TRANSPORTATION & HANDLING OF RAW MATERIALS

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CHAPTER-1

OUTLINE

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INTRODUCTION

DIFINITION

- Loading, Moving, and Unloading.

- It is the art and science involving the moving, packaging and storing of substances in any form.

REQUIRMENTS OF M.H. SYSTEM

- (*i*) Efficient and safe movement of materials to the desired place.
- (*ii*) Timely movement of the materials when needed.
- (*iii*) Supply of materials at the desired rate.
- (*iv*) Storing of materials utilizing minimum space.
- (*v*) Lowest cost solution to the materials handling activities.

SCOPE OF M.H. WITH AN INDUSTRY

- (*i*) Bulk handling is particularly relevant in the processing, mining and construction industries. Unit materials handling covers handling of formed materials in the initial, intermediate and final stages of manufacture.

- (*ii*) 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. However, consumer packaging is not directly related to materials handling.

- (*iii*) Handling of materials for storage or warehousing from raw materials to finished product stage.

IMPORTANCE OF M.H.

- (*i*) Improve efficiency of a production system by ensuring the right quantity of materials delivered at the right place at the right time most economically.
- (*ii*) Cut down indirect labour cost.
- (*iii*) Reduce damage of materials during storage and movement.
- (*iv*) Maximize space utilization by proper storage of materials and thereby reduce storage and handling cost.

IMPORTANCE OF M.H.

- (*v*) Minimize accident during materials handling.
- (*vi*) Reduce overall cost by improving materials handling.
- (*vii*) Improve customer services by supplying materials in a manner convenient for handlings.
- (*viii*) Increase efficiency and sale ability of plant and equipment with integral materials handling features.

Negative Aspect of M.H.

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

SYSTEMS OF M.H CONCEPT

SYSTEM

- It is a complex unity formed of many often diverse parts subject to a common plan or serving a common purpose.

- The important characteristics of a system is that the parts, called subsystems, are interrelated and guided by an objective for which the system exists.

- In an Industry, M.H. is a subsystem or part of the production system

In an Industry M.H. is

- Design or method to be adopted.
- Types of materials handling equipment to be used.
- Different operations like packing /unpacking, movement and storage involved.
- Maintenance required for the equipment employed.
- Mode of transportation by the raw materials suppliers, distributors / customers, waste / scrap collectors etc.

CLASSIFICATION OF MATERIALS

- **Gases** (Pressure), (pipes), pneumatic conveying.
- **Liquids** (Density, Viscosity, Temp., Inflammability), (containers, pipes), hydraulic conveying.
- **Semi Liquids,**
- **Solids**

a. **Unit Load**

- (Dimensions, shape, Wight, Temp.,Inflammability)
- Hoisting equipment, and Trucks are handling methods for this type of loads.

CLASSIFICATION OF MATERIALS

- **b. Bulk Load**

(lump-size, bulk weight, specific weight, moisture content, flow ability, angles of repose, abrasiveness, Temp., proneness to explosion, stickiness, fuming or dusty, corrosively, hygroscopic and etc.)

LUMP SIZE

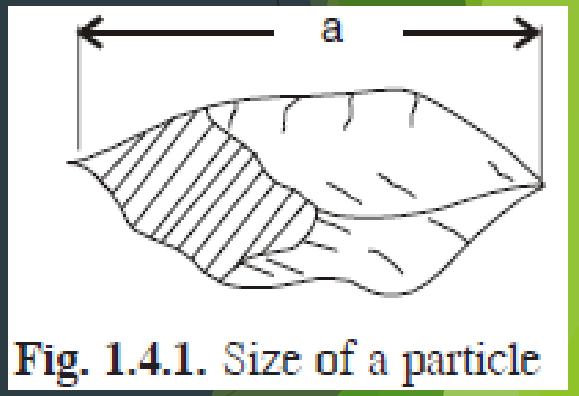


Fig. 1.4.1. Size of a particle

-**Large diagonal size/small size**=<2.5

-Otherwise its considered unsized.

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

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

-BULK COEFFICIENT VARIES FROM 1.05-1.52

Mobility Not Flowability

- When a bulk material is freely spilled 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**.

