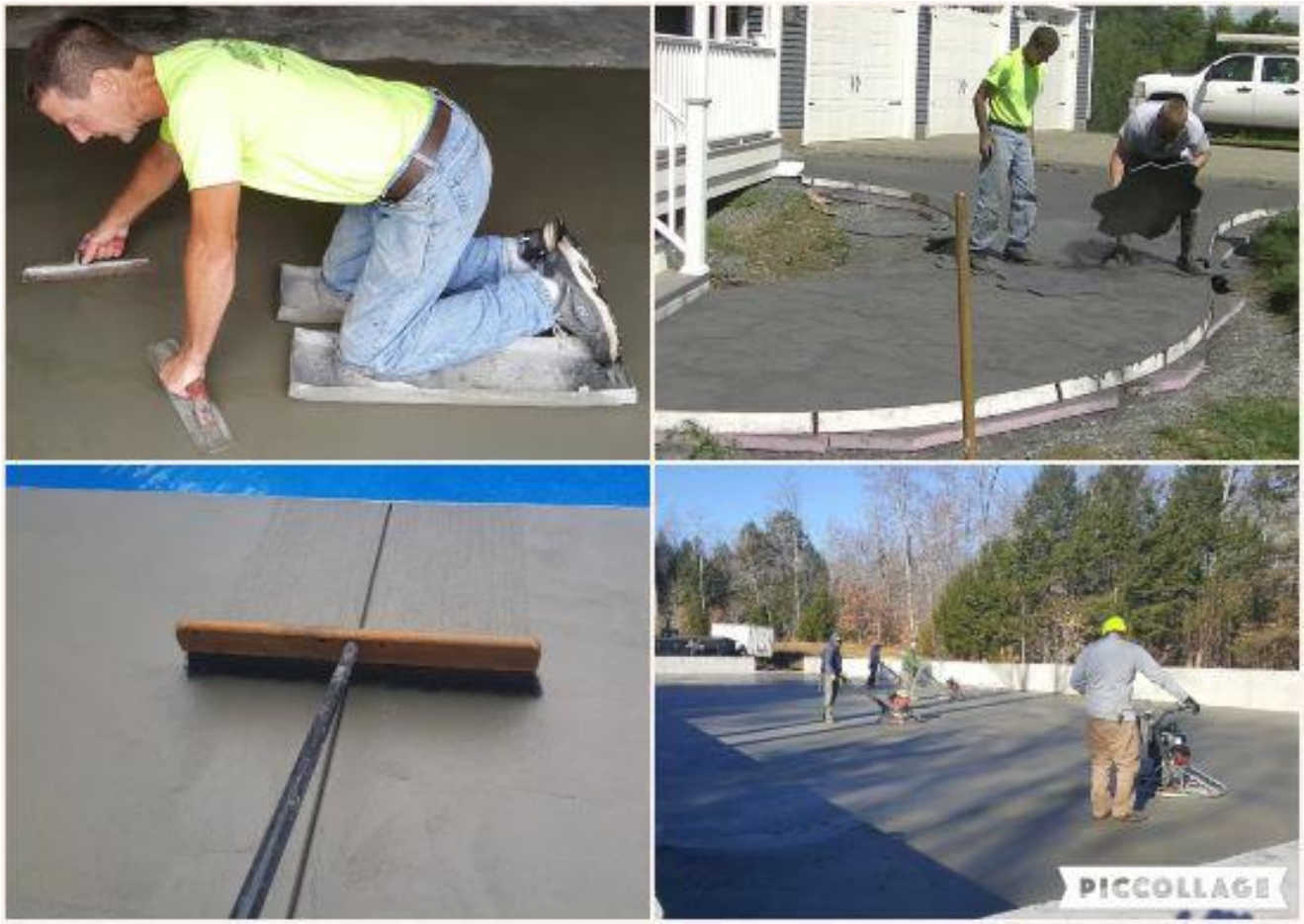
Unit 4

module 2

Finishing:

- Finishing operation is the last operation in making concrete.
- Finishing in real sense does not apply to all concrete operations. For a beam concreting, finishing may not be applicable, whereas for the concrete road pavement, airfield pavement or for the flooring of a domestic building, careful finishing is of great importance.
- Surface finishes may be grouped as under:
- (a) Formwork Finishes (b) Surface Treatment (c) Applied Finishes.
- **Formwork finishes:**
- A pre-fabricated wall unit cast between steel formwork having very smooth surface using right proportioning of materials can give such a nice surface.
- Similarly, the prefabricated floor units can have such a fine finish at the ceiling which cannot be obtained by the best masons with the best efforts.
- As the cost of labour is increasing these days, it is suggested to use good formwork material such as steel sheets or shuttering type plywood to have smooth finish floor slabs.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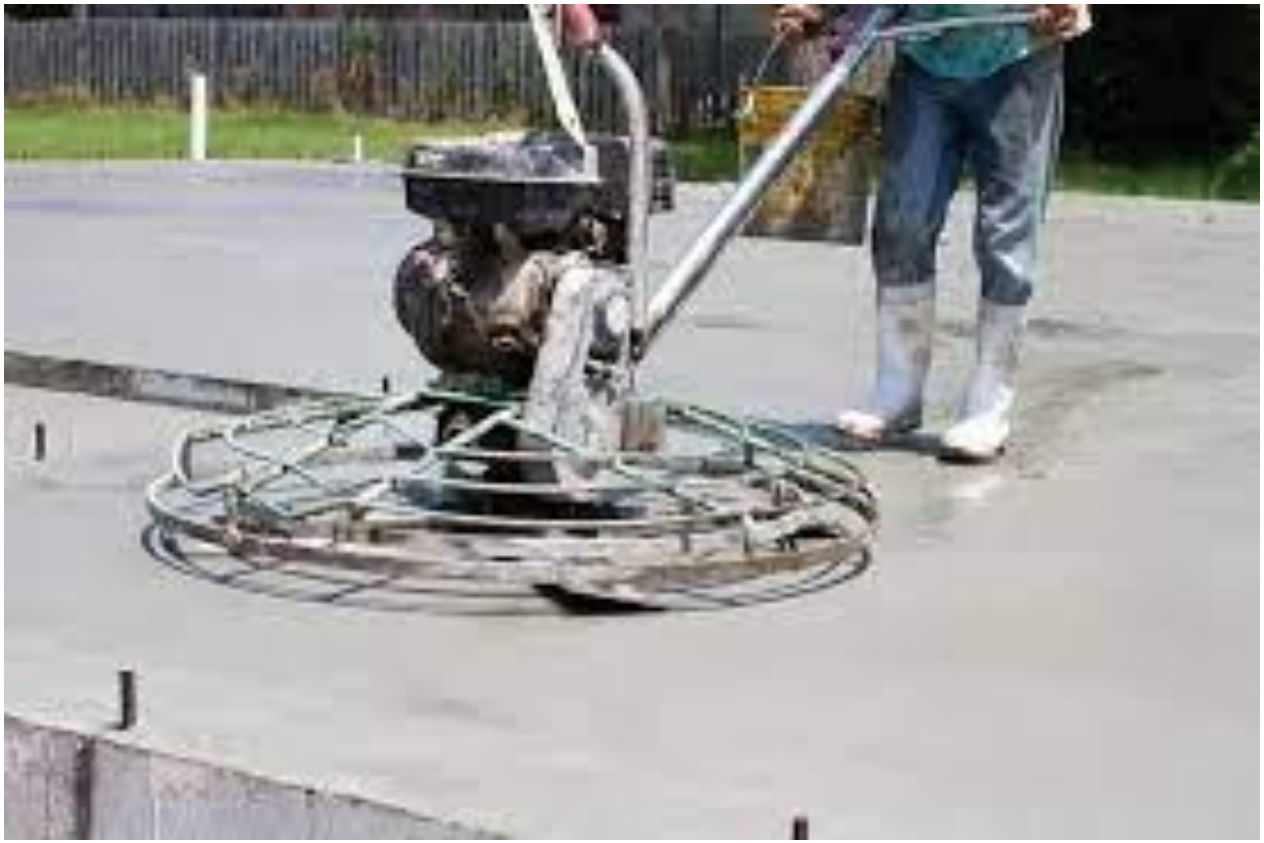

