Waste Material Management and Skill Analysis
Rakesh More1, Sangeeta Kasle2
Lab Incharge1, Lab Instructor2
At Rustomjee Academy for Global Career

Abstract:
In building construction testing material management is one of the most important aspect while carrying out various activities. In construction industries so many tone material waste per year. Very building material are use, recycle and dispose. Per day building construction material testing are important, that test used small quantity of material but after two -three month that is big quantity that's why that is important to understand and try to minimum wastage of material.

Key words: BRC (Bartec Rebar Couplers), GGBS: - (Ground Granulated Blast Furnace Slag), CCC (Concrete Curing Compound)

I. INTRODUCTION

1. Material wastage in building construction
There Will be conducting the construction material test that time small quantity of building material but every construction site they are so many material waste per day. Many building material wastage are suitable to use. So many building materials for example brick, concrete, wood etc. are waste every building construction site. In during laboratory testing of building material how to minimize waste or any situation where reuse that waste material and not usable to reuse any condition that time how to dispose it that study in discussed in this research. Every construction site use concrete, brick, wood, block, mortar etc. material and every material are required testing and that time of test material are to be waste and that material how to use, reuse, recycle and how to dispose are given in below. In because of unskilled laborers material is worst.

A. Reuse: - How to waste reuse various waste materials in construction. How to material is reuse. Where they use. Used material how to use and where they reuse. Reuse is very important to every or any kind of work for maintaining environmental condition.

B. Recycle:-It is process of converting waste Material into reuse materials. Materials are used again and again that is recycling. Wastes are converting the finishing product. For example broken concrete block are used in plain cement concrete.

D. Dispose:-That material are not use or reuse that how to dispose. That Material can’t reuse or do not recycle that material safely disport is very necessary in construction sites.

Laboratory building Material testing waste material and their reuse Recycle and dispose

1. Field test of Brick:-In Strength test of brick above one meter height that brick are break. That brick are Broken can be used in plinth filling, below the plain cement concrete in a rubble soling etc.

Figure 1. rubble soling

Compressive test of Brick:-In during the testing that brick are Broken and block are used in plinth filling, below the pcc in rubble soling. The broken brick are crushed and converted to sand and used at the below flooring. Initial and final setting time of cement:-After test is done that cement pest can be used in filling cracks and joining the 300 gm cement per test.

Figure 2. cement per test

2. Consistency of cement:-After this test that cement past are waste that cement paste used in providing and kadapa fixing practical. It is used fixing and providing kadapa. Kadapa fixing practical required cement paste for better bonding of kadapa and wall there we used this cement past.

3. Preparation of cement mortar 1:6:-In construction site mostly concrete are made by manually and that time concrete are waste. That waste concrete is used making the
small modules and any place there required or also temporary small structure etc.

4. **Compressive strength test concrete:**
   - **Use:** The wastage concrete use the concrete broken fragment in mortar as aggregate, cubes are used in partition wall, compound wall. That concrete cube after testing are only edges are broken that cube are used in compound wall made.
   - **Reuse:** Wastage concrete cubes use below Plain Cement Concrete as a rubble.

![Figure 3. Concrete as rubble](image)

5. **Slump cone test:** In Slump cone test that material are waste that used in making small step of staircase. It used to making concrete paver block and use required place.

6. **Compaction factor test:** During this test 10 to 15 % concrete are waste per sample testing concrete. After this test that testing concrete are used in the Plain Cement Concrete work.

   - In testing concrete made concrete block and used it as per requirement for construction work. In during the test that outer site of compaction factor apparatus made permanent shattering type plank formwork for three side so concrete cannot waste more and also easy to clean the apparatus.

7. **Tensile strength test:** In tensile testing of steel mostly steell brake and that is used in under the small RCC work, chajjas etc. place. It is used also decoration propose while welding of it.

8. **Lime Mortar:** In using a lime mortar we can reuse that mortar for another work. Lime mortar are used in making stretcher bond, Header bond, English bond and Flemish bond etc. that time we use lime mortar for temporary bond making and after the making of bond remove the bond easily and we can use that mortar for another bond making and it easy to working as compare to cement mortar.

