

DEFINITION: -

- A grinding wheel is a multitooth cutter made up of many hard particles known as abrasives which have been crushed to leave sharpened edges for machining.
- Every grinding wheel has two constituents:
 - i. abrasive used for cutting.
 - ii. bond that holds abrasive grains.



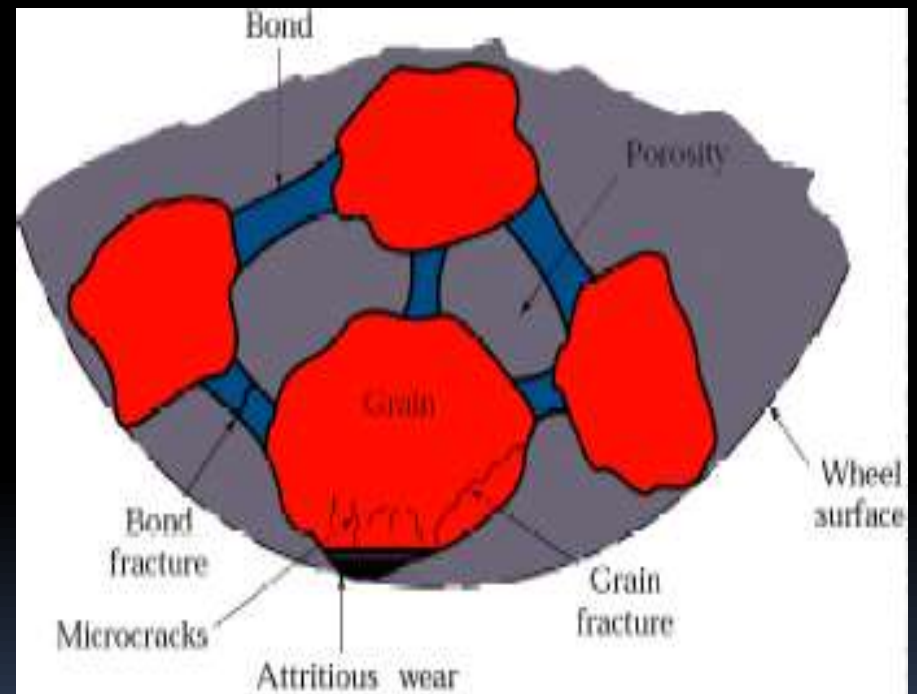
BASIC FUNCTIONS OF A GRINDING WHEEL :-

1. Removal of stock
2. Generation of cylindrical, flat and curved surfaces
3. Production of highly finished surfaces
4. Cutting off operations
5. Production of sharp edges and points.

CONSTRUCTION OF GRINDING WHEEL :-


Grinding wheel consists of-

- i. Abrasives
- ii. Bond
- iii. Grit/grain size
- iv. Grade
- v. Structure of wheels





ABRASIVES : -

- An abrasive is a hard and tough substance, having sharp edges. It cuts or wears away materials softer than itself.
 - Important properties of abrasives are penetration hardness, fracture resistance and wear resistance.
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TYPES OF ABRASIVES: -

- **Natural abrasives**- they are obtained from nature. Natural abrasives are sand stone, emery/corundum, diamond and garnet.
- **Artificial/synthetic abrasives**- they are manufactured to have well defined and controlled properties of hardness, roughness and type of structure. Artificial or synthetic abrasives are silicon carbide(SiC), aluminium oxide(Al_2O_3)

BOND : -

- The bond is an adhesive substance which cements or holds the abrasive grains together to form a grinding wheel.
- Depending upon the application, bond imparts the qualities of hardness or softness to the grinding wheel.
- The choice or selection of the bond depends upon the accuracy, the required surface finish and the nature of grinding operation.

<u>SR. NO.</u>	<u>NAME OF BOND</u>	<u>CHARACTERISTICS</u>	<u>DESIGNATION</u>
1.	Vitrified bond	Good strength and high porosity	V
2.	Silicate bond	Waterproof, used for large diameter wheels. Grinding of fine edge tools, etc.	S
3.	Shellac bond	Thin wheels, high elasticity, not suitable for heavy duty application.	E
4.	Resinoid bond	Rough grinding, high speed grinding.	B
5.	Rubber bond	Thin wheels, fine finishing and polishing e.g. ball bearing races.	R
6.	Oxychloride bond	Disc grinders, less brittle.	O

