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HIGHWAY

Chapter 1. Road Construction





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  4. Base Course Construction
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Road Construction
1.1. Subgrade Preparation and Improvement

- Clearing and Grubbing

  The removal of trees, stumps, roots, down timber, rotten wood, rubbish and other objectionable materials from the site designated by the engineer.

  Measurements of this item for the purpose of payment are made in units of hectare.

  - Clearing –the removal of materials above the existing ground surface.
  - Grubbing – removal of roots, stumps, and similar objects to a normal depth below the ground surface.

In cut areas, all stumps and roots should be removed to a depth not less than 0.3 m below the proposed grade (site clearance up-to 30cm).

Road Construction

1.1. Subgrade Preparation and Improvement

In embankment sections, when the height is more than 1.5 m, trees and stumps may be left in place and cut off at ground level or at a height of 75 to 150 mm above the existing ground surface.

Some agencies require that all large trees 450 mm or more in diameter be removed, regardless of the height of the fill.

In urban areas, relocations must be arranged for people and business that are displaced and details should be worked out for moving utilities without disruptive services.

Then buildings, pavements, sidewalks, and like obstructions must be removed and surface utilities and power lines relocated.

Clearing and grubbing operations are generally performed with bulldozer and its various attachment or

Road Construction
1.1. Subgrade Preparation and

CONSTRUCTION EQUIPMENTS

2. Earth Work Equipments

- Excavators
- Loaders
- Shovels
- Clamshells
- Draglines
- Scrapers
- Dumpers
- Dozers
- Graders
- Rollers


A


B


C


E


D



F


H


G


I


J

Equipment used for Clearing and Grubing

- Bulldozers are versatile machines where they may be used for the following operations:

1. Clearing land of timber and stumps.
2. Opening up pilot roads through mountains and rocky terrain.
3. Moving earth for haul distances up to approximately 100 m
4. Helping load tractor-pulled scrapers.
5. Spreading earth fill
6. Backfilling trenches
7. Clearing construction sites of



Road Construction

1.1. Subgrade Preparation and Improvement

Excavation

The process of loosening and removing earth or rock from it original position in a cut and transporting it to a fill or to a waste deposit.

Highway agencies usually classify excavations based on the type and ease of excavation:

- Rock excavation: materials that can not be excavated without blasting or the use of rippers and all boulders or other detached stones each having a volume of 2 cuyd or more.
- Common excavation: excavation and disposal of all materials of whatever character encountered in the work not otherwise classified.
- Unsuitable excavation: the removal and disposal of not saturated or unsaturated mixtures of suitable for embankment soil and organic matter material.
- Borrow excavation: of approved material required for construction of embankments.

Roadway and drainage excavation: the excavating and grading of the roadway and ditches, including the removal and disposal of all excavated material and all work needed for the construction and completion of the cubs, embankments, slopes, approaches, intersections, and similar portions of the work.

Road Construction

1.1. Subgrade Preparation and Improvement

- All excavated materials that are suitable are used in constructing the elements of the roadway structure, including embankments, shoulder, subgrade, slopes, and backfill for structures.

- Unsuitable or surplus materials are disposed.

- When rock is encountered in cut sections, it is generally required that it be excavated to a depth of at least 150 mm below the grade line and that suitable backfill material then be used in bringing the cut section up to the proposed grade.

- Machines such as tractor-scraper units are normally used for excavating, hauling, and spreading ordinary sols; rippers for breaking hard, compacted materials so that scarpers may load; scraper with crawler tractor are used for relatively short hauls and rough terrain; rubber tired unites are used for longer hauls.

