THE SCETIAN

CIVIL ENGINEERING DEPARTMENT
STUDENT NEWS LETTER

Vol.1

SWEDISH COLLEGE OF ENGINEERING & TECHNOLOGY
OPPOSITE LALA RUKH G.T. ROAD WAH CANT. PAKISTAN

THE SCETIAN

CIVIL ENGINEERING DEPARTMENT

STUDENT E-MAGAZINE

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Contents

Disclaimer: All articles presented in the New Letter are developed by the students and faculty as their own contribution and SCET has no responsibility for its authenticity

About SCET

The Swedish College of Engineering & Technology (SCET) has been established with the main objective of promoting the cause of education particularly in the field of Engineering, Science and Technology. We aim to produce quality Engineers and Technologist fully equipped with in depth knowledge and professional competency to play vital role in development of country, service to the society and meeting the demands of skill human resources for growing industry of the country.

We believe in discipline and provide the students conductive, peaceful and serene environment for learning and flourishing their academic excellence.

The Swedish College of Engineering & Technology (SCET) Wah Cantt is an upcoming college in the private sector surrounded by expanding industrial neighborhood. The college is established by a registered trust, Al-Asar Gujranwala Technical Education Society, formed for the promotion of technical education in the country.

WELCOME MESSAGE FROM PRINCIPAL

It gives me immense pleasure to know that the students and faculty of the Civil Engineering Department SCET have worked together to develop the first E-News Letter of their department. The staff and students of the department deserve appreciation. I am sure that the other departments will also follow them to involve their students and faculty in creative and analytical thinking and write quality articles for their News Letters. In future, we will develop combined E-News letter for the College as well.

Creative thinking is the pre-requisite for professional diligence and through written and verbal expressions; we endeavor to develop positive attitudes in life. Analytical thinking leads us to more rational decision making and writing of article help in generating both these qualities. I welcome all the students to contribute to the E-New letter and share their feelings and experiences with their class fellows and teachers.

I pray that the hard work of the editorial board may pave ways for quality and world class journal at SCET in future.

(Dr. Mohammad .Sharif .Bhatti)
Principal SCET

MESSAGE FROM  FACULTY EDITOR

Albert Einstein quoted *"Scientists investigate that which already is;* Engineers create *that which has never been Engineers always create new things"*. Hence Engineering has its roots in creativity and analytical thinking.

It gives me immense pleasure to welcome all the readers and particularly the students and faculty members of Civil Engineering Department-SCET to read the first volume of the Students News Letter. It is a historical occasion, as the first volume of the students news letter has been developed through the hard work and endeavors of the students and faculty together. The News letter has the following objectives in mind:

1. Encourage the students and faculty members for writing their articles for the News Letter, so that their writing skills and expressions are improved.
2. Enhance the interaction of the students and the faculty members through better communication and the News Letter will prove as an effective tool for the same.
3. Improve critical and analytical thinking of the students and faculty members, through their innovative solution for various problems.
4. To highlight the curricular and co-curricular activities of the Civil Engineering Department-SCET.
5. To create competition amongst the students for developing quality articles, reports, technical essays etc.
6. To inform the students about the contemporary issues in the Civil Engineering and locally tailored solutions for these issues.

Initially the News letter has been divided into four sections as follows:

i. Faculty Section: where the faculty members would contribute their articles in the core areas of Civil Engineering and other related areas.
ii. Students Section: Here the students are advised to submit their articles on various issues in Civil Engineering, their personal experiences etc.
iii. Activities of the SCET and Civil Engineering Department.
iv. Entertainment section: Where the students and faculty may contribute their anecdotes, jokes, cartons etc.

The above objectives can be realized through consistent efforts by the students and faculty and I am quite hopeful that they would continue to support the New Letter. At this stage, I must appreciate the efforts of students and faculty members who have worked hard to draft the first volume of the Students News Letter.

I am sure that the News Letter will prove a great enterprise in time to come. The faculty and students are requested to contribute their articles.

At the end I pray that May Allah bless you with more creative and analytical thinking and expression power to develop State of the Art articles for the News Letter.

(Dr. Attaullah Shah)

Adviser and Faculty Editor CED-SCET

MESSAGE FROM STUDENT EDITOR

"Engineers like to solve problems. If there are no problems handily available, they will create their own problems."

(SCOTT ADAMS)

I feel highly honored to be the Student Chief Editor of the first ever students E-NEWS letter of the SCET.

The first volume of the News letter is in your hand. There are a number of informative articles on various issues relating to the discipline and practice of Civil Engineering and I am sure that you will find it interesting and informative. The contributions of the students are highly welcome and we expect that their support will also continue in future volumes as well.

There is no shot cut to experience and writing for the first time for a News Letter may be a bit difficult for most of you but the courage and confidence is always required for creating new enterprises in life. I am sure that as we move forward, more quality articles would come from all of you.

After reading the News Letter we would need your comments and feedback, which is required for continuous improvement of the Mag. Please feel free to criticize and give your candid comments on the articles.

"I have been impressed with the urgency of doing. Knowing is not enough; we must apply. Being willing is not enough; we must do."

(Leonardo da Vinci

I pray for our success health and prosperity of our country.

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(Sohaib Naseer)

Student Editor CED- SCET

1. CIVIL ENGINEERING

(By M. Zaeem Fakhar: 2k9 session)

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like bridges, roads, canals, dams, and buildings. Civil engineering is the oldest engineering discipline after military engineering, and it was defined to distinguish non-

military engineering from military engineering.

History of the civil engineering profession

Engineering has been an aspect of life since the beginnings of human existence. The earliest practices of Civil engineering may have commenced between 4000 and 2000 BC in Ancient Egypt and Mesopotamia (Ancient Iraq) when humans started to abandon a nomadic existence, thus causing a need for the construction of shelter. During this time, transportation became increasingly important leading to the development of the wheel and sailing.

Until modern times there was no clear distinction between civil engineering and architecture, and the term engineer and architect were mainly geographical variations referring to the same person, often used interchangeably. The construction of Pyramids in Egypt (circa 2700-2500 BC) might be considered the first instances of large structure constructions. Other ancient historic civil engineering constructions include the Parthenon by Iktinos in Ancient Greece (447-438 BC), the Appian Way by Roman engineers (c. 312 BC), the Great Wall of China by General Meng T'ien under orders from Ch'in Emperor Shih Huang Ti (c. 220 BC) and the stupas constructed in ancient Sri Lanka like the Jetavanaramaya and the

extensive irrigation works in Anuradhapura. The Romans developed civil structures throughout their empire, including especially aqueducts, insulae, harbours, bridges, dams and roads.

In 1818 the Institution of Civil Engineers was founded in London, and in 1820 the eminent engineer Thomas Telford became its first president. The institution received a Royal Charter in 1828, formally recognising civil engineering as a profession. Its charter defined civil engineering as:

the art of directing the great sources of power in nature for the use and convenience of man, as the means of production and of traffic in states, both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks for internal intercourse and exchange, and in the construction of ports, harbours, moles, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce, and in the construction and application of machinery, and in the drainage of cities and towns.

The first private college to teach Civil Engineering in the United States was Norwich University founded in 1819 by Captain Alden Partridge. The first degree in Civil Engineering in the United States was awarded by Rensselaer Polytechnic Institute in 1835. The first such degree to be awarded to a woman was granted by Cornell University to Nora Stanton Blatch in 1905.

The civil engineer

Civil engineers typically possess an academic degree with a major in civil engineering. The length of study for such a degree is usually three to five years and the completed degree is usually designated as a Bachelor of Engineering, though some universities designate the degree as a Bachelor of Science. The degree generally includes units covering physics, mathematics, project management, design and specific topics in civil engineering. Initially such topics cover most, if not all, of the sub-disciplines of civil engineering. Students then choose to specialize in one or more sub-disciplines towards the end of the degree. While an Undergraduate (BEng/BSc) Degree will normally provide successful students with industry accredited qualification, some universities offer postgraduate engineering awards (MEng/MSc) which allow students to further specialize in their particular area of interest within engineering.

In most countries, a Bachelor's degree in engineering represents the first step towards professional certification and the degree program itself is certified by a professional body. After completing a certified degree program the engineer must satisfy a range of requirements before being certified. Once certified, the engineer is designated the title of Professional Engineer.

Sub-disciplines

In general, civil engineering is concerned with the overall interface of human created fixed projects with the greater world. General engineers spend much of their time visiting project sites, developing community consensus, and preparing construction plans. General civil engineering is also referred to as site engineering, a branch of civil engineering that primarily focuses on converting a tract of land from one usage to another.

Coastal engineering

Coastal engineering is concerned with managing coastal areas. In some jurisdictions the terms sea defense and coastal protection are used to mean, respectively, defence against flooding and erosion. The term coastal defence is the more traditional term, but coastal management has become more popular as the field has expanded to include techniques that allow erosion to claim

land.

Construction engineering

Construction engineering involves planning and execution of the designs from transportation, site development, hydraulic, environmental, structural and geotechnical engineers. As construction firms tend to have higher business risk than other types of civil engineering firms, many construction engineers tend to take on a role that is more business-like in nature: drafting and reviewing contracts, evaluating logistical operations, and closely-monitoring prices of necessary supplies.