![Figure 4. blocks fast](image)

2. **Material management:**
   - New materials come in construction industries. It mince how to manage construction material in work and during the testing of material in lab. Material management it is important to project management. The material manage that type to be don’t waste it and how to storage, how to protect and how to minimize wastage etc. In material management how to material can be used in without or minimum wastage of it. It is planning and managing process of construction related material and equipment. In because of not material management and testing equipment management that material or equipment are not works as per requirement at site or laboratory. In because the material management material shortage problem are come or in because material shortage required more time for completing the project.

A. **Substitute of material or equipment’s:** New material and equipment come in building construction in place of old materials and equipment’s. That gives better strength and time saving for using this materials and equipment’s.

B. **Cost Effective:** That new material and equipment come in construction industry that is cost effective material for compare that old material and equipment.

   - **New Substitute of building material’s**
     1) Plaster material substitute: - The new material comes in construction is ready mix plaster. It is ready mix in various proportion sand and cement only adds the required water contentment and it’s come in the bag. It is also used in brick work mortar. It is give excellent workability, smooth and easy to in plaster, less curing, save water and time, water resistant and ecofriendly. Ready mix plaster 3 day curing and in own day required 2 to 3 time sprinkling water. Ready mix plaster are doesn’t required dry mixing and its save time of dry mixing. Dry mixing of sand and cement are taken 10 to 15 minutes in hand mixing.

   - **Cost:** The cost of ready mix plaster is approximately 190 PRs per bag. Ready mix plaster is better that normal plastering material (cement and sand) because of not required dry mixing and mixing with proper process.
     - Sand cost is = approximate 3 Rs /Kilogram
     - Cement cost is = 6 Rs /Kilogram
     - And Ready mix plaster cost is=11 Rs/Kilogram

2) **Brick substitute:** In a today market comes various substitute of brick for example Terracotta Hollow Blocks, Interlocking Mud Blocks etc. Soil Stabilized Blocks-In this block used main raw material is soil with an addition of cement. Made with a manually operated block press. No firing required. There is no wastage in production. Fast to build with, and unskilled people can learn how to build with the blocks fast.

   - **Cost:**-The cost of Stabilized block is Stabilized =16 Rs per block and Stabilized block cost is 11 Rs per block and its size is bigger than normal clay brick

3) **Block Jointing Mortar:** Ashtech block jointing mortar is premixed mortar suitable for laying normal brick, concrete block, ACC block jointing of cement concrete floor tiles and pre- stressed concrete slab, panel, etc. Ashtech jointing mortar is comprised of high quality cement, selected sand and
polymer for bonding and water retention to counter cracking. It is ready to use, only water should be add of it, no curing required after application.

Figure 5. The cost of the 24 Rs per kilogram. It is come 40 kg bag with liner

4) Stamped concrete:- Is cast in situ concrete paving systems that resemble slate, brick and wood. Decorate enhances strength and life of concrete with beauty of natural stone. Since it is done fresh concrete it can be made into any shape and size with required design, patterns and color. Durability of this concrete is 15 to 20 year and it is design to taken heavy load. The cost of Stamped concrete is 70 to 100 Rupees per square foot and above.

Figure 6. concrete is 70 to 100 Rupees per square foot

5) Lap length of steel bar substitute: Bartec Rebar Couplers is new substitute of lap length of steel bar. It is nut bolt type joint of steel bar. It is used for better straight and tiredness in structure. It used as a jointing of one bar to another one bar. Cost of 16 to 40 mm dia price 27.44 Rs per couplers. In normal lapping go 45 X Dia =450 mm length in one bar.

Figure 7. Bartec Rebar Couplers

6) Steel bar stirrups (Ring) bending:- In using stirrups bending machine bend up the bar as per shape and size. It's is used computerized technology system for bending and cutting of steel bars. It is give Compact structure. Stable performance, Coppery motor, Flexible and easy to operate, Good steel work disk, High working efficiency, Strong durability and Easy to maintain this features.

