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-3rd-CLASS
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Transportation and Handling of Raw Materials

Chapter One

Introduction to Materials Handling

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What is Materials Handling?

- Based on the need to be of optimum design and application specific to different types of industries, materials handling can be as diverse as the industries themselves. As a consequence, unfortunately, there is no universally accepted definition of material handling. One of the definitions adopted way back by the American Materials Handling Society is: **Materials handling** is the art and science involving the moving, packaging and storing of substances in any form.
- Or **Materials handling** is loading, moving and unloading of materials.

**Essential
Requirements of a
Good Materials
Handling System**

- (1) Efficient and safe movement of materials to the desired place.
- (2) Timely movement of the materials when needed.
- (3) Supply of materials at the desired rate.
- (4) Storing of materials using minimum space.
- (5) Lowest cost solution to the materials handling activities.

Functional Scope of Materials Handling Within an Industry

- (1) Bulk materials as well as unit materials handling.
- **Bulk handling** is particularly relevant in the processing, mining and construction industries.
- **Unit materials** handling covers the handling of formed materials in the initial, intermediate and final stages of manufacture.
- (2) Industrial packaging of in-process materials, semi-finished or finished goods, primarily from the point of view of ease and safety of handling, storage and transportation.
- (3) Handling of materials for storage from raw materials to the finished product stage.

Importance of Materials Handling

- (1) Improve the efficiency of a production system by ensuring the right quantity of materials delivered at the right place at the right time most economically.
- (2) Cut down indirect labour costs.
- (3) Reduce damage to materials during storage and movement.
- (4) Maximize space utilization by proper storage of materials and thereby reduce storage and handling costs.
- (5) Minimize accidents during materials handling.
- (6) Reduce overall cost by improving materials handling.
- (7) Improve customer services by supplying materials in a manner convenient for handlings.
- (8) Increase efficiency of industry and equipment with integral materials handling features.

Negative Aspects of Materials Handling

- (1) Additional cost involved in any materials handling system.
- (2) Once the materials handling system gets implemented, flexibility for further changes gets greatly reduced.
- (3) With an integrated materials handling system installed, failure/stoppage in any portion of it leads to increased downtime of the production system.
- (4) Materials handling system needs maintenance, hence any addition to materials handling means additional maintenance facilities and costs.

Systems Concept of Materials Handling

- In the previous sections materials handling has already been referred to as a system, and it will be repeated many times in future. It is, therefore, important to understand the systems concept of materials handling.
- The term “**system**” has many meanings depending on the field where applied. A general definition of the term could be: a complex unity formed of many often diverse parts subject to a common plan or serving a common purpose.

Considerations of Materials Handling

- (1) design or method to be adopted,
- (2) types of materials handling equipment to be used,
- (3) different operations like packing /unpacking, movement and storage involved,
- (4) maintenance required for the equipment employed.
- (5) Type of transportation by the raw materials suppliers, distributors/customers etc.

Characteristics and Classification of Materials.

The method to be adopted and the choice of equipment for materials handling system primarily depends on the type of material/s to be handled. Therefore, it is very important to know types of materials and their characteristics which are related to methods and equipment used for their handling.

Basic classification of material is made based on forms, which are (i) **Gases**, (ii) **Liquids**, (iii) **Semi Liquids** and (iv) **Solids**.

For gases, it is primarily pressure, high (25 psi and more) or low (less than 25 psi). Chemical properties are also important.

For liquids and semi-liquids, the relevant characteristics are density, viscosity, freezing and boiling point, corrosiveness, temperature and inflammability etc.

Examples of common industrial liquids are: water, mineral oils, acids, alkalies, chemicals etc.

Examples of common semi-liquids are: sewage, mud, paste etc.

Solids are classified into two main groups: **Unit load** and **Bulk load** (materials).

Unit loads are formed solids of various sizes, shapes and weights. The specific characteristics of unit loads are their overall dimensions, shape, piece weight, temperature, inflammability, strength/fragility etc.

The classifications of unit loads are based on:

- (1) Shape of unit loads
- (2) Position of load stability
- (3) Mass of unit load
- (4) Volume per unit
- (5) Type of material
- (6) Geometrical shape
- (7) Specific physical and chemical properties

Lump Size

LUMP SIZE

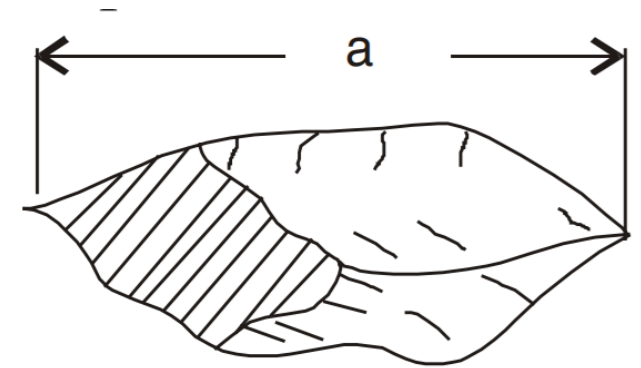
-Large diagonal size/small size= <2.5

-Otherwise its considered unsized.