Equipment used for Excavation and loading



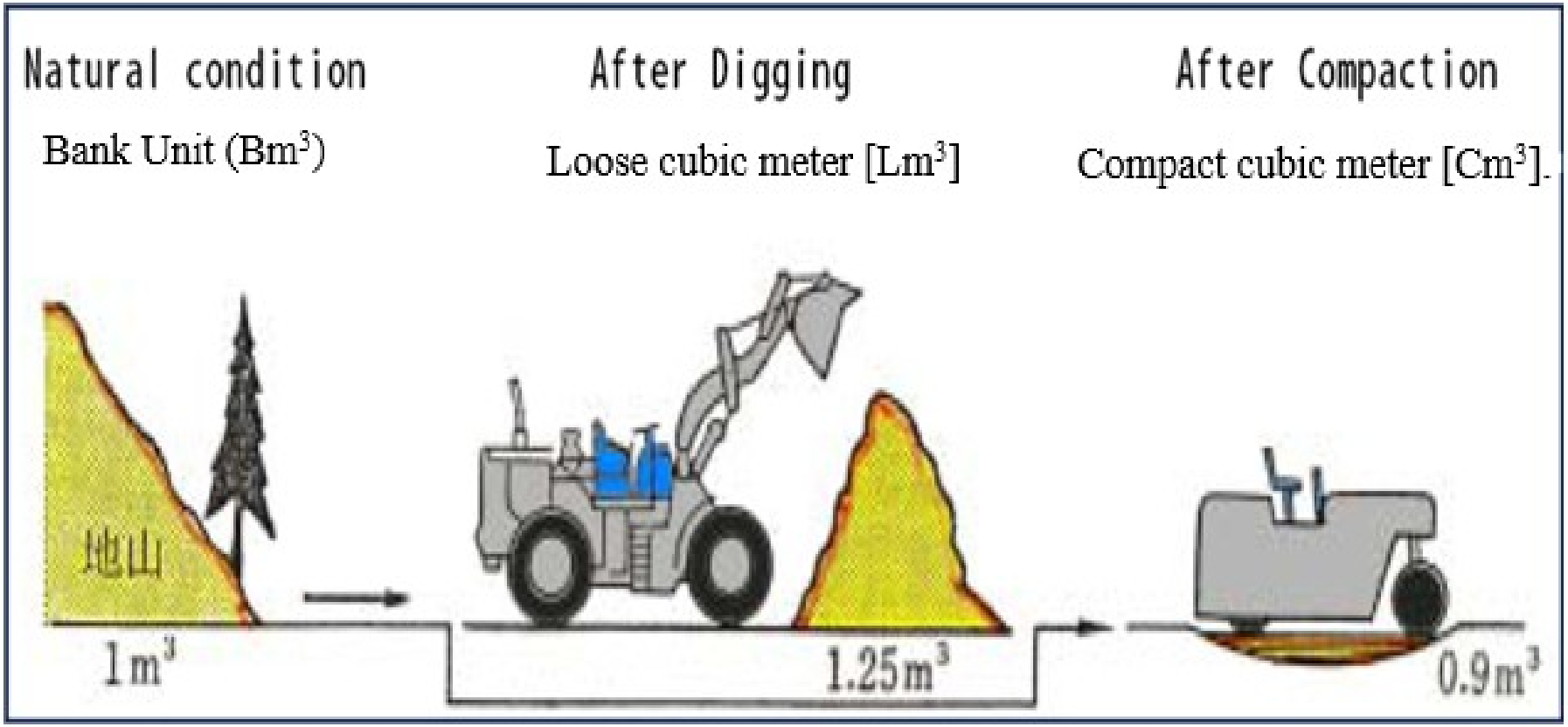






Equipment used for Excavation and loading

Soil Volume Change Characteristics



Road Construction

1.1. Subgrade Preparation and Improvement

- Excavation

In the case of rock excavation, drilling, and blasting are necessary and a shovel may be needed to load the blasted rock into trucks.

A dragline is frequently used for excavating swampy land, and a backhoe for trench excavation. Dozer units are extremely useful in excavating short hauls, spreading dumped materials and for similar operations.

A motor grader is used for shaping ditches, trimming slopes, and grading the roadway and the shoulder etc..

Payment is made for the volume in number of cubic meters and overhaul.

Structural excavation is the excavation materials in order to permit the construction culverts, foundations for bridges, retaining walls, and practically all other

Road Construction

1.1. Subgrade Preparation and Improvement

- Embankments

The fill added above the low points of the existing ground surface along the roadway to raise the level to maintain the required design standard or prevent damage to the highway through the action of surface or ground water.

In the majority of cases, rolled-earth fills of 4.5 m or less in height (commonly less than 1 m) are used, but fills as high as 117 m have been reported.

The basic factors involved in the design of embankments include height, stability of slopes, stability of foundations, and the selection of materials.

Road Construction

1.1. Subgrade Preparation and Improvement

- Height: fixed by consideration related to the general location of the road to maintain the grade to some fixed point as in the approach of bridge or a large culvert structure, or to maintain desirable grades in rolling or mountainous country.

- In low-lying areas where the water table is at or close to the surface of the ground, the minimum height of embankment to be at least 0.6 m above the water table.

- Embankment slopes: flat side slopes are generally preferred to facilitate maintenance and for embankment stability.