CONCRETE FINISHING TOOLS

5 GAL PAIL

COMBINATION TROWEL BLADE

CONCRETE FINISHING BROOM

FINISHING TROWEL

HAND GROOVER

FRESNO ADAPTER

HAND EDGER

MAGNESIUM BULL FLOAT

MARGIN TROWEL

MAGNESIUM SCREED

POINTING TROWEL

MASONRY BRUSH

MORTAR MIXER

RUBBER FLOAT

MIDGET TROWEL

RUB BRICK

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RAM TOOL
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Surface Treatment:

- This is one of the widely used methods for surface finishing. The concrete pavement slab is required to be plane but rough to exhibit skid resistance, so is the air-field pavements and road slabs.
- Concrete having been brought to the plane level surface, is raked lightly or broomed or textured or scratched to make the surface rough.
- A domestic floor slab is required to be smooth, wear resisting and crack-free. The technique of finishing the concrete floor requires very careful considerations.
- The proportioning of the mix must be appropriate without excess or deficient of matrix. Water/cement ratio should be such that it provides the just required consistency to facilitate spreading and good levelling, yet to give no bleeding

- Surface must be finished at the same rate as the placing of concrete.
- Particular care must be taken at the time of trowelling. Use of wooden float is better to start with but at the end steel trowel may be used. In all the operation, care must be taken to see that no laitance is formed and no excessive mortar or water accumulates on the surface of the floor, which reduces the wear resistance of the floor.
- The excess of mortar at the surface causes craziness due to increased shrinkage. Achieving a good surface finish to a concrete floor requires considerable experience and devotion on the part of the mason.
- A hurried completion of surface operation will make a poor surface. Application of a thick layer of mortar over set concrete is objectionable to have a smooth finishing.

- It is a good practice to the finish the floor with the matrix that comes to the top of the concrete due to the compaction of concrete and by working with mason‟s tamping rule.
- In case the above is not possible, use of extra mortar may be permitted to avoid very poor surface finish.
- But it is necessary to observe the following precautions:
- *(a) The mortar composition be the same as that of concrete.*
- *(b) It should be applied as thin a layer as possible before the base concrete is hardened, and*
- *rubbed smooth.*
- *(c) Sprinkling of dry cement in good quantity is not a good practice, however a small quantity may be permitted to reduce the bad effect of bleeding, taking care to see that it does not make the top layer too rich*.

Applied Finish:

- The term applied finish is used to denote the application of rendering to the exteriors of concrete structures. The concrete surface is cleaned and roughned and kept wet for sufficiently long time. Over this a mortar of proportion of about 1:3 is applied .
- This mortar rendering can be given any required pleasant finish, such as cement stippling either fine or coarse, combed finish, keying, renderings etc. Sometimes this rendering applied on wall is pressed with sponge.
- The sponge absorbs cement and exposes sand particles. The sponge is washed and rubbed against the surface. With the repetition of this process, the surface gets a finish, known as “Sand Facing”.
- A wet plastic mix of three parts of cement, one part of lime, six parts of sand and 4 parts of about 5 mm size peagravel aggregate is thrown against wall surface by means of a scoop or plasterer‟s trowel. This finish is known as “Rough Cast Finish”.

Factors causing variations in quality of concrete:

- The main factors which cause variations in the quality of concrete are as follows:
- 1. Personnel
- 2. Material
- 3. Aggregates
- 4. Equipment

- **1. Personnel:**
- Personnel are the basic key for the successful execution of any plan or job. Therefore the basic requirement for the success of any quality control plan is the availability of trained and experienced personnel at all levels of concrete production and its execution.
- The designer must be well versed with the construction operations and the site engineer must be able to understand the statements of specifications fully and clearly.
- In quality control everything cannot be specified and much depends on the skill and experience of the people involved in it.

2. Material:

- For producing concrete of uniform quality, its ingredients play a major role.
- Thus the ingredients used in concrete must be from the same source as far as possible, specially the cement. When ingredients from different sources are used, the strength and other qualities of the materials are likely to change.
- Thus the ingredients from different sources must be tested before use, the same type of cement from different sources and at different times from the same source exhibits variation in its properties, especially the compressive strength.
- Thus cement received from each source must be tested initially, once from each source of supply and after wards every two months as the variation in compressive strength is related to the composition of raw materials and the variation in the process of manufacturing. Cement should be protected from moisture. Set cement with hard lumps should be rejected.

