CHAPTER-1

INTRODUCTION

GENERAL:

AS part of graduation requirement,all the undergraduates,the third –year students who take diploma of Civil Engineering in Sri jayachamarajendra(Govt) Polytechnic Bangalore will undergo in-plant training programme for a duration of 10 days .This in –Plant Training is a course for undergraduates that gives them an opportunity to expose themselves in real career world so as to they will learn how to relate theoretical learning before and real practical in working's environment. Besides that, in future, they will be having good preparation and understanding for their field of profession.

THE OBJECTIVE OF INPLANT TRAINING:

1. Undergraduates have an opportunity to expose themselves in working environment of their field of profession respectively.
2. For obtaining working's experience in the industry which is relating to their field of current study.
3. Using the knowledge which is obtained from industrial training for their study after finishing training and continuing study at university afterwards.
4. Training them to be capalble communication and interaction between workers and superior.
5. Training them to be able to prepare a technical report which is related to industrial training they do.

THE SCOPE OF INPLANT TRAINING:

- Observe the whole operation of this industry.
- Doing operation's work that is involved in unit production by either using machine or tool.
- Work that involving installment and fabrication of tool.

WHAT IS ROAD OR PAVEMENT?

Pavement or Road is an open , generally public way for the passage of vehicles,people's and animals.

Pavement is finished with a hard smooth surface.It helpled make them durable and able to withstand traffic and the environment.They have a life span og between 20-30 years.

Road pavements deteriorate over time due to:

- The impact of traffic , particularly heavy vehicles.
- Environmental factors such as wether, pollution.

TYPES OF PAVEMENTS:

There are various types of Pavements depending upon the materials used;a brief description of all types is given here-

FLEXIBLE PAVEMENTS:

Bitumen has been widely used in the construction of flexible pavements for a long time. This is the most convenient and simple type of construction. The cost of construction of single lane bituminous pavement varies from 20 to 30 lakhs per km in plain areas. In some applications, however, the performance of conventional bitumen may not be considered satisfactory because of the following reasons

- In summer season, due to high temperature, bitumen becomes soft resulting in bleeding, rutting and segregation finally leading to failure of pavement.
- In winter season, due to low temperature, the bitumen becomes brittle resulting in cracking, ravelling and unevenness which makes the pavement unsuitable for use.
- In rainy season, water enters the pavement resulting into pot holes and sometimes total removal of bituminous layer.
- In hilly areas, due to sub-zero temperature, the freeze thaw and heave cycle takes place. Due to freezing and melting of ice in bituminous voids, volume expansion and contraction occur. This leads to pavements failure.
- The cost of bitumen has been rising continuously. In near future, there will be scarcity of bitumen and it will be impossible to procure bitumen at very high costs.

RIGID PAVEMENTS:-

Rigid pavements, though costly in initial investment, are cheap in long run because of low maintenance costs. There are various merits in the use of Rigid pavements (Concrete pavements) are summarized below:

- Bitumen is derived from petroleum crude, which is in short supply globally and the price of which has been rising steeply. India imports nearly 70% of the petroleum crude. The demand for bitumen in the coming years is likely to grow steeply, far outstripping the availability. Hence it will be in India's interest to explore alternative binders. Cement is available in sufficient quantity in India, and its availability in the future is also assured. Thus cement concrete roads should be the obvious choice in future road programmes.

- Besides the easy available of cement, concrete roads have a long life and are practically maintenance-free.