Earthquake engineering

Earthquake engineering covers ability of various structures to withstand hazardous earthquake exposures at the sites of their particular location.

Earthquake engineering is a sub discipline of the broader category of Structural engineering. The main objectives of earthquake engineering are:

- Understand interaction of structures with the shaky ground.
- Foresee the consequences of possible earthquakes.
- Design, construct and maintain structures to perform at earthquake exposure up to the expectations and in compliance with building codes.

Environmental engineering

Environmental engineering deals with the treatment of chemical, biological, and/or thermal waste, the purification of water and air, and the remediation of contaminated sites, due to prior waste disposal or accidental contamination. Among the topics covered by environmental engineering are pollutant transport, water purification, waste water treatment, air pollution, solid waste treatment and hazardous waste management.. Environmental engineering also deals with the gathering of information on the environmental consequences of proposed actions and the assessment of effects of proposed actions for the purpose of assisting society and policy makers in the decision making process.

Geotechnical engineering

Geotechnical engineering is an area of civil engineering concerned with the rock and soil that civil engineering systems are supported by. Knowledge from the fields of geology, material science and testing, mechanics, and hydraulics are applied by geotechnical engineers to safely and economically design foundations, retaining walls, and similar structures

Water resources engineering

Water resources engineering is concerned with the collection and management of water (as a natural resource). As a discipline it therefore combines hydrology, environmental science, meteorology, geology, conservation, and resource management. This area of civil engineering relates to the prediction and management of both the quality and the quantity of water in both underground (aquifers) and above ground (lakes, rivers, and streams) resources.

Structural engineering

Structural engineering is concerned with the structural design and structural analysis of buildings, bridges, towers, flyovers, tunnels, off shore structures like oil and gas fields in the sea, and other structures. This involves identifying the loads which act upon a structure and the forces and stresses which arise within that structure due to those loads, and then designing the structure to successfully support and resist those loads. The loads can be self weight of the structures, other dead load, live loads, moving (wheel) load, wind load, earthquake load, load from temperature change etc. The structural engineer must design structures to be safe for their users and to successfully fulfill the function they are designed for (to be serviceable). Due to the nature of some loading conditions, sub-disciplines within structural engineering have emerged,

Transportation engineering

Transportation engineering is concerned with moving people and goods efficiently, safely, and in a manner conducive to a vibrant community. This involves specifying, designing, constructing, and

maintaining transportation infrastructure which includes streets, canals, highways, rail systems, airports, ports, and mass transit. It includes areas such as transportation design, transportation planning, traffic engineering, some aspects of urban engineering, queueing theory, pavement engineering, Intelligent Transportation System (ITS), and infrastructure management.

2. Significance of Nanotechnology in Construction Engineering

(By Farhan Sadiq: 2k9 session)

INTRODUCTION

Nanotechnology is a field that is dominated by developments in basic physics and chemistry research, where phenomena on atomic and molecular level are used to provide materials and structures that perform tasks that are not possible using the materials in their typical macroscopic form. The evolution of technology and instrumentation as well as its related scientific areas such as physics and chemistry are making the research on nanotechnology aggressive and evolutional. Not surprisingly, it is observed that expenditure on Nanotechnology covers the design, construction and utilization of functional structures with at least one characteristic dimension measured in nanometers. The field of nanotechnology has developed in major leaps during the past 10 years. These developments were mainly driven by factors such as dedicated initiatives in the field (e.g. the National Nanotechnology Initiative) , improvements in characterization equipment and a new understanding into the chemistry and physics of matter on the nanoscale. Nanoscale science can be divided into three broad areas, e.g. nanostructures, nanofabrication and nano characterization with typical applications in nanoelectronics and life sciences & energy . This article examines the potential areas where nanotechnology can benefit construction engineering. The data and information collected is from current literature. The purpose is to point out clear cut direction among the nanotechnology development areas where the construction process would immediately harness nanotechnology, by specifying clear recommendations.
The information would be beneficial to both construction engineering education and research.

APPLICATION OF NANOTECHNOLOGY IN CONSTRUCTION

Nanotechnology can be used for design and construction processes in many areas since nanotechnology generated products have many unique characteristics. These include products that are for: Lighter structure; Stronger structural composites e.g. for briges etc ; Low maintenance coating ; Improving pipe joining materials and techniques ; Better properties of cementitious materials ; Reducing the thermal transfer rate of fire retardant and insulation ; Increasing the sound absorption of acoustic absorber ; Increasing the reflectivity of glass.
There are large numbers of applications of nanotechnology in construction engineering/industry. Some of these applications are examined in detail below.

A. Concrete

Concrete is one of the most common and widely used construction materials. The rapid development of new experimental techniques makes it possible to study the properties of cementitious materials at micro/nano-scale.
Research has been conducted to study the hydration process, alkali-silicate reaction (ASR), and fly ash reactivity using nanotechnology. The better understanding of the structure and behavior of concrete at micro/nano-scale could help to improve concrete properties and prevent the illness, such as ASR. Addition of nanoscale materials into cement could improve its performance. Li (2004) found that nano-SiO could significantly increase the compressive for concrete, containing large volume fly ash, at early age and improve pore size distribution by filling the pores between large fly ash and cement particles at nanoscale. The dispersion/slurry of amorphous nanosilica is used

to improve segregation resistance for self-compacting concrete. It has also been reported that adding small amount of carbon nanotube (1%) by weight could increase both compressive and flexural strength. Cracking is a major concern for many structures. When the microcapsules are broken by a crack, the healing agent is released into the crack and contact with the catalyst. The polymerization happens and bond the crack faces. The selfhealing polymer could be especially applicable to fix the microcracking in bridge piers and columns. But it requires costly epoxy injection.

B. Structural Composites

Steel is a major construction material. Its properties, such as strength, corrosion resistance, and weld ability, are very important for the design and construction. FHWA together with American Iron and Steel Institute and the U.S. Navy started to develop new, low carbon, high performance steel (HPS) for bridges in 1992. The new steel was developed with higher corrosion-resistance and weld ability by incorporating copper nanoparticles from at the steel grain boundaries. Sandvik NanoflexTM is new stainless steel with ultra-high strength, good formability, and a good surface finish developed by Sandvik Nanoflex Materials Technology. Due to its high performance, Sandvik NanoflexTM is suitable for application which requires lightweight and rigid designs. Its good corrosion and wear resistance can keep life-cycle costs low. Attractive or wear resistant surfaces can be achieved by various treatments (Sandvik Nanoflex Materials Technology). MMFX2 is nanostructuremodified steel, produced by MMFX Steel Corp. Compared with the conventional steel, it has a fundamentally different microstructure-a laminated lath structure resembling "plywood". This unique structure provides MMFX2 steel with amazing strength (three times stronger),ductility, toughness, and corrosion resistance. Due to high cost, the stainless steel reinforcement in concrete structure is limited in high risk environments. The MMFX2 steel could be an alternative because it has the similar corrosion resistance to that of Stainless steel, but at a much lower cost (MMFX Steel Corp.).

3. Structural Fracture Mechanics

(By M. Zaeem Fakhar: 2k9 session)

Structural Fracture Mechanics is the field of structural engineering concerned with the study of load-carrying structures that includes one or several failed or damaged components. It uses methods of analytical solid mechanics, structural engineering, safety engineering, probability theory, and catastrophe theory to calculate the load and stress in the structural components and analyze the safety of a damaged structure.

Model of Structural Fracture Mechanics

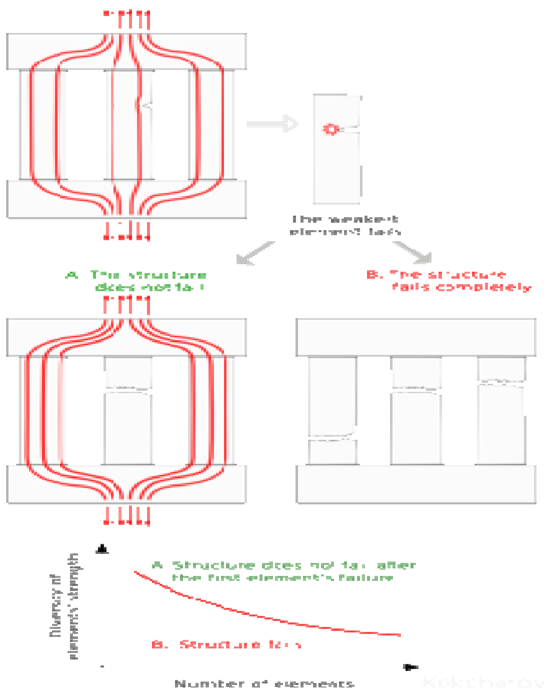
There is a direct analogy between Fracture Mechanics of solid and Structural Fracture Mechanics:

There are different causes of the first component failure: 1) mechanical overload, fatigue (material), unpredicted scenario etc. 2) "human intervention" like unprofessional behavior or a terrorist attack.

