emax-e) / (emax-emin)] x 100 Where, emax = maximum void ratio of the soil in the loosest condition emin = minimum void ratio of the soil in the densest condition e = void ratio in the natural state

V.BALASUBRAMANI

MANUFACTURE OF PORTLAND CEMENT:

The raw materials required for manufacture of Portland cement are calcareous materials, such as limestone or chalk, and argillaceous material such as shale or clay. Cement factories are established where these raw materials are available in plenty. Cement factories have come up in many regions in India, eliminating the inconvenience of long distance transportation of raw and finished materials. The process of manufacture of cement consists of grinding the raw materials, mixing them intimately in certain proportions depending upon their purity and composition and burning them in a kiln at a temperature of about 1300 to 1500°C, at which temperature, the material sinters and partially fuses to form nodular shaped clinker. The clinker is cooled and ground to fine powder with addition of about 3 to 5% of gypsum. The product formed by using this procedure is Portland cement. There are two processes known as "wet" and "dry" processes depending upon whether the mixing and grinding of raw materials is done in wet or dry conditions. With a little change in the above process we have the semi-dry process also where the raw materials are ground dry and then mixed with about 10-14 per cent of water and further burnt to clinkering temperature. For many years the wet process remained popular because of the possibility of more accurate control in the mixing of raw materials. The techniques of intimate mixing of raw materials in powder form was not available then. Later, the dry process gained momentum with the modern development of the technique of dry mixing of powdered materials using compressed

air. The dry process requires much less fuel as the materials are already in a dry state, whereas in the wet process the slurry contains about 35 to 50 per cent water.



DRY PROCESS :

In the dry and semi-dry process the raw materials are crushed dry and fed in correct proportions into a grinding mill where they are dried and reduced to a very fine powder. The dry powder called the raw meal is then further blended and corrected for its right composition and mixed by means of compressed air. The aerated powder tends to behave almost like liquid and in about one hour of aeration a uniform mixture is obtained. The blended meal is further sieved and fed into a rotating disc called granulator.

A quantity of water about 12 per cent by wright is added to make the blended meal into pellets. This is done to permit air flow for exchange of heat for further chemical reactions and conversion of the same into clinker further in the rotary kiln. The equipments used in the dry process kiln is comparatively smaller. The process is quite economical. The total consumption of coal in this method is only about 100 kg when compared to the requirement of about 350 kg for producing a ton of cement in the wet process.

During March 1998, in India, there were 173 large plants operating, out of which 49 plants used wet process, 115 plants used dry process and 9 plants used semi-dry process. Since the time of partial liberalisation of cement industry in India (1982), there has been an upgradation in the quality of cement.

Many cement companies upgraded their plants both in respect of capacity and quality. Many of the recent plants employed the best equipments, such as cross belt analyser manufactured by Gamma-Metrics of USA to find the composition of limestone at the conveyor belts, high pressure twin roller press, six stage preheater, precalciner and vertical

roller mill. The latest process includes stacker and reclaimer, on-line Xray analyser, Fuzzy Logic kiln control system and other modern process control. In one of the recently built cement plant at Reddypalayam near Trichy, by Grasim Indistries, employed Robot for automatic collection of hourly samples from 5 different places on the process line and help analyse the ame, throughout 24 hours, untouched by men, to avoid human errors in quality control. With all the above sophisticated equipments and controls, consistent quality of clinker is produced.

KISHOOORE KUMAR .B

SELF COMPACTING CONCRETE (SCC):

Making concrete structures without vibration, have been done in the past. For examples, placement of concrete under water is done by the use of tremie without vibration. Mass concrete, and shaft concrete can be successfully placed without vibration. But the above examples of concrete are generally of lower strength and difficult to obtain consistent quality. Modern application of self-compacting concrete (SCC) is focussed on high performance, better and more reliable and uniform quality. Recognising the lack of uniformity and complete compaction of concrete by vibration, researchers at the University of Tokyo, Japan, started in late 1980's to develop SCC. By the early 1990's, Japan has developed and used SCC that does not require vibration to achieve full compaction. By the year 2000, the SCC has become popular in Japan for prefabricated products and ready mixed concrete. The Fig. 12.19 shows the amount of SCC used in Japan Several European countries recognised the significance and potentials of SCC developed in Japan. During 1989, they founded European federation of natural trade associations representing producers and applicators of specialist building products (EFNARC) 12.18. The utilisation of self-compacting concrete started growing rapidly. EFNARC, making use of broad practical experiences of all members of European federation with SCC, has drawn up specification and guidelines to provide a framework for design and use of high quality SCC, during 2001. Most of the information particularly test methods given in this chapter is based on specification and guidelines for self-compacting concrete given by EFNARC. Self-compacting concrete has been described as "the most r "the most r"the most revolutionar evolutionary development in concrete construction for several decades". ete construction for several decades". ete construction for