Figure 8. maintain this features

7) Tile leveling clips:- It is used for leveling of flooring tiles. Tile leveling clip one part are below the tile and one is upper site of tile with holes and fix clip of it holes, it used vertical or horizontal also. It is easily fixing and removable. After fixing the tile clips are removing easily and fast. Per 100 psc 600 Rs plastic clips.

Figure 9. Per 100 psc 600 Rs plastic clips.

3. Requirement of Industry

- New Equipment’s and Machines use for material testing
  New equipment come in construction industries. How many equipment come in industry and where to use it. New take nicks and new application of new equipment’s.

A. New Building material testing equipment:- To understand the how many new building material testing equipment’s come in construction industry.
New equipment come off during better material testing

1. Vicat needle apparatus:- In the place of normal vicat needle apparatus come automatic needle apparatus. It is automatic and digital display.

![Figure.10. automatic and digital display](image1)

2. Automatic programmable mortar mixers:- It is used to mixing of mortar. It is automatic mixer and it machine operated by a delicate and easy to use in built software. The pre-defined procedures guide the operator in mixing operation according to standard allowing manual information of sand by the top filling hopper. The pre-defined procedures guide the operator in mixing operations according to Standards allowing manual introduction of sand by the top filling hopper.

![Figure.11. Automatic programmable mortar mixers](image2)

3. Plastering machine:- Plastering machine is used for proper thick material and smooth plastering. Its support two beam. It is automatic plastering, lifting and adjustable thickness etc. are given. It is adjust freely and one time molding. It is reduce project time, cost, and time saving minimum wastage of material and also energy saving this advantage are given this machine.

![Figure.12. Plastering machine](image3)

4. GPR (Ground Penetrating Radar) - Concrete X-ray machine:- With the help of GPRS concrete we can analyses concreting area problems easily and quickly. GPRS concrete scanning services provide safe and reliable GPR assessment for clients before excavation or drilling. The process presents no radiation hazard and is safe. When scanning concrete, the surrounding areas do not have to be cleared, and the entire process is done quickly and efficiently. Imaging, interpretation, and assessment are completed immediately on the job site and in real time. GPRS provides permanent records of the analysis. Using AUTOCAD files or GPS maps, findings can be overlaid to create a record that details depth, path, and location of subsurface obstructions and problem areas.

![Figure.13. subsurface obstructions and problem areas](image4)

5. Ductility Testing Machine of bitumen:-
Ductility Testing Machine Electrically operated for determining the ductility of asphalt and bitumen. The ductility of bitumen is expressed as the distance in centimeters to which a standard briquette can be elongated before the thread thus formed breaks under specified conditions. The Machine is designed to test three specimens simultaneously, and consists of a bath thermostatically controlled with inlet and outlet taps and is equipped with an electric pump circulator and heater and carriage moving over a lead screw. Fixed and movable brackets are so positioned that specimen is submerged in water throughout. A clutch arrangement is made to stop the movement of the movable bracket when the rapture of the specimen is noticed. An electric motor is driven reduction gear unit ensures smooth constant speed and continuous operation and provides two rates of pull/travel, i.e., 50mm/min and 10 mm/min in the machine.

- New procedure used in industries
Find out new construction procedure that used in industries to reducing build time and quality of work. It also help to reducing project cost. In construction industry come various new procedures of that help to project completing. Construction industry is required advance construction procedure of various building construction works. In a building material testing also used new procedure for fast test
and also quality wise test.

(A) **GGBS:** - (Ground Granulated Blast Furnace Slag):-This types of cement concrete are used in a Tanisha Developers in Vidhyavihar (West). GGBS is also routinely used to limit the temperature rise in large concrete pours. There they are used this for controlling Heat of hydration in concreting of slab. GGBS this system used for durability of structure. In these are also used for protection against the sulphate attack and chloride attack. To protect against the Chloride attack, GGBS is used 50% replacement in concrete. Concrete containing GGBS cement has a higher ultimate strength than concrete made with Portland cement. Concrete made with GGBS continues to gain strength over time, and has been shown to double its 28-day strength over periods of 10 to 12 years.