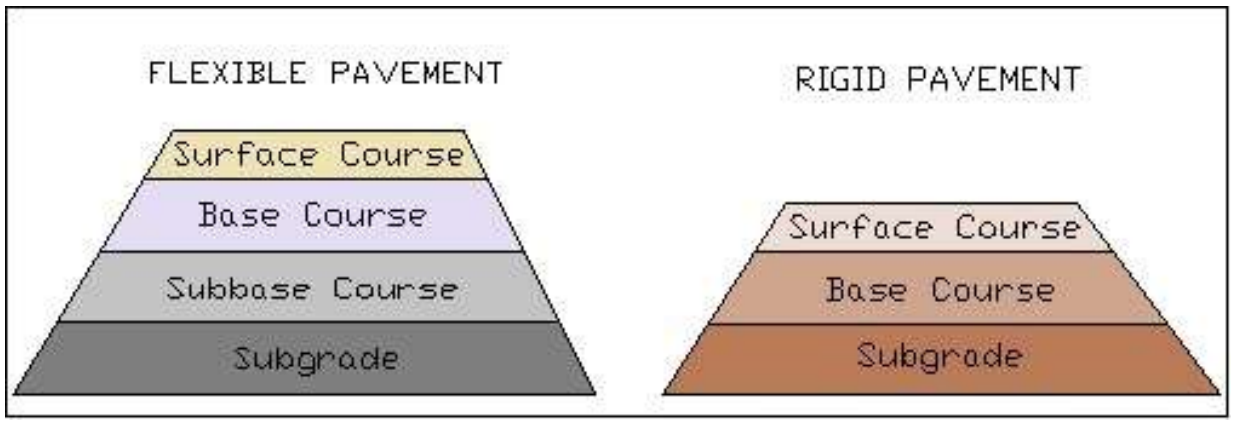
- Another major advantage of concrete roads is the savings in fuel by commercial vehicles to an extent of 14-20%. The fuel savings themselves can support a large programme of concreting.

- Cement concrete roads save a substantial quantity of stone aggregates and this factor must be considered when a choice pavements is made,

- Concrete roads can withstand extreme weather conditions – wide ranging temperatures, heavy rainfall and water logging.

- Though cement concrete roads may cost slightly more than a flexible pavement initially, they are economical when whole-lifecosting is considered.

Rigid pavment at our construction site



Flexible and rigid pavement

TYPES OF CONCRETE PAVEMENTS

1. PLAIN CONCRETE OR SHORT PAVEMENT SLAB:-

This type of pavement consists of successive slabs whose length is limited to about 25 times the slab thickness. At present it is recommended that the paving slabs not be made longer than 5,even if the joints have dowels to transfer the loads. The movements as a result of fluctuations in temperature and humidity are concentrated in the joints. Normally, these joints are sealed to prevent water from penetrating the road structure. The width of the pavement slabs is limited to a maximum of 4.5 m.

2. REINFORCEDCONCRETE:-

- **Continuously reinforced concrete**

Continuously reinforced concrete pavements are characterised by the absence of transverse joints and are equipped with longitudinal steel reinforcement. The diameter of the reinforcing bars is calculated in such a way that cracking can be controlled and that the cracks are uniformly distributed (spacing at 1 to 3 m). The crack width has to remain very small, i.e. less than 0.3 mm.

- **Reinforcedpavement slabs**

Reinforced concrete pavement slabs are almost never used, except for inside or outside industrial floors that are subjected to large loads or if the number of contraction joints has to be limited.

- **Steel fibre concrete**

The use of steel fibre concrete pavements is mainly limited to industrial floors. However, in that sector they are used intensively. For road pavements steel fibre concrete can be used for thin or very thin paving slabs or for very specific application.

CHAPTER-2

MATERIAL USED

Concrete is widely used in domestic, commercial, recreational, rural and educational construction.

Communities around the world rely on concrete as a safe, strong and simple building material. It is used in all types of construction; from domestic work to multi-storey office blocks and shopping complexes.

Despite the common usage of concrete, few people are aware of the considerations involved in designing strong, durable, high quality concrete

There are mainly three types-

1. Cement
2. M Sand
3. Coarse aggregate

1. CEMENT

A cement is a binder, a substance used in construction that sets and hardens and can bind other materials together. The most important types of cement are used as a component in the production of mortar in masonry, and of concrete, which is a combination of cement and an aggregate to form a strong building material. Cements used in construction can be characterized as being either hydraulic or non-hydraulic.

Grade 43 cement

Hydraulic cements :-

Set and become adhesive due to a chemical reaction between the dry ingredients and water. The chemical reaction results in mineral hydrates that are not very water-soluble and so are quite durable in water and safe from chemical attack. This allows setting in wet condition or underwater and further protects the hardened material from chemical attack.

Non-hydraulic cement will not set in wet conditions or underwater; rather, it sets as it dries and reacts with carbon dioxide in the air. It is resistant to attack by chemicals after setting.