several decades". Originally developed in Japan to offset a growing shortage of skilled labour, it has proved to be beneficial from the following points.

Faster construction

Reduction in site manpower

Better surface finish

Easier placing

Improved durability

Greater freedom in design

Thinner concrete sections

Reduced noise level

Safer working environment.

Material for SCC Cement :

Cement :Ordinary Portland Cement, 43 or 53 grade can be used.

Aggregates : The maximum size of aggregate is generally limited to 20 mm. Aggregate of size 10 to 12mm is desirable for structures having congested reinforcement. Wherever possible size of aggregate higher than 20mm could aslo be used. Well graded cubical or rounded aggregates are desirable. Aggregates should be of uniform quality with respect to shape and grading. Fine aggregates can be natural or manufactured. The grading must be uniform throughout the work. The moisture content or absorption characteristics must be closely monitored as quality of SCC will be sensitive to such changes. Particles smaller than 0.125 mm i.e. 125 micron size are considered as FINES which contribute to the powder content

MIXING MIXING WATER **:**

Water quality must be established on the same line as that for using reinforced concrete or prestressed concrete. Chemical Admixtures Chemical Admixtures : Superplaseizers are an essential component of SCC to provide necessary workability. The new generation superplasticizers termed poly-carboxylated ethers (PCE) is particularly useful for SCC. Other types may be incorporated as necessary, such as Viscosity Modifying Agents (VMA) for stability, air entraining agents (AEA) to improve freeze-thaw resistance, and retarders for Control of Setting.

MINERAL ADMIXTURES:

Fly ash in appropriate quantity may be added to improve the quality and durability of SCC. Ground Granulated Blast Furnace Slag Ground Granulated Blast Furnace Slag (GGBFS) : GGBFS which is both cementitious and pozzolanic material may be added to improve rheological properties.

Silica Fume :

Silica Fume : Silica Fume : Silica fume may be added to improve the mechanical properties of SCC. Stone Powder :

Stone Powder :

Finely crushed lime stone, dolomite or granite may be added to increase the powder content. The fraction should be less than 125 micron. Fibres :Fibres may be used to enhance the properties of SCC in the same way as for normal concrete.

MOHAMED AJMAL.I

COMBINED FOOTING:

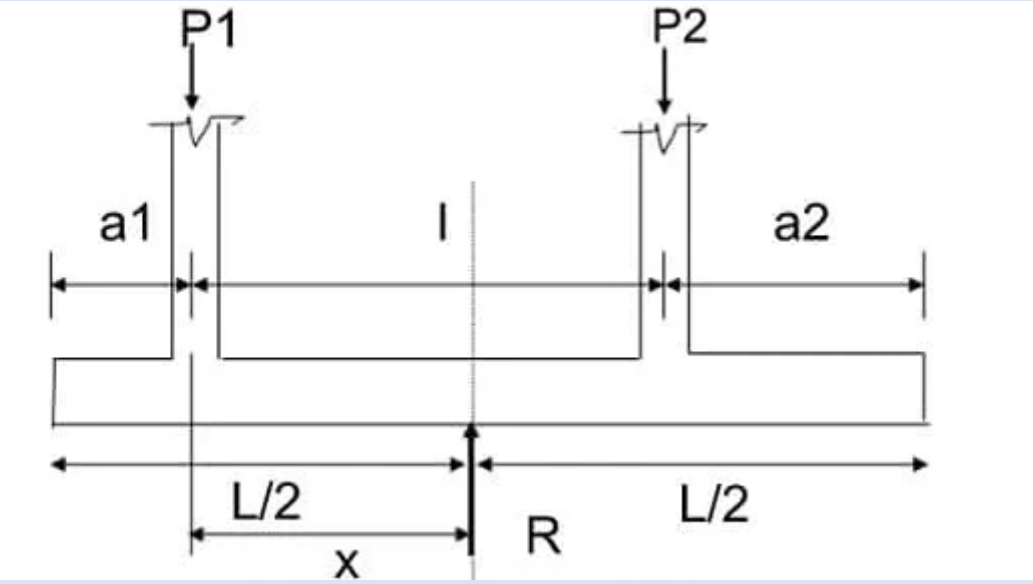
When individual footing has to accommodate two or in exceptional case more than Two columns is known as the combined footing. or. When two or three columns are located very near to each other, we provide a single substructure for them and the footing is known as a combined footing.