- Φ=1/flowability

- $\varphi_{dyn}=0.7\varphi$

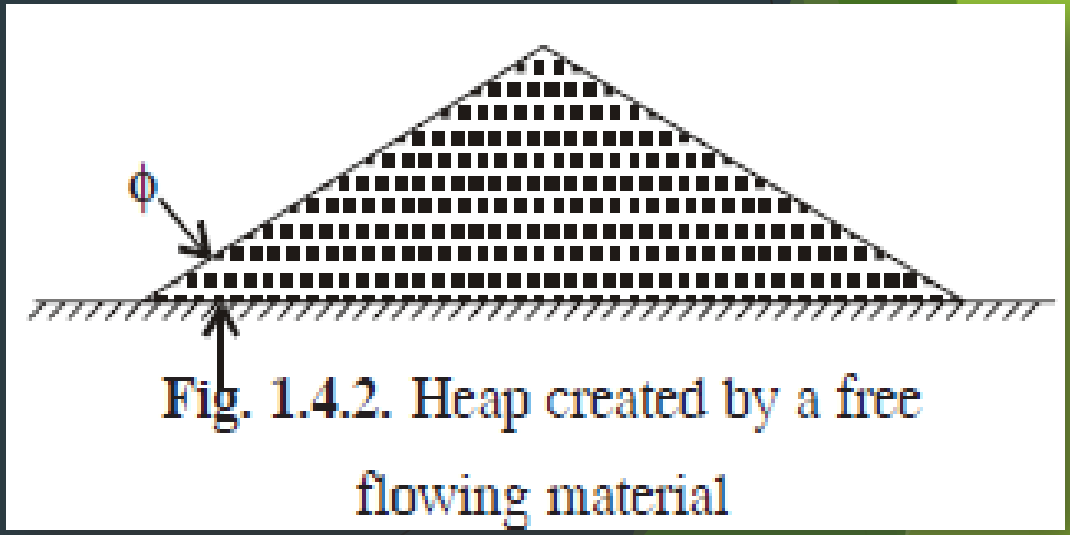
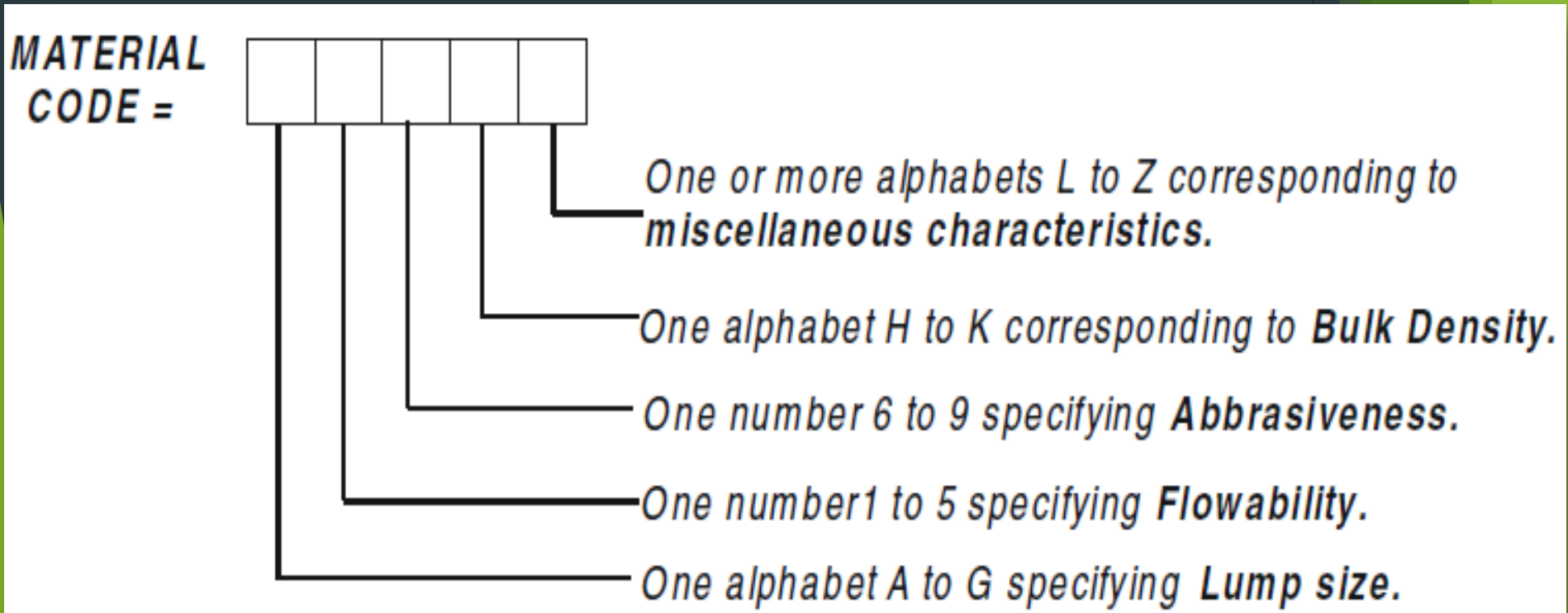


Fig. 1.4.2. Heap created by a free flowing material

Classification and Codification of Bulk Materials

- 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:



List of a Few Typical Bulk Materials with Codes

Table 1.4.2 List of a Few Typical Bulk Materials with Codes

Sl.No.	Material	Average Bulk Density, kg/m^3	Angle of Repose, degrees	Code*
1	Alumina	800–1040	22	B27M
2	Bauxite, crushed, 75mm and under	1200–1350	---	D38
3	Cement, Portland	1500	39	A27M
4	Coal, anthracite, sized	960	27	C27
5	Iron ore	1600–3200	35	D37
6	Lime, hydrated	560–720	40	---
7	Rice, hulled or polished	720–768	20	B16
8	Sand, foundry, prepared	1440	39	D38
9	Slag, blast furnace, crushed	1280–1440	25	A28
10	Stone, crushed	1360–1440	–	–
11	Wheat	720–768	28	C26N
12	Wood chips	290–320	–	E56WY

Methods of Bulk Material Handling

- Bulk materials are generally handled by belt-conveyor, screw conveyor, pneumatic conveyor, bucket elevator, grab bucket, skip hoist, stacker reclaimer, dumper-loader etc.
- It can be handled by cranes / trucks when collected in containers or bags.
- Small lump (powdered / granular) materials can be handled pneumatically or hydraulically.

Questions?

Thanking You