TYPES OF CEMENT

➢ Portland Cement

Portland cement is by far the most common type of cement in general use around the world. This cement is made by heating limestone (calcium carbonate) with small quantities of other materials (such as clay) to 1450 °C in a kiln, in a process known as calcination, whereby a molecule of carbon dioxide is liberated from the calcium carbonate to form calcium oxide, or quicklime, which is then blended with the other materials that have been included in the mix. The resulting hard substance, called 'clinker', is then ground with a small amount of gypsum into a powder to make 'Ordinary Portland Cement', the most commonly used type of cement (often referred to as OPC). Portland cement is a basic ingredient of concrete, mortar and most non-specialty grout. The most common use for Portland cement is in the production of concrete. Concrete is a composite material consisting of aggregate (gravel and sand), cement, and water. As a construction material, concrete can be cast in almost any shape desired, and once hardened, can become a structural (load bearing) element. Portland cement may be grey or white.

➢ Portland fly ash cement

Its contains up to 35% fly ash. The fly ash is pozzolanic, so that ultimate strength is maintained. Because fly ash addition allows a lower concrete water content, early strength can also be maintained. Where good quality cheap fly ash is available, this can be an economic alternative to ordinary Portland cement.

➢ Portland pozzolan cement.

It includes fly ash cement, since fly ash is a pozzolana , but also includes cements made from other natural or artificial pozzolans. In countries where volcanic ashes are available.

➢ Portland silica fume cement

Addition of silica fume can yield exceptionally high strengths, and cements containing 5–20% silica fume are occasionally produced. However, silica fume is more usually added to Portland cement at the concrete mixer.

2. FINE AGGREGATES (M SAND)

Natural sand, crushed stone, or crushed gravel sand or a suitable combination of natural sand, crushed stone, or crushed gravel, used as fine aggregates. The fine aggregates shall be dense, durable, clean and free from veins and adherent coating and other deleterious material. They shall not contain dust, lump, soft or flaky material, mica or other deleterious, material in such quantities to reduce the strength and durability of concrete.

FINE AGGREGATE AT LOADING POINT

According to MORTH specification Fine aggregates shall conform to the following grading requirement-

IS Sieve Size	Percent Passing for		
	Grading Zone I	Grading Zone II	Grading Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100
1.18 mm	30-70	55-90	75-100
600 micron	15-34	35-59	60-79
300 micron	5-20	8-30	12-40
150 micron	0-10	0-10	0-10

3.COARSE AGGREGATE

Coarse aggregates shall consist of clean, hard, strong, dense, non-porous and durable pieces of crush stone, crush gravel, natural gravel or a suitable combination of these material. They shall not contain pieces of disintegrated stone, soft, flaky, elongated particles, salt, alkali, vegetable matters or other deleterious materials in such quantities as to reduce the strength and durability of the concrete. Coarse aggregates having positive alkali-silica reaction shall not be used.

Maximum size of coarse aggregates not exceeding 25 mm.

The maximum value for flakiness index for the coarse aggregates shall not exceed 35 percentage. Los Angeles Abrasion value not exceeding 35 percentage. Combined flakiness index and elongation index not to exceed 35 percent. Water absorption not to exceeding 3 percentage.

Grading requirement of coarse aggregates according to MoRTH specification is.

IS Sieve Size	Percentage Passing for Graded Aggregate of Nominal Size		
	40 mm	20 mm	12.5 mm
63 mm	—	—	—
40 mm	95 – 100	100	—
20 mm	30 – 70	95 – 100	100
12.5 mm	—	—	90 – 100
10 mm	10 – 35	25 – 55	40 – 85
4.75 mm	0 – 5	0 – 10	0 – 10

20MM COARSE AGGREGATE AT LOADING POINT

20MM COARSE AGGREGATE AT LOADING POINT

WATER

Portable water is used for mixing and curing of concrete. It should be free from harmful matter like salt, acid, oil etc. generally used water is from local water source from economic view.

CHAPTER-3
METHODOLOGY

SITE CLEARANCE

Removalof unserviceable soil, blown sand including excavation , loading and disposal up to 1000m lead. Clearing and grubbing to remove vegetations, root and other organic matter along the alignment up to the bottom width of the embankment and the side drains.

PREPARATION OF SUBGRADE

The soil sub-grade of rigid pavements also consists of natural or selected soil from identified borrows pits fulfilling the specified requirement and well compacted in layer to the specified density and thickness , as in the case of flexible pavement .The sub-grade is the lowest layer of the components of the CC pavement which ultimately support all other component layer and traffic load .If the sub-grade settles down or yield due to in adequate compaction or any other cause, different type of failure start developing in the rigid pavement also.