Embankments constructed of high quality material (A-1 and A-3) can be constructed with slopes as steep as 1.5 to 1 without concern for sol stability. For other soil classes, a maximum slope 2 to 1 has been recommended and

Road Construction

1.1. Subgrade Preparation and Improvement

- **ERA's Recommendation**

Material	Height of Slope	Side Slope		Back Slope	Zone Description
		Cut	Fill		
Earth or Soil	0.0 - 1.0m	1:4	1:4	1:3	Recoverable
	1.0 - 2.0m	1:3	1:3	1:2	Non-recoverable
	Over 2.0m	1:2	1:2	1:1.5	Critical
Rock	Any height	See Standard Details			Critical
Black Cotton Soil*	0.0 - 2.0m	-	1:6	-	Recoverable
	Over 2.0m		1:4		

Road Construction

1.1. Subgrade Preparation and Improvement

Embankment foundation: It should, however, include an examination of the soil beneath or "the embankment foundation" against failure due to excessive stress of the weight of the fill (low bearing capacity) or settlement due to consolidation of the underlying soil.

These occur when a high fill is founded on cohesive soil or where the foundation material is soft, compressible, fine-grained soil, such as organic silt or clay, peat, or muck.

The general practice require that the original ground be compacted before the overlaying layers are placed to a depth of 100 to 300 mm.

Road Construction
1.1. Subgrade Preparation and Improvement

Selection of embankment materials:

- Materials of the A-1 are highly desirable.
- A-2 soils are generally suitable, but require a little more careful control of compaction.
- A-3 group can satisfactorily be used as embankment material if compacted by the use of pneumatic-tired rollers or vibratory compactor, but not using sheep's foot rollers.

- A-4 and A-6 groups may be included in embankments under certain conditions such as low height of fill, careful control of compaction, and where the moisture content is expected to remain the same or less during service than the optimum moisture content.

- A-5 and A-7 groups are generally unsatisfactory for

Road Construction

1.1. Subgrade Preparation and Improvement

- Embankments

Embankments are constructed by spreading uniformly a thin layer of 150 to 300 mm thick loose soil and compacting it to a satisfactory degree of density before the next layer is placed over it up to the desire height of the embankment.

Two general methods of constructions are used:

- Direct dumping and spreading the soil by scarper unitsin one operation depending on the suitability of the units, and
- Dumping of the material at proper locations by trucks or wagons, and the dumped material is then spread to the required uniform thickness by dozers or motor graders.

ERA recommends that the top of the embankment fill or the natural subgrade, be compacted to a minimum of 100 % of the maximum dry density obtained (standard compaction). Alternatively, 93 % of the maximum dry density achieved

Road Construction

1.1. Subgrade Preparation and Improvement

- The field compaction is controlled by making frequent checks of the density and moisture content using suitable techniques.

- Principal factors involved in the selection of compaction equipment
  - the specifications under which the work is to be carried out (based on the type material to be compacted) and
  - the choice of equipment available to the contractor.

- Repetition of load are effective in increasing density of fine-grained soils, but have less effect on coarse-grained soils (heavy rollers or may offer a better way). Fine-grained soils in most cases are weakened by heavy roller but can be satisfactorily compacted in thin layers with light equipment.

Equipment used for Compaction



Self-propelled, with compacting wheel



Vibratory Smooth drum rollers



Pneumatic tire rollers

Road Construction

1.1. Subgrade Preparation and Improvement

Embankments

Convectional construction is unsatisfactory and special procedures are necessary to construct embankments through marshy areas. These include:

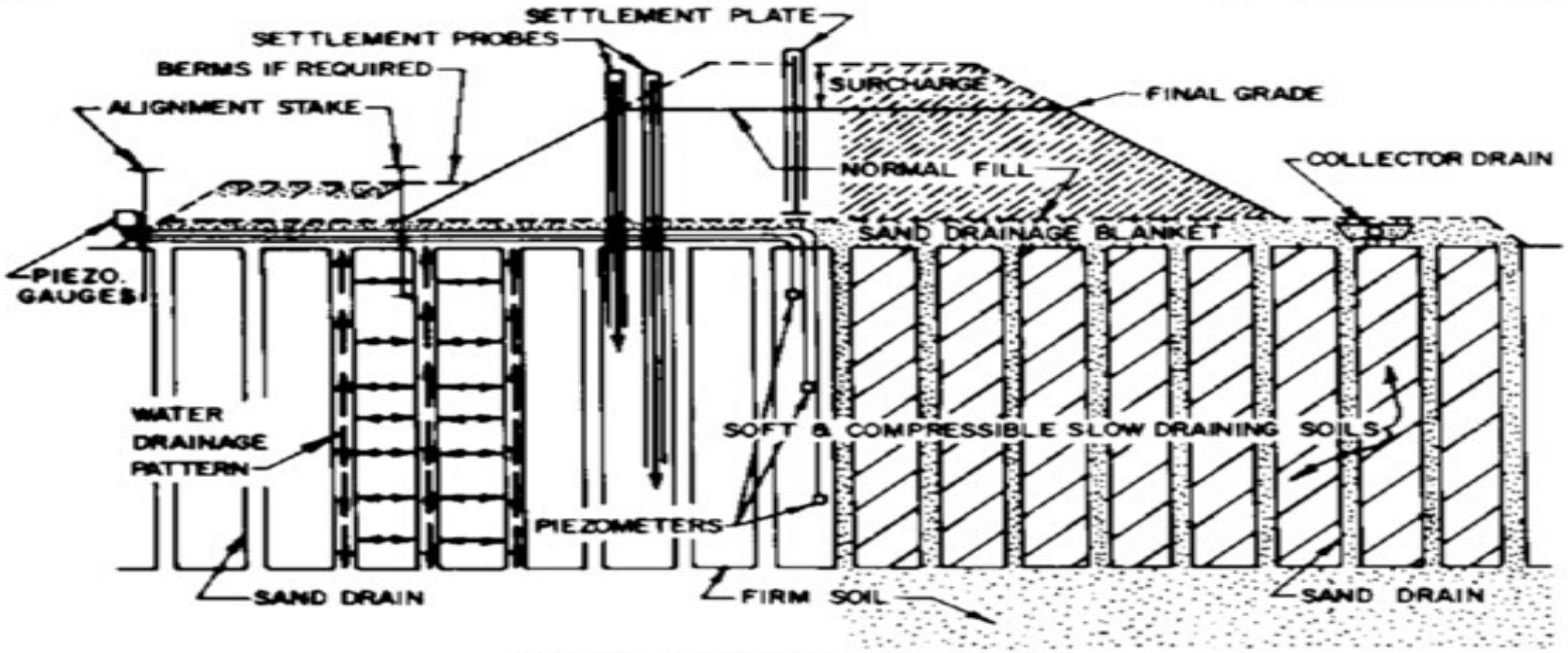
- Removal and replacement method: suitable where the undesirable soil is of shallow depth say up to 2.4 to 3.7m and is underlaid by a soil of satisfactorily character or rock. Some times, partial excavation and replacement is practiced for secondary roads when encountered deep swampy deposits.
- Displacement method: this is a method by which the unsuitable muck is displaced by the weight of the fill and possibly a surcharge or by this weight supplemented by explosives or water jetting. The blast serve to displace the material by the force of the explosions and by liquefying the remaining unsuitable material so that it is displaced more readily by the weight. The

Road Construction

1.1. Subgrade Preparation and Improvement

- Vertical sand drain: it is a method by which vertical columns of sand from 450 to 600 mm in diameter, spaced from 2 to 6 m apart on centres beneath the embankment section carried completely through the compressible soil to accelerate consolidation. A sand blanket 1 to 1.5 m thick is generally placed at the top of the drain extending across the entire width of embankment section. The embankment is then constructed by normal methods on top of the sand blanket.

- Fabric reinforcement: this is the use of engineering fabrics such as geotextiles or geotechnical fabrics placed on weak foundation (to increase the bearing capacity) and overlaid with the embankment fill.



TYPICAL SAND DRAIN INSTALLATION

DIAMETER OF DRAINS RANGES FROM 6 TO 30 IN., GENERALLY BETWEEN 16 AND 20 IN.

SPACING OF DRAINS RANGES FROM 6 TO 20 FT ON CENTER, GENERALLY BETWEEN 6 AND 10 FT.

PRINCIPAL METHODS FOR INSTALLING DRAINS ARE CLOSED OR OPEN MANDRELS ADVANCED BY DRIVING OR JETTING, OR ROTARY DRILLING WITH OR WITHOUT JETS. DRIVING CLOSED MANDREL IS THE MOST COMMON.

DRAIN BACKFILL MATERIAL SHOULD HAVE SUFFICIENT PERMEABILITY TO DISCHARGE PORE WATER FLOW ANTICIPATED, BUT USUALLY DOES NOT MEET FILTER REQUIREMENTS AGAINST FOUNDATIONS SOILS. CLEAN SANDS WITH NO MORE THAN 3% BY WEIGHT PASSING No. 200 SIEVE IS USUALLY SUITABLE. A TYPICAL GRADATION IS AS FOLLOWS:

SIEVE No.	4	16	50	100	200
% FINER BY WEIGHT:	90-100	40-85	2-30	0-7	0-3

SAND DRAINAGE BLANKET MATERIAL IS SIMILAR TO THAT USED FOR DRAIN BACKFILL. IN SOME CASES GRAVEL WINDROWS OR PERFORATED, CORRUGATED, METAL PIPE ARE PLACED IN DRAINAGE BLANKET TO REDUCE HEAD LOSS IN DRAINAGE BLANKET. LONGITUDINAL DITCH OR COLLECTOR DRAIN MAY BE PLACED AT TOE. GRANULAR WORKING MAT IS SOMETIMES PLACED BELOW DRAINAGE BLANKET TO SUPPORT EQUIPMENT.