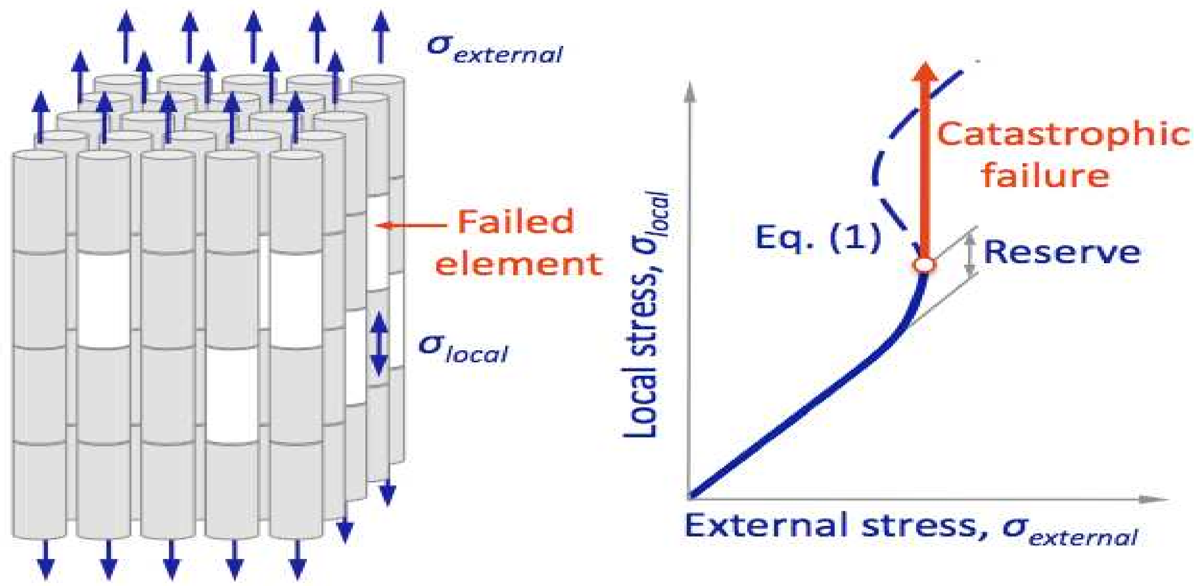
The are two typical scenarios:

A. A localized failure does NOT cause immediate collapse of the entire structure.

B. The entire structure fails immediately after one of its components fails.



If the structure does not collapse immediately there is a limited period of time until the catastrophic structural failure of the entire structure. There is a critical number of structural elements that defines whether the system has reserve ability or not. Safety engineers use the failure of the first component as an indicator and try to intervene during the given period of time to avoid the catastrophe of the entire structure. For example, “Leak-Before-Break” methodology means that a leak will be discovered prior to a catastrophic failure of the entire piping system occurring in service. It has been applied to pressure vessels, nuclear piping, gas and oil pipelines, etc.



$$\sigma_{external} = \frac{\sigma_{local}}{1 + q\,[1 - e^{-(\sigma_{local} - 1)^{b}}]} \qquad (1)$$

q, b = model’s parameters

The methods of Structural Fracture Mechanics are used as checking calculations to estimate sensitivity of a structure to its component failure.

Catastrophe failure model and reserve ability of a complex system.

The failure of a complex system with parallel redundancy can be estimated based on probabilistic properties of the system elements. The model supposes that failure of several elements causes neighboring elements overloading. The model equation (1) shows the relationship between local and external stresses. The equation (1) is similar to the cusp catastrophe behavior. The theory predicts reserve ability of the complex system and the critical external stress.

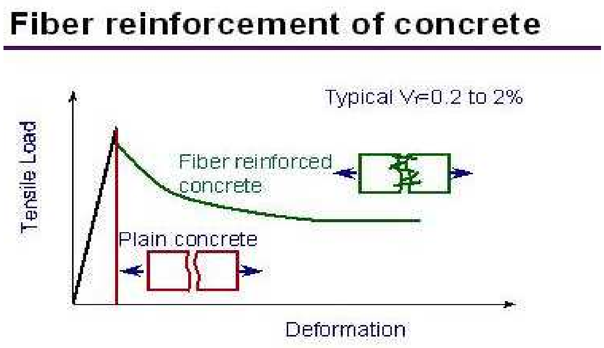
4. Fiber Reinforced Concrete (FRC)

(By: Israr Ul Haq 2k9 session)

Fiber reinforced concrete (FRC) is concrete containing fibrous material which increases its structural integrity. It contains short discrete fibres that are uniformly distributed and randomly oriented. Fibres include steel fibres, glass fibres, synthetic fibres and natural fibres. Within these different fibres that character of fibre reinforced concrete changes with varying concretes, fibre materials, geometries, distribution, orientation and densities.

Civil structures made of steel reinforced concrete normally suffer from corrosion of the steel by the salt, which results in the failure of those structures. Constant maintenance and repairing is needed to enhance the life cycle of those civil structures.
There are many ways to minimize the failure of the concrete structures made of steel reinforce concrete. The custom approach is to adhesively bond fiber polymer composites onto the structure. This also helps to increase the toughness and tensile strength and improve the cracking and deformation characteristics of the resultant composite. But this
method adds another layer, which is prone to degradation. These fiber polymer composites have been shown to suffer from degradation when exposed to marine environment due to surface blistering. As a result, the adhesive bond strength is reduced, which results in the de-lamination of the composite.

Another approach is to replace the bars in the steel with fibers to produce a fiber reinforced concrete and this is termed as FRC. Basically this method of reinforcing the concrete substantially alters the properties of the non-reinforced cement-based matrix
which is brittle in nature, possesses little tensile strength compared to the inherent compressive strength. The principal reason for incorporating fibers into a cement matrix is to increase the toughness and tensile strength, and improve the cracking deformation characteristics of the resultant composite. In order for fiber reinforced concrete (FRC) to be a viable construction material, it must be able to compete economically with existing reinforcing systems.
The behavior of FRC under loading can be understood from the Figure. The plain concrete structure cracks into two pieces when the structure is subjected to the peak tensile load and cannot withstand further load or deformation. The fiber reinforced concrete structure cracks at the same peak tensile load, but does not separate and can maintain a load to very large deformations. The area under the curve shows the energy absorbed by the FRCs when subjected to tensile load. This can be termed as the post cracking response of the FRCs.
The real advantage of adding fibers is when fibers bridge these cracks and undergo pullout processes, such that the deformation can continue only with the further input of energy from the loading source. Reinforcing fibers stretch more than concrete under loading. Therefore, the composite system of fiber reinforced concrete is assumed to work as if it were nonreinforced until it reaches its "first crack strength." It is from this point that fiber reinforcement takes over and holds the concrete together. With reinforcing, the maximum load carrying capacity is controlled by fibers pulling out of the composite. Reinforcing fibers do not have a



deformed surface unlike larger steel reinforcing bars which have a non smooth surface which helps mechanical bonding. This condition limits performance to a point far less than the yield strength of the fiber itself. This is important because some fibers pull out easier than others when used as reinforcing and will affect the toughness of the concrete product in which they are placed.

Effect of fibres in concrete

Fibres are usually used in concrete to control cracking due to both plastic shrinkage and drying shrinkage. They also reduce the permeability of concrete and thus reduce bleeding of water. Some types of fibres produce greater impact, abrasion and shatter resistance in concrete. Generally fibres do not increase the flexural strength of concrete, and so cannot replace moment resisting or structural steel reinforcement. Indeed, some fibres actually reduce the strength of concrete. The amount of fibres added to a concrete mix is expressed as a percentage of the total volume of the composite (concrete and fibres), termed volume fraction (V_f). V_f typically ranges from 0.1 to 3%. Aspect ratio (l/d) is calculated by dividing fibre length (l) by its diameter (d). Fibres with a non-circular cross section use an equivalent diameter for the calculation of aspect ratio. If the modulus of elasticity of the fibre is higher than the matrix (concrete or mortar binder), they help to carry the load by increasing the tensile strength of the material. Increase in the aspect ratio of the fibre usually segments the flexural strength and toughness of the matrix. However, fibres which are too long tend to "ball" in the mix and create workability problems.

Advantages and Disadvantages of Fiber Reinforced Concrete.

Fiber reinforced concrete has started to find its place in many areas of civil infrastructure applications where the need for repairing, increased durability arises. Also FRCs are used in civil structures where corrosion can be avoided at the maximum. Fiber reinforced concrete is better suited to minimize cavitation /erosion damage in structures such as sluice-ways, navigational locks and bridge piers where high velocity flows are encountered. A substantial weight saving can be realized using relatively thin FRC sections having the equivalent strength of thicker plain concrete sections. When used in bridges it helps to avoid catastrophic failures. Also in the quake prone areas the use of fiber reinforced concrete would certainly minimize the human casualties. In addition, polypropylene fibers reduce or relieve internal forces by blocking microscopic cracks from forming within the concrete.

The main disadvantage associated with the fiber reinforced concrete is fabrication. The process of incorporating fibers into the cement matrix is labor intensive and costlier than the production of the plain concrete. The real advantages gained by the use of FRC overrides this disadvantage.

The main properties that affect the hardness and the maximum fiber reinforced concrete are:

- Type of the fibers used.

- Volume percent of the fiber.

- Aspect ratio (the length is divided by the diameter of the fiber).

- Orientation of the fibers in matrix.

The materials that are used in reinforcing fiber such as asbestos, acrylic, cotton, nylon, glass, polyester, polyperpylane, polyethylene, rayon, steel and rock wool. Of these, the acid-resistant glass as well as the steel fibers has received more attention. The plastic fibers have proved of little value in the concrete until recently. The natural fibers are subject to alkali attack as well as are also determined to be of little value. Nylon is making a form on the slab at grade technology. Most of the test data, however, focuses on the use of steel fibers and fiberglass.