3. Aggregates:

- The maximum size, moisture content, grading and shape of coarse aggregate are major source of variability in the concrete. Hence aggregates should be stock piled separately in single sizes. The graded aggregate should not be allowed to segregate.

- **Rule for Grading of Aggregate:**
- i. For fine aggregate long and continuous grading is preferable. The material passing through 300 micron (0.3 mm) sieve and 150 micron (0.15 mm) sieve should be minimum.
- ii. The grading‟s that are at the coarser end of the range are more suitable for rich mixes and those at finer end of the range are suitable for lean mixes.

4. Equipment:

- The equipment used for batching, mixing and compaction should be of the right type.
- The weight batchers should be checked frequently for their accuracy. Generally weight batching should be preferred than volume batching. If volume batching has to be adopted, the volume measures should be checked frequently for the weight volume ratio.
- Mixer‟s performance also should be checked to the requirements of the relevant standards. Concrete should be mixed for the stipulated time as under mixing and over mixing both affect the compressive strength of concrete and should be avoided. The vibrators should be of required frequency and amplitude.
- The green concrete should be handled, transported and placed in such a manner that it does not segregate. The time interval between mixing and placing should be as minimum as possible.
- The targeted strength, impermeability and durability can be achieved only by thorough compaction.
- 1% voids left due to incomplete compaction will reduce the compressive strength by 5%.

Quality Control of Concrete:

- **Field Control:**
- It consists of inspection and testing. They play a vital role in the overall quality control plan.
- **Inspection may be divided into the following two groups:**
- 1. Quality control inspection
- 2. Acceptance inspection

1. Quality Control Inspection:

- For repeated type activities or operations an early inspection is important. After the plant is stabilized, occasional checks may be sufficient to ensure the continued satisfactory results.
- On the other hand for the activities or operations which are not of repetitive type, more constant checks are necessary.
- Apart from the tests of concrete material, concrete should be tested at the fresh or green and hardened stages.
- Tests in the green stage of concrete offer an opportunity for necessary corrective steps to be taken before it is too late. These tests include unit weight, air content and workability test.
- The accelerated strength tests from which a reliable idea of the 28 day strength can be obtained with in few hours are effective quality control tools.