-Average Lump size= $1/2 (a_{\max} + a_{\min})$.

-Bulk density_{packed}/Bulk density_{unpacked}=BULK COEFF.

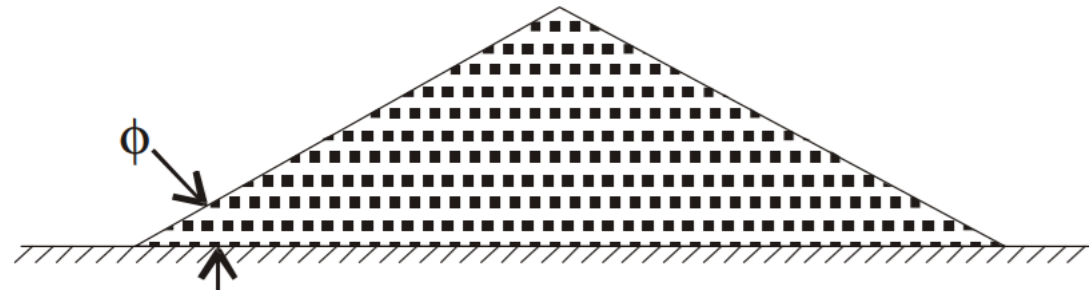
-BULK COEFFICIENT VARIES FROM 1.05-1.52



Mobility Not Flowability

Mobility Not Flowability

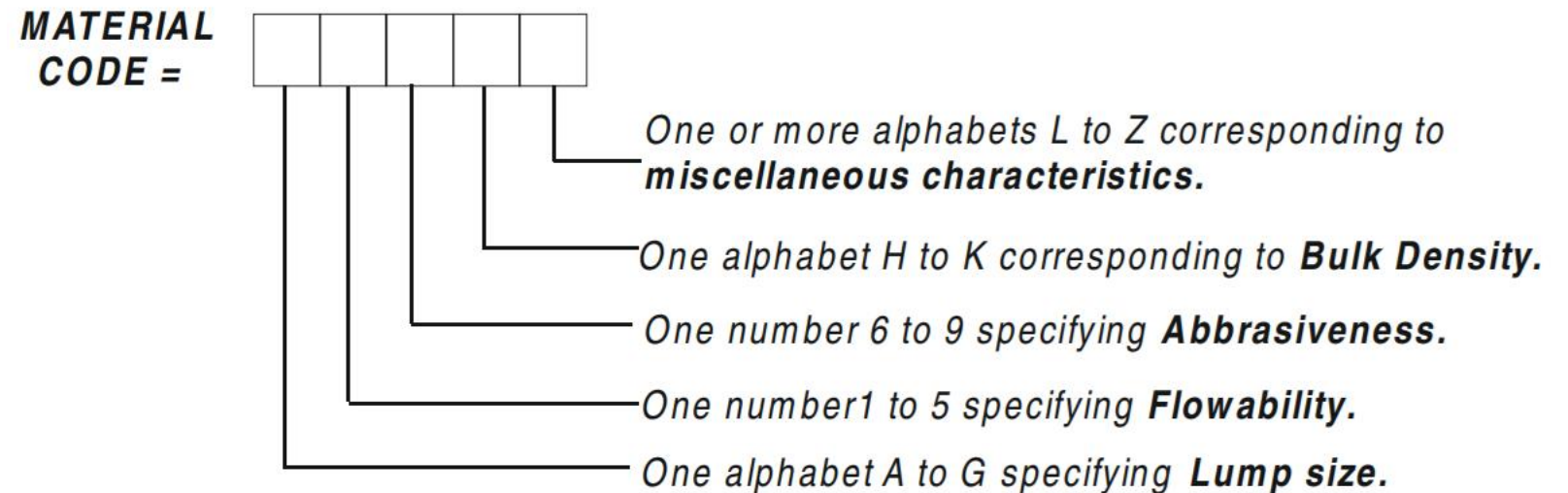
- When a bulk material is freely spilt over a horizontal plane, it assumes a conical heap.
- The angle ' ϕ ' of the cone with the horizontal plane is called the angle of repose.



Codification of Bulk Materials

Classification and codification of bulk materials based on lump size, flowability, abrasiveness, bulk density and various other characteristics have been specified by the BIS specification number IS:8730:1997(3).

The alphanumeric codification system as per this specification is shown below:





- Thank You