Whenever two or more columns in a straight line are carried on a single spread footing, it is called a combined footing. Isolated footings for each column are generally the economical. Combined footings are provided only when it is absolutely necessary, as

When two columns are close together, causing overlap of adjacent isolated footings

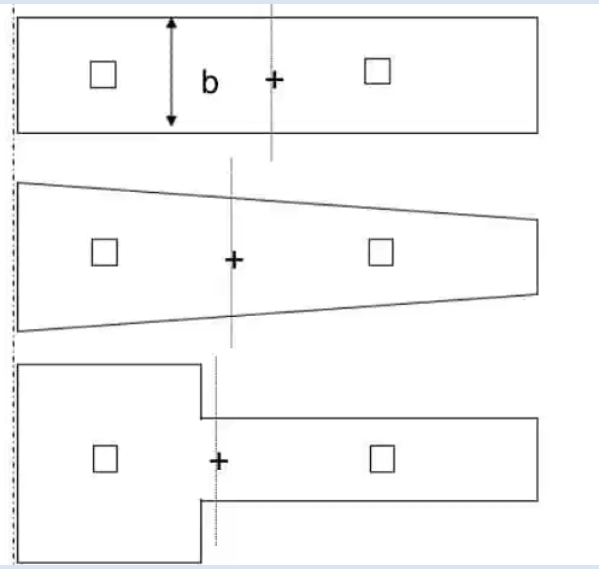
Where soil bearing capacity is low, causing overlap of adjacent isolated footings

Proximity of building line or existing building or sewer, adjacent to a building column.



COMBINED FOOTING WITH LOAD

TYPES OF COMBINED FOOTING:



The combined footing may be rectangular, trapezoidal or Tee-shaped in plan.

The geometric proportions and shape are so fixed that the centeroid of the footing area coincides with the resultant of the column loads. This results in uniform pressure below the entire area of footing.

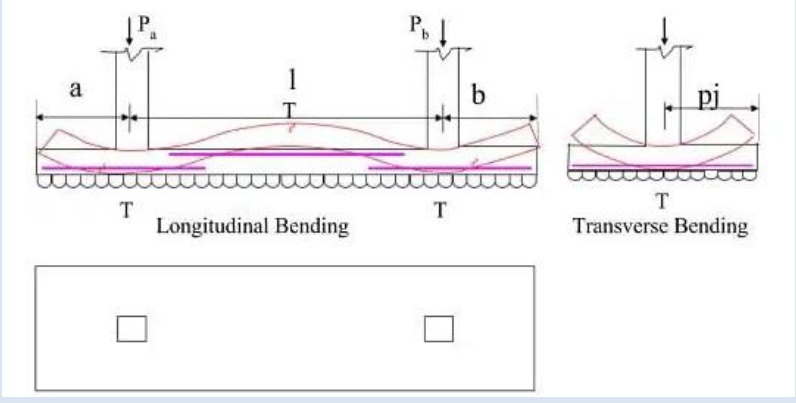
Trapezoidal footing is provided when one column load is much more than the other. As a result, the both projections of footing beyond the faces of the columns will be restricted.

Rectangular footing is provided when one of the projections of the footing is restricted or the width of the footing is restricted.

RECTANGULAR COMBINED FOOTING:

Longitudinally, the footing acts as an upward loaded beam spanning between columns and cantilevering beyond. Using statics, the shear force and bending moment diagrams in the longitudinal direction are drawn. Moment is checked at the faces of the column. Shear force is critical at distance 'd' from the faces of columns or at the point of contra flexure. Two-way shear is checked under the heavier column.

The footing is also subjected to transverse bending and this bending is spread over a transverse strip near the column.



STEPS FOR DESIGN OF COMBINED FOOTING:

Locate the point of application of the column loads on the footing.