The strength test commonly adopted for the evaluation of soil sub-grade for rigid pavement design is 'plate bearing test' using a relatively large diameter plate. The load supporting capacity of the sub-grade is assed in term of 'modulus of sub-grade reaction ',K in Westergaard's approach of rigid pavement analysis.

PREPARATION OF GRANULAR SUB-BASE(GSB)/ DRAINAGE LAYER

The granular sub-base (GSB) course has to serve as an affective drainage layer of the rigid pavement to prevent early failure due to excessive moisture content in the sub-grade soil. Presence of excess moisture in soil sub-grade consisting of fines (such as silt and clay) will cause early failure of rigid pavement due to ' pumping and blowing' .Crushed stone aggregate are preferred in the GSB coarse as this material has high permeability and serve as an effective drainage layer .

The road sub grade has to be prepared carefully, in order to realize everywhere a pavement structure of an adequate and uniform thickness. This allows to provide a homogeneous bond between the concrete slab and its foundation which is important for the later behaviour of the pavement structure.

For roads with a base, drainage of the water must be provided. Mud, leaves, etc. have to be removed.

When the base is permeable, it should be sprayed with water in order to prevent the mixing water from being sucked out of the concrete.

However, if the base is impermeable (e.g. if the concrete is placed on a watertight asphalt concrete.

However, if the base is impermeable (e.g. if the concrete is placed on a watertight asphalt concrete interlayer) it can be necessary under warm weather conditions to cool down this layer by spraying water on the surface. Prepare the GSB (150mm)using following thickness of by gravel.

Gravel layer is compacted using 8-10 tonn roller.

The granular sub-base or drainage layer is prepared by laying the two layer are:

- 75 mm thick layer using of 65-45 mm ballast
- 75 mm thick layer using of 53-22.4 mm ballast.

The following points are important for roads without a foundation:

- Drainage of all surface water.
- Good compaction of the sub grade.
- Filling and compaction of any ruts caused by construction traffic;

Provide an additional width of the sub grade for more lateral support.

- It is forbidden to level the sub grade by means of a course of sand. If the sub grade has to be levelled, it is advisable to do this by using a granular material: either slag or coarse aggregate e.g. with a grain size 0/20.

An effective drainage layer under the CC pavement has the following benefit

- Increase in service life and improved performance of the CC pavement.

Prevention of early failure of the rigid pavement due to ‘pumping and blowing’ Protection of the sub-grade against frost action in frost susceptible areas.

PROPORTIONING

- In plane cement concrete (cc road) we use the proportioning of 1:4:8(40mm)
- Means 1 part of cement ,4 part of fine aggregate and 8 part of course aggregate.
- In cement concrete (top surface) we mix in the proportioning of 2:6:4:7 by
- Means that we mix
- 2 bag of cement (100 kgs)
    - bowl of coarse aggregate
- 4 bowl of fine aggregate
    - o bowl of sand
- Bowl mean generally for carrier use by labour

PREPARATION OF THE SUB-GRADE OR BASE

Prepare the sub-Surface using wmm thickness of 40 mm by gravel. Gravel layer is compacted using 8-10 tonn roller and on the gravel surface pcc is provide .pcc mean plain cement concrete(kaccha) which is producing using 33 grade off wonder cement or ordinary plain cement.

Thick ness of the pcc layer is about 40 mm and the mix proportioning is 1:4:8.

1= cement ,4 = sand,8= coarse aggregate batching by volume. On pcc layer cement concrete layer spread of 150 mm.

PREPARATION OF SUB BASE AT FIELD

MIXING AND TRANSPORT OF CONCRETE

CONCRETE MIXING PLANT :-

The concrete mixing plant must have a sufficient capacity in order to be able to continuously supply concrete to the paving machines. The mix constituents and admixtures have to be dosed very accurately. The number of aggregate feed bins has to equal at least the number of different aggregate fractions. The bins shall have raised edges to prevent contamination of the aggregate fractions. The equipment for loading the materials shall be in good condition and shall have sufficient capacity to be able to continuously feed the bins. The bucket of the loaders shall not be wider than the bins. The content of the cement silos and the water tank are in proportion to the production rates.

For small works, permanent concrete mixing plants are often called on. In that case, mixing plants that are inspected and that can deliver Indian quality certification concrete should be used.

Furthermore it is useful and even essential to have a communication system between the concrete mixing plant and the construction site in order to coordinate the batching and paving operations.