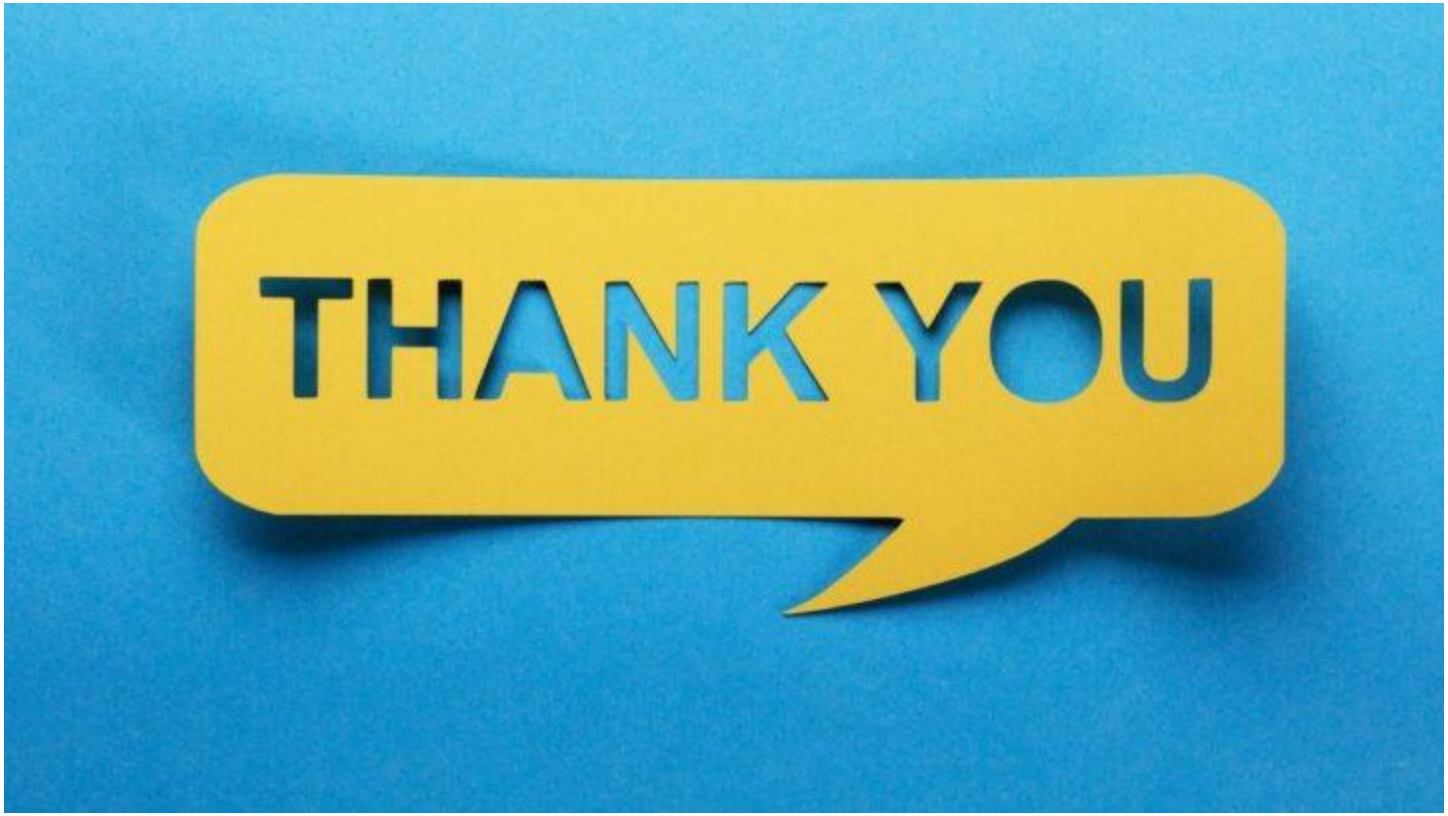
- **2. Acceptance Test:**
- The tests whose results are at universal acceptance level are known as accepted tests.
- The 28 day concrete strength test is the only acceptance test on the basis of which the acceptance or rejection of concrete mix depends.

Advantages of Quality Control in Concrete:

- **Following are the advantages of quality control:**
- *i. Quality control is the rational use of available resources after testing their characteristics resulting in the reduction of material cost.*
- *ii. Quality control reduces the maintenance cost.*
- *iii. In the absence of quality control there is no guarantee that the weakness of a certain area can be compensated by over spending in other areas.*
- *For example the loss of strength due to incomplete compaction or in adequate curing of concrete cannot be compensated by adding more cement in concrete at some other place.*

- *iv. In the absence of quality control at the site, the designer may be tempted to overdesign to minimise the risk. This will result in more cost.*
- *v. Checks at every stage of production of concrete and rectifications of defects at the proper time will result in early completion of work reducing the delay and cost.*
- **Statistical Quality Control:**
- Cement concrete is a mixture of cement, aggregate, and water and thus have certain amount of variability in materials as well as in construction methods.
- This results in variation of concrete strength from batch to batch as well as in the same batch. To assess the strength of the final product is very difficult.
- To evaluate the strength of end product requires a very large number of destructive tests, which is very costly and time consuming.

- Thus we have to resort to sample tests. To adopt very rigid criteria to reject a structure on the basis of a single or few standard samples will prove very costly.
- Thus to have a reasonable control on concrete work, the acceptance test basis of samples may be adopted, by ensuring that the probability of test result falling below the design strength is not more than a specified tolerance level.
- The aim of quality control is to limit the variability of concrete as much as possible. Statistical quality control method provides a scientific approach to concrete designer to understand the realistic variability of materials
- With the knowledge of variability of materials, he may lay down the design specifications with proper tolerance to provide for the unavoidable variations. The acceptance criteria are based on statistical evaluation of the test results of samples taken at random during the execution period of the work. For this purpose various statistical techniques are available.


THANK YOU