(B) **Building material testing used below new procedure:**

- Consistency of Cement: - Vicat needle apparatus
With the help of new machines and equipment consistency of cement test do easily.

1. First unscrew the end trade of the probe. Then insert the needle make sure the needle is not locked. It must be able to slide during needle calibration.
2. Place of the probe into the vicat apparatus.
3. Than tem of the vicat apparatus on. Wait until the end of startups.
4. Place the glass plate, select instrument and then needle calibration to calibrate needle position.
5. Le the needle tip touch the glass platen then lock it by tightening small screw located on brass tang.
6. Before starting a test, the option menu allow you to modify date, time and system language.
7. With its wide choice of option and settings, vicitronic satisfies all user categories it is able to perform both basic test and customize cycle for research purpose.
8. To start setting up a standard and basic test, press execution.
9. Insert the test no’s insert the standard follow: insert operator's name or identification code. Insert customer code, date of test, time of specimen preparation.
10. To start penetrating at a certain time (Time first penetrate) or to start penetrating certain delay (Time delay).
11. 11. If no time or time delay is set, penetrating start immediately after conforming test start.
12. 12. Pass of the next screen and set type of drove fall (Free fall or driven fall).
13. 13. Than push start test (push twice).The test is about the start. Various option available during the test stop or pause the test, show the data, show test the measures.
14. Each penetration value show in screen. Press test measure to show penetration chart and time. Press test measure to see penetration time and chart. Push in wheel encoder and scroll each penetration to view corresponding value and times.
15. Once the test is finished, vicitronic return the main menu.

(C) **Tile leveling clips:** - Fixing of tiling used below new procedure for better leveling and finishing.

1. First taken tile leveling clips and all required materials or equipment’s.
2. Then select the place there tile can fixing make sure there are proper bead of sand are spread.
3. Than make cement paste for spreading below of tile and that is approximately in level.
4. Than taken wetted tile and put up it on the paste or in corner of the tile fix two leveling clips.

![Figure 14. Tile leveling clips](image1)

5. And proper fix and compact tile with the help of rubble hammer.
6. Then take another tile and same process apply for fixing.
7. After the four tile fixing upper clip should be fix at holes of clip and proper level of it as per required.

![Figure 15. proper level of it as per required.](image2)

8. And same process applies for all tile fixing.

![Figure 16. applies for all tile fixing](image3)

(D) **Concrete Curing compound.**
Concrete Curing Compound GCC-31S water base concrete curing compound.
1. It is formulated from hydrocarbon resins and may be used on interior, exterior, vertical and horizontal concrete surfaces.
2. Once applied, it forms a liquid membrane that retains an optimum amount of water present in freshly placed concrete to allow complete hydration of the cement.

Uses: -
GCC-31S has been used on both interior and exterior applications where paint, resilient tile or resilient flooring was applied later. Because of the wide variety of paints and
adhesives for carpeting and resilient tile in use, contact the manufacturer of the flooring system for application approval over resin-type curing compounds. A small test application is also recommended.

**Features and benefits:-**
When properly applied, produces an impermeable film which optimizes water retention. Furnished as a ready to use, true water-based compound. Produces hard, dense concrete - minimizes hair-checking, thermal cracking, dusting and other defects. Enhances the functional capabilities of concrete by "sealing in" the performance assets of strength and long life. Offers a compressive strength significantly greater than improperly cured concrete. Increases tensile strength for greater resistance to cracking and surface crazing. Improves resistance to the abrasion and corrosive actions of salts and chemicals. Minimizes excessive shrinkage. Can be applied quickly and easily with conventional commercial spray equipment. VOC compliant (volatile organic compounds).

**Application**
Application equipment must be clean and free of any previously used materials.

**Preparation:**
For optimum performance, gentle mixing or agitation is recommended.

**Mixing:**
Caution: to avoid foaming, do not mix excessively. in the container, the product will appear ivory in color. However, it dries to a clear, transparent coating with a very slight amber tint.