SURCHARGE LOAD IS PLACED TO REDUCE OR ELIMINATE POSTCONSTRUCTION CONSOLIDATION BENEATH NORMAL FILL. GENERALLY THE SURCHARGE LOAD IS NO MORE THAN ABOUT 30% OF NORMAL EMBANKMENT LOAD.

FIELD CONTROL DEVICES:

PIEZOMETERS OF STANDPIPE OR CLOSED SYSTEM TYPE TO OBSERVE PORE WATER PRESSURES;

SETTLEMENT PLATES, MINIMUM 3 FT SQUARE, PLACED AT BASE OF FILL TO RECORD TOTAL SETTLEMENT;

SETTLEMENT PROBES DRIVEN OR AUGERED INTO FOUNDATION STRATUM TO MEASURE COMPRESSION WITHIN FOUNDATION.

ALIGNMENT STAKES, T-SHAPED STAKES PLACED AT OR OUTSIDE EMBANKMENT TOE TO OBSERVE LATERAL MOVEMENT AND HEAVE.

Session plan

Title of session: Sub base Course Construction

Specific learning objectives:
By the end of the session the students will be able to

- **Know the steps and procedures how to construct sub base course**

- **Know the equipments that are used for the construction of sub base course**

Road Construction
1.2. Subbase Course Construction

- The materials used for the construction of sub-base layers shall be either:

1. Natural Gravel;
2. Scoria (Cinder Gravel);
3. Weathered Rock;
4. Crushed Gravel;
5. Crushed Rock or crushed Boulders;
6. Recycled Pavement Material.

Any other granular material complying with the requirements

Road Construction
1.2. Subbase Course Construction

- Material Requirements (FRA)

Test Types	Materials with requirements	
	Gravel Sub-base	Crushed Stone Sub-base
Grading limits	As the requirements	As the requirements
Grading Modulus	>1.5 (with exception >1.2)	>1.5 (with exception >1.2)
PI	Max. 6 or 12	Max. 6
CBR	≥30%	≥30%
Compaction	>95% of modified AASHTO	Min. 95%
LAA	<51%	<45%
Flakiness Index	<35	-

Road Construction

1.2. Subbase Course Construction

Construction

- Mix the aggregate and adjust the moisture content to obtain a uniform mixture with moisture content within 2 percent of the optimum moisture content
- The surface of each completed layer shall be moistened prior to the construction of the succeeding layer.
- Sub-base materials be spread on the approved sub-grade by mechanical means without segregation. The material shall be loosely spread in layers to give a compacted thickness not exceeding 200mm and not less than 100mm.
- Compact each layer full width (with roller, or possible compactors).
- Roll from the sides to the center, parallel to the

Road Construction
1.2. Subbase Course Construction

- Each succeeding pass shall overlap the previous pass by at least one third of the roller width. Rolling shall continue until the entire thickness of each layer is thoroughly and uniformly compacted to the specified density.
- The final compacted layer shall be free from cor

Tes

Testing Frequency		
Test	One test every	Minimum number of tests per lot
Materials		
Field density and OMC	2 510 m2	4
Atterberg limits and gradings	2 510 m2	4
Construction Tolerances		
Surface levels	20 m	(3 points per cross section)
Thickness	20 m	(3 points per cross section)
Width	20 m	-
Cross section	20 m	-

Road Construction
1.2. Subbase Course Construction





Road Construction
1.3. Construction of Gravel Roads

- For roads of low traffic (up to 300 vehicles per day), surfaces of untreated soil mixture described as gravel or crushed rock are widely used.
- These consist of largely of stone pebbles or crushed-rock particles combined with clay or other fine material in sufficient amount to bind the coarse particles together.
- Requirements of gravel surfacing materials:
  - Stability: support the superimposed loads without detrimental deformation,
  - They must stand the abrasive action of traffic,
  - They must shed a large portion of the rain which falls on the surface,
  - They should posses capillary properties to replace the moisture lost by surface evaporation,
  - They must be free from large stones so that they can be maintained by balding or dragging, and
  - They must be of low cost.

Road Construction

1.3. Construction of Gravel Roads

- Further criteria are:
  - Grading requirements to ensure stability, and
  - Plasticity requirements.