The percentage of fiber in the concrete mix is based on the volume and is expressed as a percentage of the mixture. Tests ranging from 1.7 percentages – 2.7 percentages are common. When using the volumes that are greater than 2 percentages the concrete could be difficult to mix. When the concrete is placed by means other than a truck-mixed concrete, the fiber may be higher. This is an example of using the concrete shot. The volumes of 2.3 percentages have been used successfully. In some prefabrication operations by using the fiber reinforced concrete percentage's volume has been used up to five percentages. In general, if all of the other properties will become equal, the resistance increases linearly with fiber volume of concrete.

5. Transportation Engineering

(By: Majid Yasin 2k9 session)

Transportation engineering is the application of technology and scientific principles to the planning,

functional design, operation and management of facilities for any mode of transportation in order to provide for the safe, rapid, comfortable, convenient, economical, and environmentally compatible movement of people and goods (transport). It is a sub-discipline of civil engineering. Transportation engineering is a major component of the civil engineering discipline. The importance of transportation engineering within the civil engineering profession can be judged by the number of divisions in ASCE (American Society of Civil Engineers) that are directly related to transportation. There are six such divisions (Aerospace; Air Transportation; Highway;

Pipeline; Waterway, Port, Coastal and Ocean; and Urban Transportation) representing one-third of the total 18 technical divisions within the ASCE (1987).

Transportation Engineering

Transportation engineers are involved with the safe and efficient movement of both people and goods. They design and maintain all types of transportation facilities, including

Highways and streets
Mass transit systems
Railroads
Airfields
Ports and harbors

Transportation engineers apply technological knowledge as well as an understanding of the economic, political, and social factors in their projects. They must work directly with urban planners because the quality of a community is directly related to the quality of the transportation system.

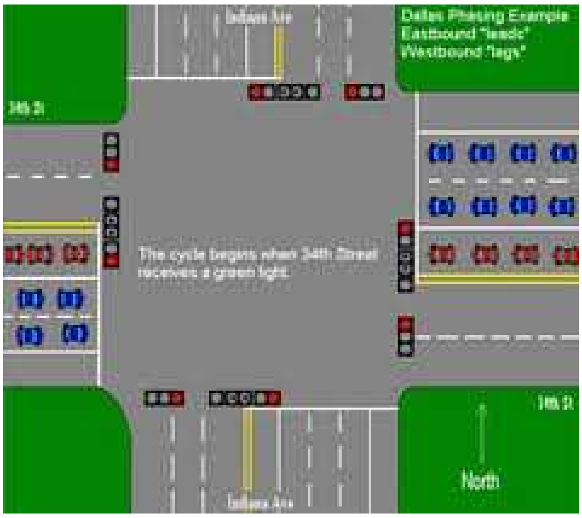
The planning aspects of transport engineering relate to urban planning, and involve technical forecasting decisions and political factors. Technical forecasting of passenger travel usually involves an urban transportation planning model, requiring the estimation of trip generation (how many trips for what purpose), trip distribution (destination choice, where is the traveler going), mode choice (what mode is being taken), and route assignment (which streets or routes are being used). More sophisticated forecasting can include other aspects of traveler decisions, including auto ownership, trip chaining (the decision to link individual trips together in a tour) and the choice of residential or business location (known as land use forecasting). Passenger trips are the focus of transport engineering because they often represent the peak of demand on any transportation system.

A review of descriptions of the scope of various committees indicates that while facility planning and design continue to be the core of the transportation engineering field, such areas as operations planning, logistics, network analysis, financing, and policy analysis are also important to civil engineers, particularly to those working in highway and urban transportation. The National Council of Examiners for Engineering and Surveying (NCEES) list online the safety protocols, geometric design requirements, and signal timing.

Transportation engineering, as practiced by civil engineers, primarily involves planning, design, construction, maintenance, and operation of transportation facilities. The facilities support air, highway, railroad, pipeline, water, and even space transportation. The design aspects of transport engineering include the sizing of transportation facilities (how many lanes or how much capacity the facility has), determining the materials and thickness used in pavement designing the geometry (vertical and horizontal alignment) of the roadway (or track).

Before any planning occurs the Engineer must take what is known as an inventory of the area or if it is appropriate, the previous system in place. This inventory or database must include information on (1)population, (2)land use, (3)economic activity, (4)transportation facilities and services, (5)travel patterns and volumes, (6)laws and ordinances, (7)regional financial resources, (8)community values and expectations. These inventories help the engineer create business models to complete accurate forecasts of the future conditions of the systemReview.

Operations and management involve traffic engineering, so that vehicles move smoothly on the road or track. Older techniques include signs, signals, markings, and tolling. Newer technologies involve intelligent transportation systems, including advanced traveler information systems (such as variable message signs), advanced traffic control systems (such as ramp meters), and vehicle infrastructure integration. Human factors are an aspect of transport engineering, particularly concerning driver-vehicle interface and user



interface of road signs, signals, and markings.

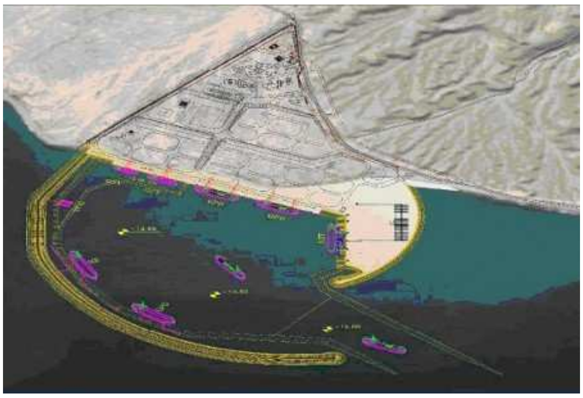
Highway engineering

Engineers in this specialization:
Handle the planning, design, construction, and operation of highways, roads, and other vehicular facilities as well as their related bicycle and pedestrian realms.
Estimate the transportation needs of the public and then secure the funding for the project.
Analyze locations of high traffic volumes and high collisions for safety and capacity.
Use civil engineering principles to improve the transportation system.
Utilizes the three design controls which are the drivers, the vehicles, and the roadways themselves.
Railroad engineering

Railway engineers handle the design, construction, and operation of railroads and mass transit systems that use a fixed guideway (such as light rail or even monorails). Typical tasks would include determining horizontal and vertical alignment design, station location and design, and construction cost estimating. Railroad engineers can also move into the specialized field of train dispatching which focuses on train movement control.

Railway engineers also work to build a cleaner and safer transportation network by reinvesting and revitalizing the rail system to meet future demands. In the United States, railway engineers work with elected officials in Washington, D.C. on rail transportation issues to make sure that the rail system meets the country's transportation needs.
[edit] Port and harbor engineering

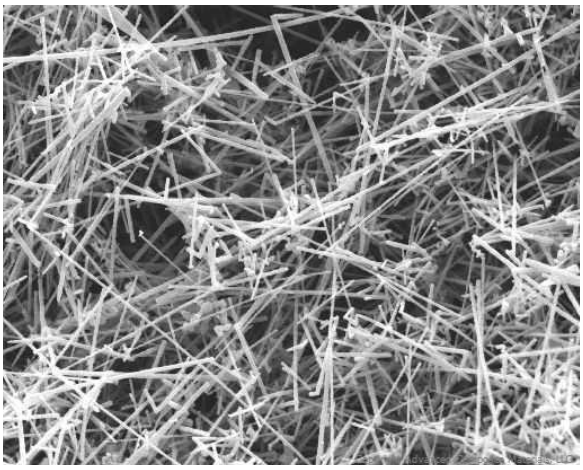
Port and harbor engineers handle the design, construction, and operation of ports, harbors, canals, and other maritime facilities. This is not to be confused with marine engineering.
Airport engineering
Airport engineers design and construct airports. Airport engineers must account for the impacts and demands of aircraft in their design of airport facilities. These engineers must use the analysis of predominant wind direction to determine runway orientation, determine the size of runway border and safety areas, different wing tip to wing tip clearances for all gates and must designate the clear zones in the entire port.



6. COMPOSITE MATERIALS IN CIVIL ENGINEERING

(By Muhammad Haroon 2k9 Session)

What is a Composite?



A Composite is a multiphase material formed from a combination of two or more materials that differ in composition or form, which are bonded together, but retaining their identities and properties. The outcome of this "*composition*" is that the newly formed material has superior properties over the individual components.

Or we can also define composite materials as:

Composite materials, often shortened to composites, are engineered or naturally occurring materials made from two or more constituent materials with significantly different physical or chemical properties which remain separate and distinct at the macroscopic or microscopic scale within the finished structure.

Composite Engineering, which basically consists of the use of Composite materials in Engineering, is slowly but surely making inroads into the Civil Engineering field. Despite the fact that Composites are generally more expensive in comparison to traditional construction materials, and therefore not as widely used in many constructive and building activities, they have the advantage of being lightweight, more corrosion resistant and stronger. The fibre reinforcements provide good damping characteristics and high resistance to fatigue.