CONCRETE MIXMING AT LOADING POINT

TRANSPORT OF THE CONCRETE

Sufficient trucks must be available to continuously supply the paving machines. The number depends on the yield at the construction site, the loading capacity of the trucks and the cycle time (i.e. the transport time plus the time required to load and unload a truck). The loading capacity and the type of truck to be used depend on the nature of the work, the haul roads and the concrete paving machines.

Usually, the specifications prescribe that the concrete has to be transported in dump trucks as paving concrete consists of a relatively dry mix having a consistency that makes transport and unloading in truck mixers difficult. Furthermore, dump trucks can discharge the concrete faster. For small works and in urban areas, the use of truck mixers is increasingly accepted

TRANSPORT OF THE CONCRETE

PLACING THE CONCRETE

Usually the concrete is placed using slip form paving machines which applies for all categories of roads. This equipment meets both the requirements for quality and for the envisaged rate of production. Conventional concreting trains riding on set up rails, are hardly used any more for roadwork's in our country. For this reason this manner of execution will not be dealt with here. However, the technique of manually placing the concrete using forms s still applied in certain cases, such as for the construction of roundabouts with a small diameter, at intersections, for repair work or when the execution conditions are such that slip

form pavers cannot be utilized. This occurs increasingly often in urban areas for the construction of pavement surfaces of exposed aggregate and possibly coloured concrete.

PLACING THE CONCRETE AT THE FIELD

COMPACTION & FINISHING OF CONCRETE

Compaction is the process that expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of the concrete.

Compaction is the process which expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of concrete. It increases significantly the ultimate strength of concrete.

Compaction significantly increases the ultimate strength of concrete and enhances the bond with reinforcement. It also increases the abrasion resistance and general durability of the concrete, decreases the permeability and helps to minimise its shrinkage and creep characteristics. Proper compaction also ensures that the reinforcement, tendons, inserts and fixings are completely surrounded by dense concrete, the formwork is completely filled – i.e. there are no pockets of honey-combed material – and that the required surface finish is obtained on vertical surfaces.

Concrete shall be compacted during placing so that:

- A monolithic mass is created between the ends of the member, planned joints or both.
- The formwork is completely filled to the intended level;
- The entrapped air is expelled.
- All reinforcement, tendons, ducts, anchorages and embedments are completely surrounded;
- The specified finish to the formed surfaces of the member is provided.

The required properties of the concrete can be achieved.

COMPACTING AND FINISHING

CURING

Curing is the process or operation which controls the loss of moisture from concrete after it has been placed in position, or in the manufacture of concrete products, thereby providing time for the hydration of the cement to occur. Since the hydration of cement does take time, days, and even weeks, rather than hours, curing must be undertaken for some specified period of time if the concrete is to achieve its potential strength and durability. Curing may also encompass the control of temperature since this affects the rate at which cement hydrates. This period will depend on the properties required of the concrete, the purpose for which it is to be used, and the ambient conditions, that is the temperature and relative humidity of the surrounding atmosphere.

Since curing is designed primarily to keep the concrete moist by preventing the loss of moisture from the concrete during the period in which it is gaining strength, it may be done in two ways:

- By preventing an excessive loss of moisture from the concrete for some period of time, e.g. by leaving formwork in place, covering the concrete with an impermeable membrane after the formwork has been removed, or
- By a combination of such methods; or By continuously wetting the surface thereby preventing the loss of moisture from it. Ponding or spraying the surface with water are methods typically employed to this end.

Wet Coverings:-

Wet coverings such as hessian or other moisture retaining fabrics are extensively used for curing. Such coverings should be placed as soon as the concrete has hardened sufficiently to prevent surface damage. Care should be taken to cover the entire surface, including the edges of slabs such as pavements and footpaths. The coverings should be kept continuously moist so that a film of water remains on the concrete surface throughout the curing.

WET COVERING

CONCLUSION

This training work is a outcome of immense dedication and hardwork of not one but many people. The things which we got to learn in this project work are really important as well as very helpful in our future.

The theory part taught in our colleges and universities are way different than the actual world . The things which we got to learn practically are very different from that of the theory. In fact there are several things which we got to learn in field would never have been learnt theoretically . Also there was interaction with the workers and the public which was something like a sense of responsibility.

The nation is developing and the future aspects of construction are very wide keeping that in mind we need to contribute ourselves with full dedication towards the progress of our country

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