- Normally, the loose thickness of untreated materials is usually in the range of 200 mm to 300 mm.

- Commonly, materials are dumped in piles on the subgrade and spread by a grader, and then compacted with moisture.

- Compaction begins at the edges and progresses toward the center with each passage lapping about half a width. If the thickness exceeds this, it should be laid into 250 mm loose thickness and compacted before the top loose material spread on it.

Road Construction

1.4. Granular Base Course Construction

- The materials used for the construction of base layers shall be either:

1. Crushed Rock or Stone;
2. Naturally occurring Granular Materials, Boulders, Weathered Rock;
3. Dense Bitumen Macadam.

Road Construction

1.4. Granular Base Course Construction

Construction Equipment

- Material laid either by a self-propelled paving machine or by grader
- The equipment used be of adequate rated capacity and in good working order
- The mixing plant shall be either a batch or a continuous type, equipped with satisfactory means of accurately controlling the proportions of all constituent materials.
- Compaction shall be carried out using self-propelled 8 – 10 tonnes deadweight smooth wheeled rollers having a width of roll not less than 450mm, or by multi-wheeled pneumatic tyred rollers of equivalent mass, or by vibratory rollers of equivalent compactive performance, or a combination of these.

Road Construction

1.4. Granular Base Course Construction

Placing and Compaction

- The surface on which the crushed rock and crushed boulder road base is to be laid be free from loose or deleterious material.
- The crushed material screened into at least four different aggregate fractions.
- The aggregates recombined in a mixing plant in the proportions necessary to produce a smooth continuous combined grading curve
- The mixed material are transported at the required moisture content and in such a way, that no segregation occurs.
- The material are spread in layers not exceeding 200mm and not less than 100mm compacted thickness.

Road Construction

1.4. Granular Base Course Construction

- The material compacted by the use of rollers progressing gradually from the outside towards the centre of the layer, except on super-elevated curves, where the rolling shall begin at the low side and progress to the high side.
- Each succeeding pass shall overlap the previous pass by at least one third of the roller width. Rolling shall continue until the entire thickness of each layer is thoroughly and uniformly compacted to the specified density.
- Any area, which is inaccessible to rolling equipment, be compacted by means of mechanical tampers or other suitable equipments
- Upon completion of compaction, the surface of the completed layer be tightly bound, free from movement under the compaction plant, and free from laminations, ridges, cracks or loose or segregated material.

Road Construction

1.5. Construction of Stabilized Layers

- Mechanical stabilized materials:
  - The following three basic procedures are used for base and wearing surfaces as well as to lesser extent for subbase construction and subgrade improvement:
  - Road mix construction: the proper proportions of soil elements that form the material are mixed directly on the surface by balding from one side of the road to the other.

    Special high-speed rotary mixing machines may be used and can generally provide a more uniform mix. After uniformly mixing at or near the optimum moisture content, it is spread in a uniform layer and then compacted to the specified density.

Road Construction

1.5. Construction of Stabilized Layers

- Travelling plant construction: the construction process is not much different from the road mix method previously described, but the mixing and spreading operation of soil elements and water are accomplished by the travelling plant.

- Central plant method: when a large mileage of roads are to be constructed, it is advantageous to use central mixing plant in terms of uniformity of mixing, ease of control of the proportion of materials and water, and fewer delays due to bad weather.

When mixing is completed, the material is transported using dump trucks, and then spread, compacted, finished, and cured similar to those described for in-

Road Construction

1.5. Construction of Stabilized Layers - Lime

Lime Stabilized Materials:

- Different classes:

Class 1: Stabilization and construction operations:

a. Spread the first increment of lime
b. Perform initial mixing
c. Cure the mixed material
d. Spread the second increment of lime
e. Perform final mixing
f. Compact to required density and finish

Road Construction

1.5. Construction of Stabilized Layers - Lime

Class 2: Stabilization and construction operations:

a. Spread the specified percentage of lime
b. Perform initial mixing
c. Cure the mixed material
d. Perform final mixing
e. Compact to required density and finish

Class 3: Stabilization and construction operations:

f. Spread the specified percentage of lime
g. Perform mixing

Road Construction
1.5. Construction of Stabilized Layers - Lime

Steps:

- Grade the roadbed surface to specified lines, grades, and cross sections.
- Prevent water from ponding in the roadbed
- Scarify/ Pulverize: Scarify the road bed to the specified depth and width and pulverize the scarified material to 100% passing 75-mm sieve
- Remove all unsuitable soil and organic materials
- Lime: apply hydrated lime or lime by product as slurry or in dry form. Apply quick lime only in dry form.
- Mix quick lime thoroughly with the dry roadbed material before adding water, add water to the mixture within 6 hours of dry mixing.