Proportion the footing such that the resultant of loads passes through the center of footing.

Compute the area of footing such that the allowable soil pressure is not exceeded.

Calculate the shear forces and bending moments at the salient points and hence draw SFD and BMD.

Fix the depth of footing from the maximum bending moment.

Calculate the transverse bending moment and design the transverse section for depth and reinforcement. Check for anchorage and shear.

Check the footing for longitudinal shear and hence design the longitudinal steel

Design the reinforcement for the longitudinal moment and place them in the appropriate positions.

Check the development length for longitudinal steel

Curtail the longitudinal bars for economy

Draw and detail the reinforcement

Prepare the bar bending schedule

MUNISWARAN.V

THE WASTEWATER TREATMENT PROCESS:

EIGHT STAGES OF THE WASTEWATER PROCESS:

Stage One — Bar Screening.

Stage Two — Screening.

Stage Three — Primary Clarifier.

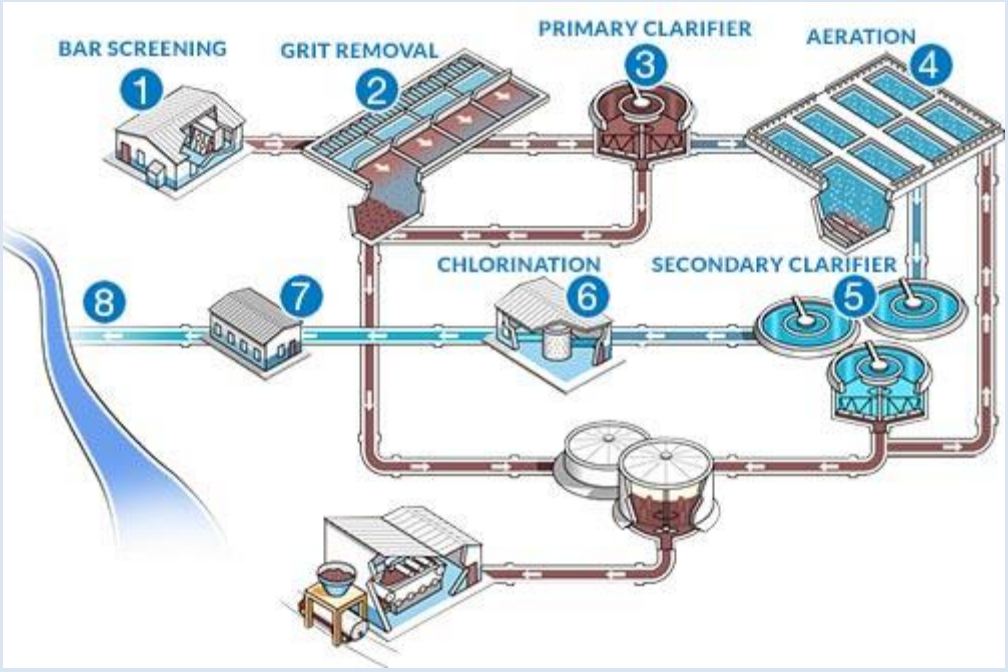
Stage Four — Aeration.

Stage Five — Secondary Clarifier.

Stage Six — Chlorination (Disinfection)

Stage Seven — Water Analysis & Testing.

Stage Eight — Effluent Disposal.



STAGE ONE — BAR SCREENING:

The process of treating and reclaiming water from wastewater (any water that has been used in homes, such as flushing toilets, washing dishes, or bathing, and some water from industrial use and storm sewers) starts with the expectation that after it is treated it will be clean enough to reenter the environment.

The quality of the water is dictated by the Environmental Protection Agency (EPA) and the Clean Water Act, and wastewater facilities operate to specified permits by National Pollutant Discharge Elimination System (NPDES). According to the EPA, The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under the CWA, EPA sets wastewater standards for industry. The EPA has also developed national water quality criteria recommendations for pollutants in surface waters. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges.

As an example of expected standards, the Biochemical Oxygen Demand (BOD) of average wastewater effluent is 200 mg/L and the effluent after treatment is expected to be >30 mg/L. It is crucial a wastewater facility meets these expectations or risk stiff penalty.

The physical process of wastewater treatment begins with screening out large items that have found their way into the sewer system, and if not removed, can damage pumps and impede water flow. A bar screen is usually used to remove large items from the influent and ultimately taken to a landfill.