Composites can benefit Civil Engineering?
The two aforementioned disciplines are more and more getting acquainted. If the advantages that Composites offer are combined with the physical limits of Civil Engineering an interesting development can occur. Composites are more often a part of the material forming and basis for Civil Engineering projects. Over the last thirty years Composite materials, plastics, and ceramics have been the dominant emerging materials. The volume and number of applications of Composite materials has grown steadily, penetrating and conquering new markets relentlessly. Modern Composite materials constitute a significant proportion of the engineered materials market.

As the years go by, Civil engineers have realised the benefits of using Composite materials in construction. Composite Engineering is therefore taking a turn in the manner in which it is being applied today. There has been a substantial increase in the amount of structures in building and construction that use Composite materials. In addition, with increased demand on strength, safety and reliability it has become imperative for many industries to use Composite Engineering.

Composite Technology Development benefits Civil Engineering:
Due to this, there have been significant developments in Composite materials. With the technological know-how available today, Composite materials are constantly being adapted to the way that they are used. As a

result, there are a wide variety of Composites to choose from, thanks to the ever-changing technological advances that make it possible to apply Composite Engineering. As a result, each type of Composite brings its own performance characteristics that are typically suited for specific applications.

In addition, Civil Engineering today faces challenges that require building reinforced structures that can overcome natural disasters like earthquakes and hurricanes. This requires the creative use of Composite materials in existing structures and structural systems. Composites are now successfully applied in making concrete structures more earthquake resistant around the world.

CARBON-FIBER-REINFORCED POLYMER:

Carbon-fiber-reinforced polymer or carbon-fiber-reinforced plastic (CFRP or CRP), is a very strong and light fiber-reinforced polymer which contains carbon fibers. The polymer is most often epoxy, but other polymers, such as polyester, vinyl ester or nylon, are sometimes used. The composite may contain other fibers such as Kevlar, aluminum, glass fibers as well as carbon fiber.

Although it can be relatively expensive, it has many applications in aerospace and automotive fields, as well as in sailboats, and notably finds use in modern bicycles and motorcycles, where its high strength-to-weight

Carbon-Fibre Reinforced Polymer Hexapod

ratio and good rigidity is of importance. Improved manufacturing techniques are reducing the costs and time to manufacture, making it increasingly common in small consumer goods as well, such as laptops, tripods, fishing rods, paintball equipment, archery equipment, racquet frames, stringed instrument bodies, classical guitar strings, drum shells, golf clubs, and pool/billiards/snooker cues.

Civil Engineering Applications of CFRP:

Carbon fiber reinforced polymer-[CFRP] has over the past two decades become an increasingly notable material used in structural engineering applications. Studied in an academic context as to its potential benefits in construction, it has also proved itself cost-effective in a number of field applications strengthening concrete, masonry, steel, cast iron, and timber structures. Its use in industry can be either for retrofitting to strengthen an existing structure or as an alternative reinforcing (or prestressing material) instead of steel from the outset of a project.

Retrofitting has become the increasingly dominant use of the material in civil engineering, and applications include increasing the load capacity of old structures (such as bridges) that were designed to tolerate far lower service loads than they are experiencing today, seismic retrofitting, and repair of damaged structures. Retrofitting is popular in many instances as the cost of replacing the deficient structure can greatly exceed its strengthening using CFRP.

Applied to reinforced concrete structures for flexure, CFRP typically has a large impact on strength (doubling or more the strength of the section is not uncommon), but only a moderate increase in stiffness (perhaps a 10% increase). This is because the material used in this application is typically very strong (e.g., 3000 MPa ultimate tensile strength, more than 10 times mild steel) but not particularly stiff (150 to 250 GPa, a little less than steel, is typical). As a consequence, only small cross-sectional areas of the material are used. Small areas of very high strength but moderate stiffness material will significantly increase strength, but not stiffness.

CFRP can also be applied to enhance shear strength of reinforced concrete by wrapping fabrics or fibers around the section to be strengthened. Wrapping around sections (such as bridge or building columns) can also enhance the ductility of the section, greatly increasing the resistance to collapse under earthquake loading. Such 'seismic retrofit' is the major application in earthquake-prone areas, since it is much more economic than alternative methods.

If a column is circular (or nearly so) an increase in axial capacity is also achieved by wrapping. In this application, the confinement of the CFRP wrap enhances the compressive strength of the concrete. However, although large increases are achieved in the ultimate collapse load, the concrete will crack at only slightly enhanced load, meaning that this application is only occasionally used.

Specialist ultra-high modulus CFRP (with tensile modulus of 420 GPa or more) is one of the few practical methods of strengthening cast-iron beams. In typical use, it is bonded to the tensile flange of the section, both increasing the stiffness of the section and lowering the neutral axis, thus greatly reducing the maximum tensile stress in the cast iron.

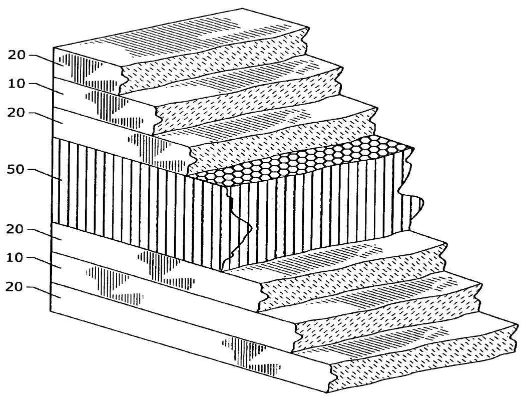
When used as a replacement for steel, CFRP bars could be used to reinforce concrete structures, however the applications are not common.

CFRP could be used as prestressing materials due to their high strength. The advantages of CFRP over steel as a prestressing material, namely its light weight and corrosion resistance, should enable the material to be used for niche applications such as in offshore environments. However, there are practical difficulties in anchorage of carbon fiber strands and applications of this are rare.

In the United States, Prestressed Concrete Cylinder Pipes (PCCP) account for a vast majority of water transmission mains. Due to their large diameters, failures of PCCP are usually catastrophic and affect large populations. Approximately 19,000 miles of PCCP have been installed between 1940 and 2006. Corrosion in the form of hydrogen embrittlement has been blamed for the gradual deterioration of the prestressing wires in many PCCP lines. Over the past decade, CFRPs have been utilized to internally line PCCP, resulting in a fully structural strengthening system. Inside a PCCP line, the CFRP liner acts as a barrier that controls the level of strain experienced by the steel cylinder in the host pipe. The composite liner enables the steel cylinder to perform within its elastic range, to ensure the pipeline's long-term performance is maintained. CFRP liner designs are based on strain compatibility between the liner and host pipe.

CFRP is a more costly material than its counterparts in the construction industry, glass fiber-reinforced polymer (GFRP) and aramid fiber-reinforced polymer (AFRP), though CFRP is, in general, regarded as having superior properties.

Much research continues to be done on using CFRP both for retrofitting and as an alternative to steel as a reinforcing or prestressing material. Cost remains an issue and long-term durability questions still remain. Some are concerned about the brittle nature of CFRP, in contrast to the ductility of steel. Though design codes have been drawn up by institutions such as the American Concrete Institute, there remains some hesitation among the engineering community about implementing these alternative materials. In part, this is due to a lack of standardization and the proprietary nature of the fiber and resin combinations on the market, though this in itself is advantageous in that the material properties can be tailored to the desired application requirement



Prepeg and carbon fiber reinforced **composite**

7. Placing Concrete in Cold Weather

(By Muhammad Anees 2k9 session)

Introduction

Concrete placed during cold weather will develop sufficient strength and durability to satisfy
intended service requirements only if it is properly produced, placed and protected.
ACI 306 "Cold Weather Concreting" defines cold weather concreting as a period when for more than three (3) consecutive days, the following conditions exist:

• The average daily air temperature is less than 5°C (40°F) and,
• The air temperature is not greater than 10°C (50°F) for more than one-half of any
24 hour period.

Even though not defined as cold weather, protection during Spring and Fall is required during
the first 24 hours to avoid freezing.

Cold weather concrete requires special planning. To achieve a long life from your concrete placed during cold weather the production of aggregates, proper design of the mix, adequate mixing and the transporting to the jobsite, as well as proper placing and finishing practices with special care in its protection must be followed.

Here are some ways that will help ensure your cold weather concreting will be a success:

* Planning
* Pre-placement
* Placement
* Post-placement

Why is cold weather a problem?

There are two main problems with concrete in cold weather:

- Concrete can freeze before it gains strength which breaks up the matrix
- Concrete sets more slowly when it is cold—very slow below 50°F; below 40°F the hydration reaction basically stops and the concrete doesn't gain strength

But these are concrete temperatures not air temperatures. So when it's cold, we need to protect the concrete until it can handle the cold on its own. The general rule is that once the concrete has gained strength to about 500 psi then it's OK. The magical thing that happens is that at almost the same time that the concrete achieves 500 psi compressive strength, hydration of the cement has consumed enough of the water in the original mix so that even if it does freeze, there's not enough water left in the pores to damage the concrete. With most concrete, even at 50°, this happens during the second day. To help it reach that 500 psi strength, then, there are two things we can do in cold weather: Change the mix to get it to set more quickly or protect the concrete from the cold—or more likely, both.