Road Construction

1.5. Construction of Stabilized Layers - Lime

- Adding water: add water and thoroughly mix. Limit the maximum moisture content to 3 percent over the optimum
- Mixing: Mix the lime and water in to the soil to form uniform, homogenous mixture with 100% passing a 75mm seive. Reshape to specific line, grade and section.
- Seal the class 1 and 2 surface with a roller. Compact and finish the
Class 3 stabilization
- Curing: Cure Class 1 & 2 mix at least 3 days. Reprocess surfaces that become dry or dusty during curing period
- Compacting and finishing: complete the final compaction and finishing within 12 hours of the final

Road Construction

1.5. Construction of Stabilized Layers- Cement

- Cement stabilized materials:
  - Cement-soil mixtures may be processed by:
    - Road mixing equipment,
    - Travelling mixing plant, and
    - Central mixing plant.
  - The basic steps in the construction of cement stabilized layer include:
    - Pulverization of the soil,
    - Adding the required amount of cement and mixing with the soil,
    - Addition of the required amount of water and mixing with the soil-cement mixture,
    - Spreading on to the prepared layer,
    - Compaction, including final rolling and finishing, and
    - Curing

Road Construction

1.5. Construction of Stabilized

C. Dozers

This is where the driver's seat is. Some types have a roof only, and others have a room like this one.



Ripper
The sharp ripper at its bottom can dig up the ground.



Blade
This part is used to push soil and rocks, and level the ground.

Crawler
With this crawler, bulldozers can move even on rough surfaces. Some crawlers can move on muddy surfaces too.

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Road Construction

1.5. Construction of Stabilized









Road Construction

1.5. Construction of Stabilized Layers-Bitumen

- Bituminous stabilized materials:
  - Methods of mixing soil-bitumen materials are generally the same as those previously described. An additional step, of course, involves the application of the necessary bituminous material and its uniform distribution through the mixture.
  - In the case of road mixing, the bituminous material which is moderately heated to the specified temperature for application is applied in a measured amounts by a pressure distributor, along with water applied separately, and the entire mix thoroughly blended by motor graders disk harrows, rotary speed mixers, and so on.
  - Where a travelling or central mixing plant is used, the measured amount of binder is incorporated in

Road Construction

1.5. Construction of Stabilized Layers-Bitumen

- The material is spread in a layer of uniform thickness ready for compaction, and
- compaction is done usually by sheep's-foot roller or with pneumatic-tired rollers until a specified density is achieved.
- After compaction, curing is necessary before the next layer is placed.

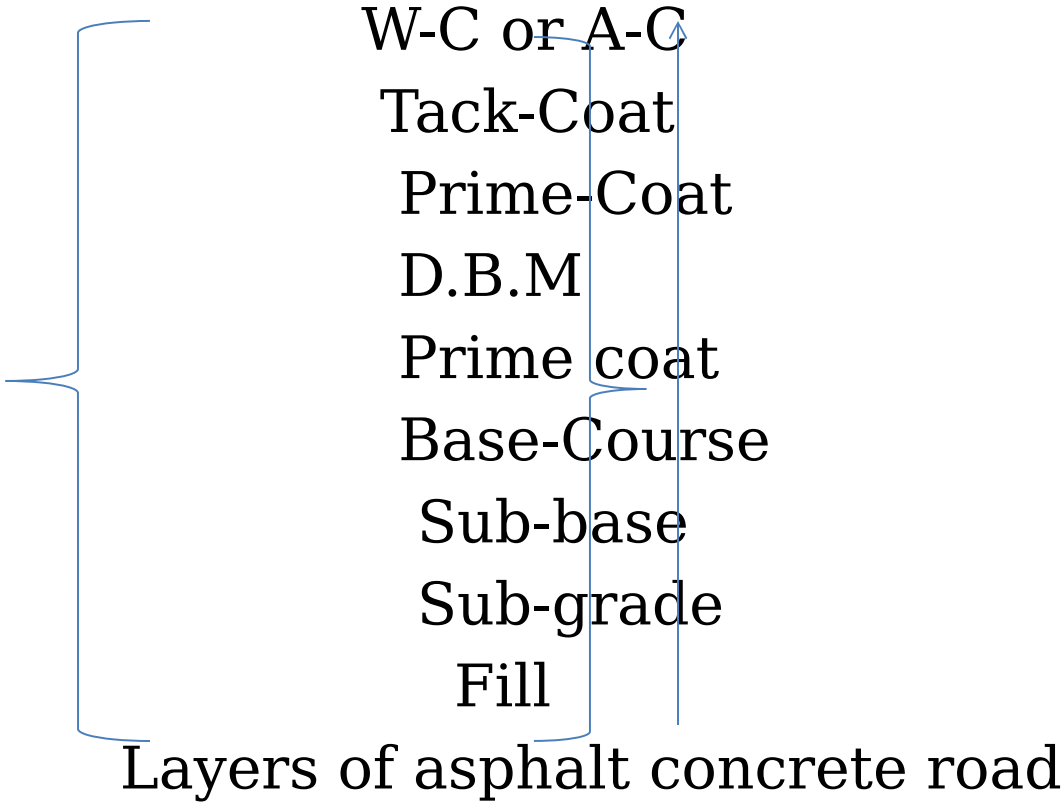
- No mechanical mixing is involved for oil earth surface construction. A liquid binder is simply applied to properly prepared natural soil surface.