STAGE TWO — SCREENING:

Fine grit that finds its way into the influent needs to be removed to prevent the damage of pumps and equipment downstream (or impact water flow). Too small to be screened out, this grit needs to be removed from the grit chamber. There are several types of grit chambers (horizontal, aerated or vortex) which control the flow of water, allowing the heavier grit to

fall to the bottom of the chamber; the water and organic material continue to flow to the next stage in the process. The grit is physically removed from the bottom of the chamber and discarded.

STAGE THREE — PRIMARY CLARIFIER

Solids known as organics/sludge sink to the bottom of the tank and are pumped to a sludge digestor or sludge processing area, dried and hauled away. Proper settling rates are a key indicator for how well the clarifier is operating. Adjusting flow rate into the clarifier can help the operator adjust the settling rates and efficiency.

After grit removal, the influent enters large primary clarifiers that separate out between 25% and 50% of the solids in the influent. These large clarifiers (75 feet in diameter, 7½ inches at the edges and 10½ feet in the center as an example) allow for the heavy solids to sink to the bottom and the cleaner influent to flow. The effectiveness of the primary clarification is a matter of appropriate water flow. If the water flow is too fast, the solids don't have time to sink to the bottom resulting in negative impact on water quality downstream. If the water flow is too slow, it impacts the process up stream.

STAGE FOUR — AERATION:

Once converted to NO3, the bacteria remove/strip oxygen molecules from the nitrate molecules and the nitrogen (N) is given off as N2↑ (nitrogen gas).

At the heart of the wastewater treatment process is the encouragement and acceleration of the natural process of bacteria, breaking down organic material. This begins in the aeration tank. The primary function of the aeration tank is to pump oxygen into the tank to encourage the breakdown of any organic material (and the growth of the bacteria), as well as ensure there is enough time for the organic material to be broken down. Aeration can be accomplished with pumping and defusing air into the tank or through aggressive agitation that adds air to the water. This process is managed to offer the best conditions for bacterial growth. Oxygen gas [O2] levels below 2 ppm will kill off the bacteria, reducing efficiency of the plant. Dissolved oxygen monitoring at this stage of the plant is critical. Ammonia and nitrate measurements are common to measure how efficient the bacteria are in converting NH3 to N2↑.

STAGE FIVE — SECONDARY CLARIFIER:

Treated wastewater is pumped into a secondary clarifier to allow any remaining organic sediment to settle out of treated water flow.
As the influent exits the aeration process, it flows into a secondary clarifier where, like the primary clarifier, any very small solids (or fines) sink to the bottom of the tank. These small solids are called activated sludge and consist mostly of active bacteria. Part of this activated sludge is returned to the aeration tank to increase the bacterial concentration, help in propagation, and accelerate the breakdown of organic material. The excess is discarded.

STAGE SIX — CHLORINATION (DISINFECTION):

Chlorine is added to kill any remaining bacteria in the contact chamber. With the enhanced concentration of bacteria as part of the aeration stage, there is a need to

test the outgoing effluent for bacteria presence or absence and to disinfect the water. This ensures that higher than specified concentrations of bacteria are not released into the

environment. Chlorination is the most common and inexpensive type of disinfection but ozone and UV disinfection are also increasing in popularity. If chorine is used, it is important to test for free-chlorine levels to ensure they are acceptable levels before being released into the environment.

STAGE SEVEN — WATER ANALYSIS & TESTING:

Testing for proper pH level, ammonia, nitrates, phosphates, dissolved oxygen, and residual chlorine levels to conform to the plant's NPDES permit are critical to the plant's performance.

Although testing is continuous throughout the wastewater treatment process to ensure optimal water flow, clarification and aeration, final testing is done to make sure the effluent leaving the plant meets permit specifications. Plants that don`t meet permit discharge levels are subject to fines and possible incarceration of the operator in charge.

STAGE EIGHT — EFFLUENT DISPOSAL:

After meeting all permit specifications, clean water is reintroduced into the environment.

Although testing is continuous throughout the wastewater treatment process to ensure optimal water flow, clarification and aeration, final testing is done to make sure the effluent leaving the plant meets permit specifications. Plants that don`t meet permit discharge levels are subject to fines and possible incarceration of the operator in charge.

SANJAY KUMAR