Sheaves, Incorporated

Sheave Design

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There are many aspects and options to consider when making a sheave. You have to determine the working load for the cable, the sheave dimensions, the groove characteristics, an appropriate bearing, and the load ratings for that bearing. Once you have carefully decided all these factors you are on your way to crafting a sheave.

Wire Working Loads

The following table (Table A), is a calculated chart that gives you the safe working loads for cable sizes from ¼" to 1-1/2. It is important to know the WWL (working load limit), so you know how much weight the cable you might be using is capable of holding. Your actual sheave's physical strength will be six times the WWL and in many cases the rope will break before the sheave will. Nylon sheaves have 3.5 times more strength than the cables they carry.

Working Load Limit (lbs.)			
Rope Size	**IPS**	**XIP**	**IWRC**
1/4	1,480	1,700	--
3/8	3,280	3,780	4,160
7/16	4,440	5,100	5,600
1/2	5,760	6,660	7,300
9/16	7,260	8,400	9,260
5/8	8,960	10,300	11,360
3/4	12,800	14,700	16,200
7/8	17,300	19,900	21,900
1	22,460	25,860	28,460
1 1/8	28,260	32,500	35,760
1 1/4	34,700	39,960	43,960
1 3/8	41,760	48,000	53,000
1 1/2	49,460	57,000	62,500
IPS Improved plow steel (popular)			
XIP Extra Improved Plow Steel			
IWRC Independent Wire Rope Core			

Table A

Sheave Dimensions

When finding the dimensions for a sheave, there are a few steps that we like to follow so we produce the most efficient product. You want to make sure the sheave won't get damaged by the cable and the cable will not get worn down by the sheave itself.

1. The tread diameter is 16 times the cable size.

   If you have a ¼" cable, your tread should be 4 inches.

2. The OD is the tread plus 3 inches for the groove.
3. Round the OD to the nearest whole.

Sheave Outside and Tread Diameter		
Rope Size	**Tread**	**Minimum OD**
1/4	4	7
3/8	6	9
7/16	7	10
1/2	8	11
9/16	9	12
5/8	10	13
3/4	12	15
7/8	14	17
1	16	19
1 1/8	18	21
1 1/4	20	23
1 3/8	22	25
1 1/2	24	27
	Table B	

Table B shows the calculated tread and outside diameters for some common rope sizes. These are still customizable and should be discussed with an engineer to ensure the customization is appropriate.

Groove Decision

The groove is the area on the sheave where the rope rides. It is crucial for the groove to be a perfect fit for your cable. If you use a cable that is too big for the groove it could snap the sheave; if you use a cable that is too small for the groove it will dance around in the groove.

The groove depth all depends on the cable size and the rim width. A good formula to determine an appropriate depth is 1.5 multiplied by the cable size for a minimum length. The maximum you can go is 1.75 multiplied by the cable size. For the angle of the groove, on most sheaves, the cable will sit in a

30 degree groove. For international specifications, it can be customized for the 35, or even 45 degree angles that are used overseas.

Bearing Selection

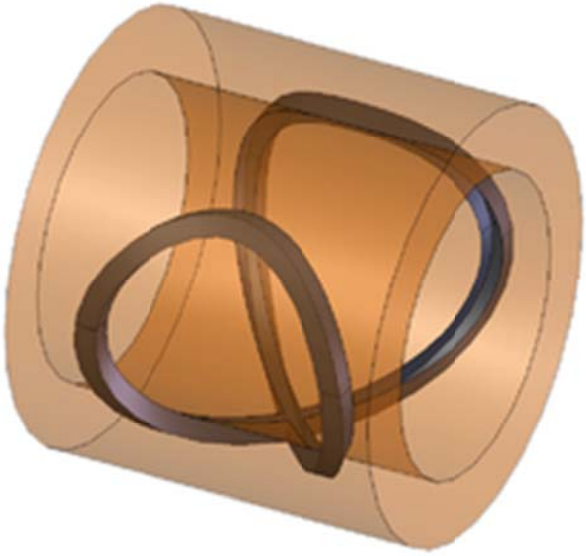
Bearings play a big role in the sheave industry. Whether you use a Bronze Bearing, Roller Bearing or Ball Bearing, there are circumstances that have to be considered. The speed the sheave will be working at, the temperatures, weather conditions, the load ratings for the bearing; these are all factors that will help determine which bearing is the appropriate fit for your sheave. Below you will find a description on some of the bearings we provide.

Bearing Types

There are dozens of different types of bearings. Different bearings include:

- Bronze Bearings
- Oilite Sleeve Bearings
- Roller Bearings

BRONZE SLEEVE BEARING (SAE 660)



- Simple and very effective bronze alloy bearing.
- Lightweight.
- High load carrying capacity.
- Low speed applications only.
- Supplied with figure 8 grease retention grooves.

Shaft Type Required: Regular steel with the proper bending and tensile strength for the application.

OILITE SLEEVE BEARING (SAE 841)

- Simple and most cost effective porous bronze alloy bearing.
- Lightweight.
- Medium load carrying capacity.
- Low speed applications only.
- Self-lubricating with vacuum impregnated SAE 30 oil (20% by volume).

Shaft Type Required: Regular steel with the proper bending and tensile strength for the application.

OTHER BEARINGS AVAILABLE:

- Higher Grade Bronze & Oilite.
- Various types of Plastics.
- Metal Bi-Material Combinations.
- Plain Bore Sheaves

ROLLER ASSEMBLY

(Without separable inner ring, with sealed outer ring)

- Higher speeds are necessary that exceed the capability of a Bronze Bushing.
- Maximum radial load rating with space limitation is necessary.
- Thrust load is minimal or non-existent.
- Greater misalignment is present.
- Low internal friction is required (less than a bushing, more than a ball bearing).
- Greater lubrication reservoir.

- Sealed at each end with lips turned in for lubrication retention.

Shaft Type Required: 58 Rockwell “C”

ROLLER ASSEMBLY

(With separable inner ring with sealed outer ring)

- Higher speeds are necessary that exceed the capability of a Bronze Bushing.
- Maximum radial load rating with space limitation is necessary.
- Thrust load is minimal or non-existent.
- Greater misalignment is present.
- Low internal friction is required (less than a bushing, more than a ball bearing).
- Greater lubrication reservoir.
- Sealed at each end with lips turned in for lubrication retention.

Shaft Type Required: Regular steel with the proper bending and tensile strength for the application.

Now that you know the science behind a sheave, you can now decide what type of sheave you will need. In this report we went over the wire rope working loads, the strength of sheaves, how to determine some of the dimensions, and described some bearings that you may use.