- The material penetrates a short distance into the soil layer, thus preventing dust and forming a thin stabilized surface that will be capable of supporting a limited number of light vehicles.

Road Construction

1.6. Construction of Asphalt Concrete

- Modern methods of construction for Hot- Mix Asphalt



Layers of asphalt concrete road

Cont.

Spraying prime coat:

- Application of low viscosity cut back or emulsified asphalt to a granular base

Spraying method :

- The ideal rate of application is the amount that will be completely absorbed by the surface in a 24 hr period.

After 24 hr the next layer can continue

Tack coat:

- Very light sprat application of diluted asphalt emulsion.

Used to ensure a bond b/n a surface being paved

Hot mix Asphalt paving Equipment

The paving operation:

- Aggregates have been selected and combined
- The material mixed together and delivered to the pavers.
- The pavers spreads the mix at a set width and thickness as it moves forward.
- The pavers partially compacts the martial, immediately vibratory or rubber tired roller are driven over the freshly-paved strip.

Asphalt paving Equipment:

- The basic item of paving equipment is Asphalt pavers
- Equipments used in connection with the paving operation includes:
- Asphalt distributer, motor grader, hand tools, windrowing equipment, trucks
- Pavers can place a layer of less than 25mm to 250mm in thickness, width of 1.8 to 9.8m working speed 3 to 20m per

Asphalt Paving Equipments







Road way surface preparation

Placing Hot-Mix Asphalt:

Before spreading operation carefully plan the entire operation: such as (should be made/prepared)

- **Continuity and sequence of operations**
- **Number of pavers needed for the project**
- **Number and types of rollers needed**
- **Number of trucks required**
- **The chain of command for giving and receiving instructions**
- **Reasons for possible rejection of the mix**
- **Weather and temperature requirements**
- **Traffic control**

Inspection of mix:

Close cooperation b/n the paving crew and the asphalt plant

Mix Deficiencies:

Too hot:

blue smoke rising from the mix usually indicates an over

Cont.

Too cold:

Generally stiff appearance, or improper coating of the larger aggregate particles.

Too much asphalt:

Excessive asphalt may be detected under the screed by tend the mix slicks off.

Too little asphalt:

It has lean , granular appearance, improper coating and lacks the typical shiny black luster.

Non uniform mixing:

Shows up as spots of lean, brown, or uncoated dull-appearing martial with in areas having rich, shiny appearance.

Excess coarse Aggregate:

Can be detected by the poor workability of the mix.

Excess Fine Aggregate:

Has a different texture from a properly graded mix

Excess moisture:

It may be bubbling or popping as if it were boiling.

Placing with the pavers rate of speed

For a given width, thickness, and density, the length of pavement per unit of weight of paving mix can be determined.

L=1000/AW where,

L=linear in per tone

A=cross sections area(width*thickness)

W= compacted density Kg per cum

Some paving is placed on the weight per unit area basis.

L=1000/RW where

R=spreading rate kg per sqm

W=width of spread, m

Construction of paving joints

Longitudinal joints:

After the first lane has been placed and rolled, it is important that the adjoining lane be placed so that it uniformly overlaps the first lane by 25 to 50mm.

The thickness of the over lap should be about ¼ the desires compacted thickness the coarse aggregate in the material overlapping the cold joint should be carefully removed and wasted.

Transverse joints: there are two methods

1) Bulk head to form a vertical face

After the last load of asphalt mix has been placed in the hopper and the material around the spread screws fails below normal, the pavers is moved off, and a lumber bulk head, having the same thickness as the compacted mat, is inserted in to a space manually shoveled from the mat. The mat is then rolled.

2) Vertically face sawed in to the mat

The mat must be sawed before paving operations being again the location of the sawed face should be at least 25mm behind the point of tangency.

Thank you! Questions!