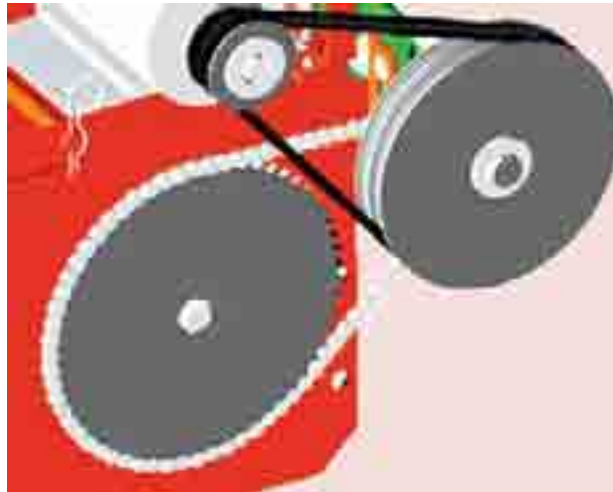


## V-Belt and Rope Drives

1. Introduction.
2. Types of V-belts and Pulleys.
3. Standard Pitch Lengths of V-belts.
4. Advantages and Disadvantages of V-belt Drive over Flat Belt Drive.
5. Ratio of Driving Tensions for V-belt.
6. V-flat Drives.
7. Rope Drives.
8. Fibre Ropes.
9. Advantages of Fibre Rope Drives.
10. Sheave for Fibre Ropes.
11. Ratio of Driving Tensions for Fibre Rope.
12. Wire Ropes.
13. Advantages of Wire Ropes.
14. Construction of Wire Ropes.
15. Classification of Wire Ropes.
16. Designation of Wire Ropes.
17. Properties of Wire Ropes.
18. Diameter of Wire and Area of Wire Rope.
19. Factor of Safety for Wire Ropes.
20. Wire Rope Sheaves and Drums.
21. Wire Rope Fasteners.
22. Stresses in Wire Ropes.
23. Procedure for Designing a Wire Rope.



### 20.1 Introduction

We have already discussed that a V-belt is mostly used in factories and workshops where a great amount of power is to be transmitted from one pulley to another when the two pulleys are very near to each other.

The V-belts are made of fabric and cords moulded in rubber and covered with fabric and rubber as shown in Fig. 20.1 (a). These belts are moulded to a trapezoidal shape and are made endless. These are particularly suitable for short drives. The included angle for the V-belt is usually from  $30^\circ$  to  $40^\circ$ . The power is transmitted by the \*wedging

\* The wedging action of the V-belt in the groove of the pulley results in higher forces of friction. A little consideration will show that the wedging action and the transmitted torque will be more if the groove angle of the pulley is small. But a small groove angle will require more force to pull the belt out of the groove which will result in loss of power and excessive belt wear due to friction and heat. Hence the selected groove angle is a compromise between the two. Usually the groove angles of  $32^\circ$  to  $38^\circ$  are used.

action between the belt and the V-groove in the pulley or sheave. A clearance must be provided at the bottom of the groove as shown in Fig. 20.1 (b), in order to prevent touching of the bottom as it becomes narrower from wear. The V-belt drive may be inclined at any angle with tight side either at top or bottom. In order to increase the power output, several V-belts may be operated side by side. It may be noted that in multiple V-belt drive, all the belts should stretch at the same rate so that the load is equally divided between them. When one of the set of belts break, the entire set should be replaced at the same time. If only one belt is replaced, the new unworn and unstretched belt will be more tightly stretched and will move with different velocity.

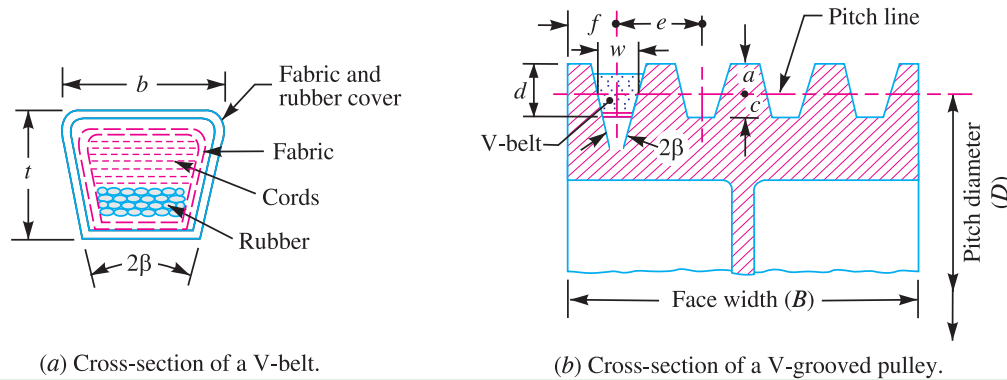


Fig. 20.1. V-Belt and V-grooved pulley.

### 20.2 Types of V-belts and Pulleys

According to Indian Standards (IS: 2494 – 1974), the V-belts are made in five types *i.e.* A, B, C, D and E. The dimensions for standard V-belts are shown in Table 20.1. The pulleys for V-belts may be made of cast iron or pressed steel in order to reduce weight. The dimensions for the standard V-grooved pulley according to IS: 2494 – 1974, are shown in Table 20.2.

Table 20.1. Dimensions of standard V-belts according to IS: 2494 – 1974.

Type of belt	Power ranges in kW	Minimum pitch diameter of pulley (D) mm	Top width (b) mm	Thickness (t) mm	Weight per metre length in newton
A	0.7 – 3.5	75	13	8	1.06
B	2 – 15	125	17	11	1.89
C	7.5 – 75	200	22	14	3.43
D	20 – 150	355	32	19	5.96
E	30 – 350	500	38	23	–

Table 20.2. Dimensions of standard V-grooved pulleys according to IS : 2494-1974. (All dimensions in mm)

Type of belt	w	d	a	c	f	e	No. of sheave grooves (n)	Groove angle (2β) in degrees
A	11	12	3.3	8.7	10	15	6	32, 34, 38
B	14	15	4.2	10.8	12.5	19	9	32, 34, 38
C	19	20	5.7	14.3	17	25.5	14	34, 36, 38
D	27	28	8.1	19.9	24	37	14	34, 36, 38
E	32	33	9.6	23.4	29	44.5	20	–

Note : Face width (B) = (n – 1) e + 2f