**Application method:**
Apply in a uniform film to horizontal surfaces as soon as the surface water disappears and the surface will not be marred by walking workmen. On vertical surfaces, apply promptly after the forms are removed. May be applied with a typical commercial hand or power sprayer. Use a Chapin 8005 or equivalent spray tip that produces a flow of ½ gallon (1.89 l) per minute under 40 psi (.276 mpa) of pressure.

**Clean-up:**
Prior to drying, clean up can be accomplished with soap and water. Once dried, it will be necessary to clean up with mineral spirits or other suitable petroleum distillate.

(4) **Skill analysis:-**
Skill analysis it mean what skills are requirement of building construction industry that come today in construction industry. Collect the information for what requirement of industry in today are uses. So that is implement and do better construction works and better quality of work. New process and procedures that come in industry for time saving and better quality give. It is important to skill analysis for every site in today world. Growing of country is depend upon the development of construction and construction work and this is depend upon skill, without skill is not possible for think working of construction, that's why it is very-very important to understanding skill of employees and worker.

The growth of Construction Industry are depend upon

- Skilled Labor
- Quality material
- Quantity on time
- Adequate manpower

**Skilled Labor:-**
The growth of company or industry is dependent on skilled labor. Working skill is very needful for doing all kind of work. It is very important of every construction sites and various activities that do in site. Skilled labors are save time, money, high quality work, less wastage of material etc. In all construction site required so many different deference skill type labor for example-carpenter, mastery meson, and fitter. And doing of this kind of work required skill. In because of unskilled labor their impact on industry by less productivity, inferior quality work, demolition & repetition of work, material wastage, increase in cost.

**Quality material:-**
Construction industries are required of good quality of material so can do works easily and complete work in time. Good qualities of material are very important to straight of structure, durability of structure.

**Quantity on time:-**
For every project the timely execution is important required quantity of material should be available at the time of execution and it should have less time for transportation. Easily available in market.

**Adequate manpower:-**
Any work doing and completing required adequate manpower. Adequate manpower is most important to completing construction project on time. For completing the project required manpower. Manpower is impact everything from production of works also.

**Skill Analysis of a various practical that do in collages.**
In a collage various practical are do the student for practice and that practical are check by a check list and cross check by external, in a check list various parameter can check for example.

1. **All types brick Bond practical.**
   - Proper wearing of Personal protective equipment.
   - Proper step by step procedure followed or not for doing particular practical.
   - Design of bond as per manual.
   - Proper in Line.
   - Proper dimension, shape and size as per drawing are maintained or not.
   - All horizontal in proper in a Plumb or not.
   - Racking of joints & surface cleaning, after completion of day to day work.
   - Thickness of joints is not more than 12 mm.
   - Housekeeping and Neatness after the practical.
   - Time taken for completing the job.

2. **Floor Tiles fixing checklist.**
   - All Personal Protective Equipment are used during the practical or transferring of material.
   - Proper Level check with Level Tube.
   - The slope are provided or not if any.
   - Tiles should be firmly fixed without any gaps.
   - Gaps filled with dry sand +cement mixture.
   - Housekeeping and Neatness after the practical.
   - Time required to complete (Hasty/ Optimum/ Careless).
3. Various wooden joint checklists.

- All Personal Protective Equipment
- Are used during the practical or transferring of material.
- Dimension of wood piece.
- Right angle of wood piece.
- No joint gap left.
- Finishing

Understanding of Applicability of type of Joint
- Housekeeping and Neatness after the practical.
- Time required to complete (Hasty/ Optimum/ Careless).

4. A setting out practical checklist.

- Proper wearing of Personal protective equipment.
- Proper step by step procedure followed or not for doing particular practical.
- Proper dimension, shape and size as per drawing are maintained or not.
- Dimension.
- Finishing.
- Level are proper or not.
- Understanding of applicability of that particular practical.
- Tools and Tackles are used properly or not.
- Who many time taken to complete a job.
- All level are proper or in a plumb bob or not.
- Housekeeping and Neatness after the practical.

5. Estimation checklist

- Drawing reading & understand dimensions
- Identify Various item of work from drawing
- Mode of Measurement
- Unit of Measurement
- Reading and applicability

II. REFERENCE:

[1]. civil engineering portal, wikipedia