Objectives of Cold Weather Concreting

The objectives of cold weather concreting are to:

• Prevent damage to concrete due to freezing at early ages

• Assure that concrete develops the required strength for the safe removal of forms

• Maintain curing conditions that foster normal strength development without using
excessive heat

• Limit rapid temperature changes in the concrete to prevent thermal cracking

• Provide protection consistent with the intended serviceability of the structure

Changes to Concrete Mix During Cold Weather

Many of the problems with cold weather can be overcome by the ready mix producer. Here are a few things to keep in mind:

- Hot water—Your ready mixed concrete producer will usually have, and use, hot water in the concrete when the weather turns cold. Most producers will try to have the concrete be at least 65°F when it leaves the plant, which is generally good enough depending on air temperature and thickness of the concrete element.

- Specify the slump at less than 4 inches and use air entrained concrete to reduce bleeding.

- Accelerators—Since colder weather leads to colder concrete, the set time can be delayed. Accelerators added to the concrete can keep it on schedule. Addition of 2% (by weight of cement) of calcium chloride is the traditional way to accelerate the hydration reaction—it is very effective and reasonably cheap. But—a big but—that much chloride can lead to corrosion of any steel embedded in the concrete (like rebar) and it can lead to a mottled surface appearance with colored concrete.

- Nonchloride accelerators are widely available and are very effective. They won't discolor the concrete but they are a bit expensive. Don't make the mistake of thinking that accelerators are anti-freeze agents—they are not, they simply increase the rate of the hydration reaction.

- Fly ash—You should typically stay away from using fly ash or slag cement in cold weather, since those materials set up more slowly and generate less internal heat; slag can cause the same effect.

- To make the reaction a bit hotter, the ready mix producer can add some extra cement (typically an extra 100 pounds per cubic yard) or can use Type III (high-early strength) cement, which hydrates more rapidly.

- Be careful with water reducers in cold weather, since they can slow the set time. Besides, you seldom need water reduction with cooler concrete since the cooler temperatures prevent slump loss.

For admixtures added at the job site, don't use them if they have frozen. The chemicals may have separated.

Precautions Before Placing Concrete in the Cold weather

- Frozen ground—NEVER place concrete on frozen ground or onto ice or snow. There are a couple of problems with this. First, frozen ground will settle when it thaws, cracking the concrete. Second, when the ground is cold, the concrete in contact with it will be cold and will set more slowly. You can even get crusting, with the top part of the concrete set and the bottom still soft.

- If the ground is frozen, you can thaw it using hydronic heat pipes and blankets (such as those from Ground Heaters), or electric blankets (check out Power Blanket).

Ground Heaters

- Remove all snow and ice in areas where concrete is to be placed. Also remove any standing water that could get mixed into the concrete.
- Warm up anything that will come in contact with the concrete, including forms and any embedments, to at least 32°F. If it's not too cold and you cover everything with tarps the day before the pour, it will stay dry and warm enough. Keep tools in your truck or trailer.
- Be ready with blankets, even if you don't think it will get that cold. Also consider whether you will need lights if the concrete sets more slowly than expected and the winter sun sets just as you're finally ready to start finishing.

There will be some heat loss from the ready mix plant to the job site. For a one-hour delivery time, the concrete temperature will drop about one-fourth the difference between the air temperature and the concrete temperature. So if the concrete's 65°F and the air is 45°F, in one-hour of travel it will drop 5°F and the concrete will end up at 60°F.

Placement of concrete in the cold weather

Concrete temperatures should be checked and recorded for record and control purposes. An acceptable temperature for concrete placement is normally from 60 degrees to 85 degrees Fahrenheit. The temperature of the fresh concrete should be maintained at a minimum of 55 degrees until the compressive strength requirement is met. For transit mixed concrete, the specifications will typically require that the concrete meet the requirements of ASTM C94. ASTM C94 also establishes limits on the amount of concrete that can be mixed in transit based on the size of the mixing drum.

Once the compressive strength requirement is achieved, insulated blankets can be removed in a manner that will prevent a rapid decline in temperature. An acceptable rate of temperature loss is not more than 2 degrees Fahrenheit per hour. A simple pocket thermometer is handy.

The recording of concrete temperatures, ambient temperature, and other weather conditions at the time of placement should be done by the contractor. These duties can become very important in the event that the concrete has to be removed due to exposure to freezing temperatures, unacceptable cracking, cold joints, segregation of aggregate, or failing compressive strength tests. Good documentation helps pinpoint the source of the problem and the liable party. Thorough documentation is an aid to determining if the problem was caused by exposure to cold temperatures, poor workmanship, poor or improper curing, defective curing compound, or faulty concrete because of mixing or batching problems.

Protection and Curing

For flatwork, the traditional, and still the best

way, to protect concrete from the cold is to cover it with blankets after it's been finished. Since the ground is a bit warmer and the concrete generates its own heat, blankets will keep it warm even if the temperature goes below 20°F. A few things to think about are:

- Remember the definition: If the air is below or expected to go below 40°F, then use cold weather techniques.

- When finishing concrete in cold weather, you still need to wait for all the bleed water to evaporate. Bleed water is basically the concrete particles settling (like mud in a stirred up pond) and squeezing out all the extra water. If you finish that water into the surface, you increase the water-cement ratio and get weak surface concrete. Since the concrete is setting more slowly in the cold, bleeding starts later, lasts longer, and you can get more bleed water. You can try getting it off with squeegees or vacuums or you can wait.

- Typically, you only need to keep the blankets on for a couple of days, if the concrete is warmer than 50°F.

- If you want to make sure of that, check the concrete temperature using an infrared temperature gun, or use maturity methods. Maturity is a way to determine if the concrete has gained enough strength to be on its own and it relies on the combination of time and temperature.

- To determine how much insulating value you need to keep the concrete at 50°F, check out the tables of ACI 306. The insulation needed is based on concrete thickness, cement content, and the lowest air temperature anticipated for the protection period.

- Place triple layers of insulating blankets at corners and edges that could freeze. Wrap any protruding rebars. Make sure the blankets won't blow off during the night.

Power Blanket LLC

- If blankets alone aren't enough to keep the slab warm (or the walls for formed concrete) then you can use hydronic heating pipes or electric heating blankets laid on top of the slab and insulated.

- If that's still not enough, or if it's too cold to even place the concrete, then you would need to enclose the work and heat the air. Temporary enclosures are expensive, but if the work must go forward, sometimes that's the only option.

Lay field group

- In an enclosure or even in a building heated by temporary heat, you need to consider the potential problem of carbonation. With unvented heaters (salamanders), or even with gas-powered equipment, the carbon dioxide levels can increase. This carbon reacts with the concrete, creating a chalky carbonated layer at the surface. This layer will be soft and generally unacceptable.

- Heaters are available that exhaust to the outside of an enclosure or building and just blow in warm air. That eliminates the carbonation problem. Assign someone to make sure the heaters are fueled and will stay on all night.

- When using hot, dry air in an enclosure, the concrete surface can dry out quickly, leading to crusting or plastic shrinkage cracking. Also, be careful about fire with propane heaters.

- If the concrete is kept at around 50°F, protection can typically be removed after two days. If the concrete remains at 50°F, depending on what kind of cement is used and how much accelerator, you should wait a couple of weeks, better to wait 4 weeks, before actually putting it into service. You can always test to determine the strength if it's essential.

- Removing the blankets suddenly in cold weather can cause a temperature differential to build up between the outside of the concrete and its middle. This can cause cracking from the thermal differential, but typically only in thicker members.

- Cure concrete in cold weather without additional water; adding water will keep the concrete saturated so that freezing will damage it even after it reaches 500 psi compressive strength.

Concrete in cold weather absolutely does need to be cured, the surface can dry out even faster than in warm weather, if the concrete is warmer than the air.

8. Self Consolidating Concrete

(By Bilal Riaz 2k9 session)

Self-consolidating concrete, also known as self formwork, and encapsulates even the most congested reinforcement, all without any mechanical vibration. It is defined as a concrete mix that can be placed purely by means of its own weight, with little or no vibration. As a high-performance concrete, SCC delivers these attractive benefits while maintaining all of concrete's customary mechanical and durability characteristics. Adjustments to traditional mix designs and the use of superplasticizers creates flowing concrete that meets tough performance requirements. If needed, low dosages of viscosity modifier can eliminate unwanted bleeding and segregation.

Self-consolidating concrete is designed to meet specific applications requiring high deformability, high flowability, and high passing ability. The maximum flowability is governed by the application, and since flowability is controlled by the composition of the mix, observations show that the rheological properties of SCC vary in a wide range, so does its robustness.

Since its inception in the 1980s, the use of SCC has grown tremendously. The development of high performance polycarboxylate polymers and viscosity modifiers have made it possible to create “flowing” concrete without compromising durability, cohesiveness, or compressive strength. The flowability of SCC is measured in terms of spread when using a modified version of the slump test (ASTM

C 143). The spread (slump flow) of SCC typically ranges from 18 to 32 inches (455 to 810 mm) depending on the requirements for the project. The viscosity, as visually observed by the rate at which concrete spreads, is an important characteristic of plastic SCC and can be controlled when designing the mix to suit the type of application being constructed.