GRIT/GRAIN SIZE:-

- Size of grain grit is determined by sorting or grading the material by passing through screens with the no. of meshes per linear inch.
- The grain size influences stock removal rate and the generated surface finish.
- The selection of grain size is determined by-
 - i. Nature of grinding operation
 - ii. Material to be grinded
 - iii. Material removal rate
 - iv. Surface finish required

<u>SR. NO.</u>	<u>SIZE</u>	<u>TYPE</u>	<u>APPLICATIONS</u>
1.	10,12,14,16,20,24	Coarse	Rapid material removal
2.	30,36,46,54,60	Medium	Stock removal and finish both
3.	80,100,120,150,180	Fine	Less stock removal, high surface finish
4.	220,240,280,320,400,500,600	Very fine	Very high surface finish, grinding hard materials

GRADE OF THE WHEEL :-

- Structure of the grinding wheel represents to the grain spacing or the manner in which the abrasive grains are distributed throughout the wheel.
- The entire volume is occupied by abrasive grains, bonding material and pores.
- The primary purpose of structure is to provide chip clearance and it may be open medium or dense.

<u>SR. NO.</u>	<u>TYPE</u>	<u>DESIGNATION</u>	<u>APPLICATION</u>
1.	Dense	1,2,3,4	Cutting and snagging, hard and brittle materials
2.	Medium	5,6,7,8	90% grinding wheels
3.	Open	9,10,11,12,13,14	Soft, tough, ductile materials e.g. ball bearings, brass, bronze

WHEEL SHAPES AND SIZES:-

- The shape of grinding wheel should be such that it permits proper contact between the wheel and all of the surface must be ground.
- They are classified in the following groups:
 - i. Straight side grinding wheel
 - ii. Cylindrical wheels
 - iii. Cup wheels
 - iv. Dish wheels



STRAIGHT (TYPE 1)



CYLINDER (TYPE 2)



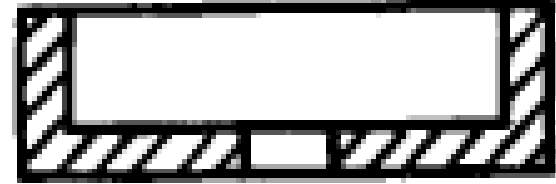
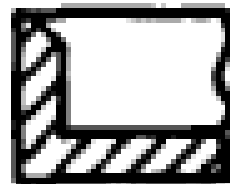
TAPERED (TYPE 4)



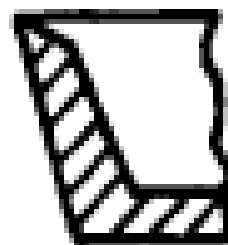
**RECESSED ONE SIDE
(TYPE 5)**



**RECESSED TWO SIDE
(TYPE 7)**



STRAIGHT CUP (TYPE 8)



FLARING CUP (TYPE 11)



DISH (TYPE 12)



SAUCER (TYPE 13)

(WHEEL DESIGNING) :

- It consists of 6 symbols representing following properties of grinding wheel:
 - i. Manufacturer's symbol
 - ii. Type of abrasive
 - iii. Grain size
 - iv. Grade
 - v. Structure
 - vi. Type of bond
 - vii. Manufacture symbol (optional) for reference

Example of a wheel specification:

51 A 36 L 5 V 40

51 → Manufacturer's symbol indicating type of abrasive

A → Abrasive (aluminium oxide)

36 → Grain size (medium)

L → Grade (medium)

5 → Structure (dense)

V → Bond (vitrified)

40 → Manufacture symbol (suffix) optional

WHEEL IDENTIFICATION:

Prefix	Abrasive	Grain size	Grade	Structure	Bond	Suffix
45	C	54	H	6	S	23
(Optional)	A → Al ₂ O ₃	Coarse → 10,12,14,16, 20,24	Soft → H,I,J,K	Dense → 1,2,3,4	Vitrified(V)	(optional)
By	Aluminium oxide	Medium → 30,36,46,54,60	Medium → L,M,N,O	Medium → 5,6,7,8	Silicate(S)	By
Manufacturer	S → SiC	Fine → 80,100,120,150,1 80	Hard → P,Q,R,S	Open → 9,10,11,12,13 ,14	Shellac(E)	Manufacturer
	Silicon	Very fine → 220,240,280,320, 400,500,600	Very hard → T,U,V,W		Rubber(R)	
	Carbide				Resinoide(R)	
					Oxychloride (O)	