Admixtures needed for self compacting concrete

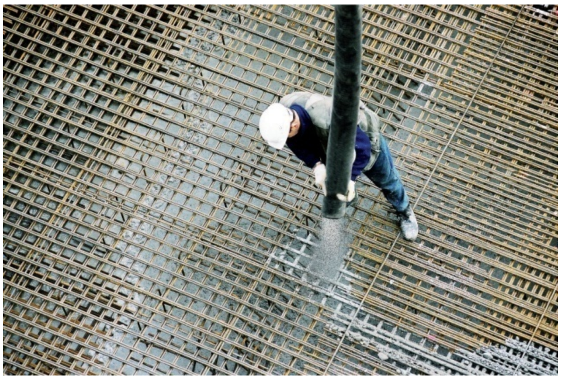
Self compacting concrete is a type of concrete that is highly fluid allowing it to self-level, penetrate into complicated areas and formwork, through complex reinforcement and much more. Despite its increased fluidity, self compactingconcrete maintains the high quality demanded by today’s building industry, presenting both flexibility as well as incredible strength.

When working on residential or commercial projects the goal is to create an aesthetical pleasing result which is strong as well. For example driveways inresidential areas or floors in high traffic commercial zones need to present a good looking finish while also being strong enough to take the weight of multiple vehicles on a daily basis. The advantage of using self compactingconcrete in this case is that is requires no vibration and also dries to a shiny finish which requires little extra water.

SOME ADMIXTURES THAT CAN BE USED IN THE SELF COMPACTING CONCRETE APPLICATION INCLUDE:

High water reducer – superplasticizer. This is an admixture that is used in all types of self compacting concrete because it is what gives it its flowability. Essentially, this admixture reduces the quantity of water needed to achieve the same consistency as traditional concrete meaning that if the same quantity of water is used then the resulting material will be much more fluid and easy to work with.

Generally, poly carboxylate ether super plasticizers are used in self-compacting concrete, despite the fact that they are quite expensive. However, they are extremely strong so a lower dose will achieve the same result as other products.



Retarding admixtures. These admixtures prevent the self compacting concrete from setting too soon. The concrete will then require an additional 90 to 360 minutes to set after it has been poured. Retarding admixtures can be made from gluconate, sucrose or phosphate, depending on the application.

Retarders are useful because rarely is concrete poured in a single batch, and if the first batch has had too much time and has begun to set it may not bond properly with the second batch. No matter how great the plan is, delays are bound to happen and retarders can help extend the setting period of the self compacting concrete to allow all the batches to bond properly.

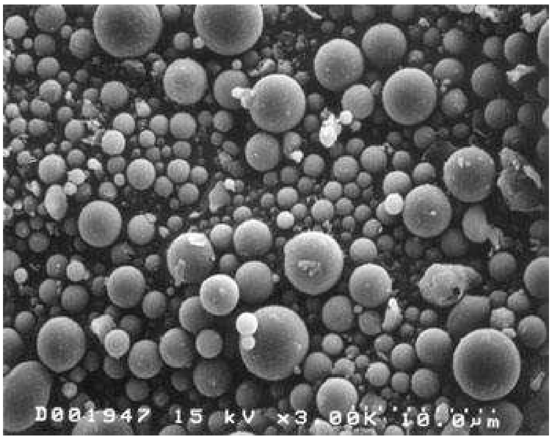
Air-entraining admixture. This is used to entrain the air within the concrete while mixing to obtain a uniform distribution of the air pockets within the concrete. Air entrainment helps protect the self compacting concrete from the damaging effects of freezing and subsequent thawing, it also increases the level of cohesion as well as the stability of the final product.

Water resisting admixtures. These reduce the permeability of self compacting concrete which protects from the corrosive action of water. However, these admixtures only prevent absorption through surface pores and not if cracks are present in the concrete. There are a wide range of admixtures that are used to improve self compacting concrete, with more being developed constantly with the rise in popularity of this concrete.

9. Fly Ash Concrete

(By Sohaib Naseer 2k9 session)

Fly ash is one of the residues generated in combustion, and comprises the fine particles that rise with the flue gases. Ash which does not rise is termed bottom ash. In an industrial context, fly ash usually refers to ash produced during combustion of coal



Photomicrograph made with a Scanning Electron Microscope (SEM): Fly ash particles at 2,000x magnification

Flyash is defined in Cement and Concrete Terminology (ACI Committee 116) as “the finely divided residue resulting from the combustion of ground or powdered coal, which is transported from the firebox through the boiler by flue gases.” Flyash is a by-product of coal-fired electric generating plants.

Two classifications of flyash are produced, according to the type of coal used. Anthracite and bituminous coal produces flyash classified as Class F. Class C flyash is produced by burning lignite or subbituminous coal. Class C flyash is preferable for the applications presented in the Green Building Guide and is the main type offered for residential applications from ready-mix suppliers.

Flyash is one of three general types of coal combustion byproducts (CCBP’s). The use of these byproducts offers environmental advantages by diverting the material from the wastestream, reducing the energy investment in processing virgin materials, conserving virgin materials, and allaying pollution.

Thirteen million tons of coal ash are produced in Texas each year. Eleven percent of this ash is used which is below the national average of 30 %. About 60 – 70% of central Texas suppliers offer flyash in ready-mix products. They will substitute flyash for 20 – 35% of the

portland cement used to make their products.

Although flyash offers environmental advantages, it also improves the performance and quality of concrete. Flyash affects the plastic properties of concrete by improving workability, reducing water demand, reducing segregation and bleeding, and lowering heat of hydration. Flyash increases strength, reduces permeability, reduces corrosion of reinforcing steel, increases sulphate resistance, and reduces alkali-aggregate reaction. Flyash reaches its maximum strength more slowly than concrete made with only portland cement. The techniques for working with this type of concrete are standard for the industry and will not impact the budget of a job.

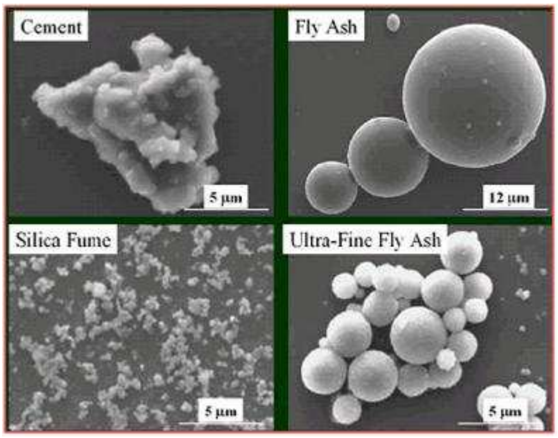
Some wall-form materials are made from EPS (expanded polystyrene) which is a lightweight non-CFC foam material. There are also fiber-cement wall-form products that can contain wood waste. The EPS/concrete systems offer high insulating qualities and easy installation. The fiber-cement blocks offer insulating qualities as well. Some EPS products also have recycled content.

Fly ash is a fine, glass-like powder recovered from gases created by coal-fired electric power generation. U.S. power plants produce millions of tons of fly ash annually, which is usually dumped in landfills. Fly ash is an inexpensive replacement for portland cement used in concrete, while it actually improves strength, segregation, and ease of pumping of the concrete. Fly ash is also used as an ingredient in brick, block, paving, and structural fills.

Fly ash concrete was first used in the U.S. in 1929 for the Hoover Dam, where engineers found that it allowed for less total cement. It is now used across the country. Consisting mostly of silica, alumina and iron, fly ash is a pozzolan--a substance containing aluminous and silicious material that forms cement in the presence of water. When mixed with lime and water it forms a compound similar to portland cement. The spherical shape of the particles reduces internal friction thereby increasing the concrete's consistency and mobility, permitting longer pumping distances. Improved workability means less water is needed, resulting in less segregation of the mixture. Although fly ash cement itself is less dense than portland cement, the produced concrete is denser and results in a smoother surface with sharper detail.

Class F fly ash, with particles covered in a kind of melted glass, greatly reduces the risk of expansion due to sulfate attack, as may occur in fertilized soils or near coastal areas. It is produced from Eastern coal. Produced from Western coal, Class C fly ash is also resistant to expansion from chemical attack, has a higher percentage of calcium oxide, and is more commonly used for structural concrete.

Although the Federal government has been



using the material for decades, smaller and residential contractors are less familiar with fly ash concrete. Competition from portland cement is one consideration. Because fly ash comes from various operations in different regions, its mineral makeup may not be consistent; this may cause its properties to vary, depending on the quality control of the manufacturer. There are some concerns about freeze/thaw performance and a tendency to effloresce, especially when used as a complete replacement for portland cement.

The Clean Air Act of 1990 requires power plants to cut nitric oxide emissions. To do so, plants restrict oxygen, resulting in high-carbon fly ash, which must be reprocessed for cement production. Thus, fly ash could be less available or more costly in the future. Researchers at Brown University are studying why the high-carbon ash doesn't work for cement, and other treatment options.

Visit to Taxila Museum

Few weeks before, our teacher Prof. Dr. Attaullah Shah and class planned the visit to museum. It was our first tour of university and was really enjoyable and unforgettable.

We reached museum at 12:00 pm. We were

surprised and inspired to see the master work done by the ancient people. Although they

lacked many equipments and tools but even then all the things they made were outclass. We although of the hard work of those people that how keenly they did their all the work. The work was really surprising and awesome.

During the visit we come to know about the culture of these people, their gods, their women. These people had such a great mind and talent. Outside the museum, there were also some buildings constructed which gave a great knowledge regarding to CIVIL

ENGINEERING. We all class and teacher had a discussion about the various things in museum which helped all of us regarding to our general knowledge. These people know the use of gold, silver and copper and they made variety of things from that. The utensils made by these people were amazing. Their tools, their all the work was really impressive. At about 3 pm we had our lunch and photo session. All the class members participated in it. This tour was fascinating and unforgettable. We went back at about 4 pm. The memories of this tour will always remain in our mind and

we will be thankful to our University for arranging such a great tour.

SPORTS GALA

Report On Sports Gala At

SCET Wah Cant.

(By: Majid Yasin 2k9 session)

Introduction: It was the 1st sports days in Swedish college of engineering and technology. All students were so happy and all enjoyed it very well. Our college held 3 games this time foot ball, cricket and badminton. There were 3 days of sports. All students and also our teachers participate in the sports and they enjoyed it. The students of each department were sporting to their teams and that kind of passion of sports I didn't seen ever. Those moments of losing and winning of the games I remember that very clearly that smiling on some 1 face and the face of a loser.

Management (faculty)

The sports gala was nothing without the help of our teachers, some of them are:

- Sir Naveed
- Sir Ali Raza

Management (students)

_without the student's helps it will not possible to manage the sports some students names who helps or mange this function are:

- M.Majid Yasin (2k9-Scet/Civil/26)
- M.Zaeem Fakhar (2k9-Scet/Civil/03)
- M.Waqar (2k9-Scet/civil/51)

Favorites teams of the cricket:

These are the teams which was favorite teams from the starting days of the sports in cricket.

1. Mechanical (B-1)
2. Electrical (B-2)
3. Civil (B-1)
4. Electrical (B-1)

These 4 teams played semi finals.

Favorite team in foot ball:

Civil (B-1)

There was only 1 team which was favorite in the tournament.

Best players of the badminton:

1. Sir Ali Raza
2. M.Noman (Elec)
3. Sir Amjad Amen
4. Waqas Ahmed (Mech)

Winners

Mechanical (B-1) Cricket

Civil (B-1) Football

M.Noman (Badminton)

Places Where It Held:

22 area ground (cricket)

23 area ground (football)

SCET campus (badminton)

We all students are very thankful to our principal and our chairman who gave us permission for the sports Galla

Entertainment

(By M. Zaeem Fakhar: 2k9 session)

A woman gets on a bus with her baby. The bus driver says : “That’s the ugliest baby that I’ve ever seen. Ugh!” The woman goes to the rear of the bus and sits down, fuming. She says to a man next to her, the bus driver just insulted me! The man says… You go right up there and tell him off – go ahead, I’ll hold your monkey for you!!!

Two engineering students were walking across a university campus when one said, “Where did you get such a great bike?” The second engineer replied, “Well, I was walking along yesterday, minding my own business, when a beautiful woman rode up on this bike, threw it to the ground, took off all her clothes and said, “Take what you want.” The first engineer nodded approvingly and said, “Good choice; the clothes probably wouldn’t have fit you anyway.”

What is the difference between mechanical engineers and civil engineers? Mechanical engineers build weapons. Civil engineers build targets.

A guy is sitting at home when he hears a knock at the door. He opens the door and sees a snail on the porch. He picks up the snail and throws it as far as he can.
Three years later, there is a knock on the door. He opens it and sees the same snail. The snail says, "What the hell was that all about?"

The graduate with a science degree asks, “Why does it work?”
The graduate with an engineering degree asks, “How does it work?”
The graduate with an accounting degree asks, “How much will it cost?”

The graduate with an arts degree asks, “Do you want fries with that?”

A depressed engineering student went to rail track for suicide...
Train coming closer & closer..
But he suddenly Came out Of track & said:
'I have to submit assignment tomorrow'

One of the funniest things about engineers!

Engineer thinks they are genius in mathematics!
But most of the teachers and professors think
....
....
....
....
....
....
ENGINEERS MAKE A PROBLEM COMPLEX RATHER THAN SOLVING IT!!!

A guy meets a girl in a bar. She says, "This is your lucky night. I've got a special offer for you. I'll do absolutely anything you want for $300, as long as you can say it in three words."
The guy replies, "Hey, why not?" He pull his wallet out of his pocket, and one at a time lays three hundred-dollar bills on the bar, and says slowly, "Paint my house."

What it takes to be a Civil. Engineering?

(By: Sohail Saleh 2k9 session)

We entered the college with lot of dreams,
With the first day, came the first shock: NO GIRLS.
With this we started the great journey.

First half of first year passed getting acquainted;
Getting out of school mentality, exploring the campus;
Second half entangled in draughters, t-squares, set square, sheets;
Eventually ended by rewriting the drawing rules.

Third was the sem of great transformation;
Mastering the art of copying assignments,
Getting famous for infamous acts;
No matter lost only few marks.

Then came the fourth sem,
The of tech fests, seminars;
We were the hearth of all the events;
And were rated best till date.

Fire began from fifth sem;
Suddenly the class was rated the worst ever;
And rebels had borned;
Revolution started, superficially suppressed.

Sixth sem saw new senses coming up,
Desire to excel beyond academics grew;
Explored unexplored areas;
Ideas succumbed under the campus interviews.

Finally the last year started,
Campus interviews came at large,
Quickly we were being absorbed in,
The fairy tale had already started.

Eighth sem: None of us know what it was
May we were in ecstasy, or in heaven, only He knows,
We were the achievers of rare feet: NO GIRL IN WHOLE DEPARTMENT (curse turned into blessing)
We knew it was unfair but we were the dictator. (the whole class acted as one thought)
Disqualification was appreciated over defeat;
The inter bond was stronger than ever,
The last week of college saw us becoming different persons.

Engineering Ethics

(By: Sohail Saleh 2k9 session)

The study of moral issues and decisions confronting individuals and organizations engaged in engineering.

or

The study of related questions about the moral ideals, character, policies and relationships of people and corporations involved in technological activity.

Though in engineering ethics, our focus is engineers, but we should not forget that others involved in engineering and technological enterprises are equally important like scientists, managers, production personnel, sales staff, and govt. officials, elected reps, lawyers and the general public

AIMS OF ENGINEERING ETHICS

While Engineers have done very useful work for the welfare, health and raising the quality of life and standards of living of the society, they also share responsibility for the damage to human life, property, environment due to their bad engineering decisions and not meeting their professional obligations to avert such losses.

On 28 January 1986, the space shuttle challenger blew off in less than one and a half minutes (67 seconds to be exact) into the flight killing all six astronauts and a lady school teacher. A seal in the booster rocket failed along the hot gases to enter the massive fuel tanks and thus causing explosion under the watchful eyes of millions of viewers on their TV screen round the globe.

It later came to the public knowledge that 14 engineers at Martin Thiokol, the manufacturer of the Booster Rocket, had voiced opposition to the launch of the space craft, the engineers were certain that the booster seals will fail under the low temperatures at the launch site. The lesson of the engineers, themselves engineers, ignored the call and did not communicate the concerns to NASA authorities.

This shows the decisions which engineers make or is prevented from making have far reaching consequences. Engineering decisions have certainly moral dimensions. As engineering takes place, mostly, in profit earning organizations, one has to see what is morally correct or incorrect for engineers in carrying out their professional obligations. It is also important to understand how corporations can be better structured to allow responsible engineers to act on their moral convictions and moral judgments.

.**MORALITY & ETHICS**

In our definition we said ‘Engineering Ethics’ is the study of moral issues and decisions. We can say Engineering Ethics is the study of morality.

Morality is concerned with what ought or ought not to be done in a given situation, what is right or wrong in handling of it and what is good or bad about people, policies, and ideals involved.

This definition is however incomplete as good or bad, right or wrong, ought to or ought not to are also used for non-moral issues. Thus in order to start a car a person ought to put the key in the ignition which is the right thing to do. People ought to brush their teeth before leaving for work, and it is good to read a book. None of these judgments would be counted as moral ones.

Moral judgments are about what morally ought or ought not to be done, what is morally right or wrong, and what is morally good or bad.

HOW MORAL PROBLEMS ARISE IN ENGINEERING

A product or project goes through various stages of conception, design, and manufacture, followed by testing, sales, and service. Engineers (civil, electrical, mechanical or chemical) carry out or supervise the appropriate activities at different stages.

As engineers carry out their tasks, there will be times when their activities will ultimately lead to a product that is unsafe or less than useful. This may happen intentionally, or under pressure, or in ignorance. A product may be intentionally designed for early obsolescence; an inferior material may be substituted under pressure of time or budget; a product’s ultimately harmful effects may not be foreseen.

These problems arise apart from the temptations of bribe and other forms of corruption.

Some common examples are given below.

An inspector declared a consignment of vehicle engines to be used ones and not new as required by the contract. The head of the office, an engineer himself, overruled the inspector’s opinion and ordered to sign acceptance document, and threatened the inspector of disciplinary action in case of refusal.

A tannery disposed off its chemical wastes in a seasonal nallah where downstream children take a swim, women wash their clothes and utensils, and sheep and buffaloes drink water. Knowing these hazards, the engineers took no action for changing the disposal method.

An electrical company was ready for production of its own version of a popular new item. The product was not ready for sale and attractive advertisements appeared in the print and electronic media making people believe that it was available off the shelf and were drawn away from competing lines.

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