TABLE 1 — Chain construction options	
OPTION	**APPLICATION**
Zinc plating	Moist and salty environments
Stainless steel construction	Corrosive environments
Oval, single-pin construction	Conveying where lubrication is minimal
Prelubricated chains	Low-speed operation where lubrication is not practical
Link and steel bushing construction	Where reduced chain weight and open construction are needed
Link and plastic bushing construction	Wet environments

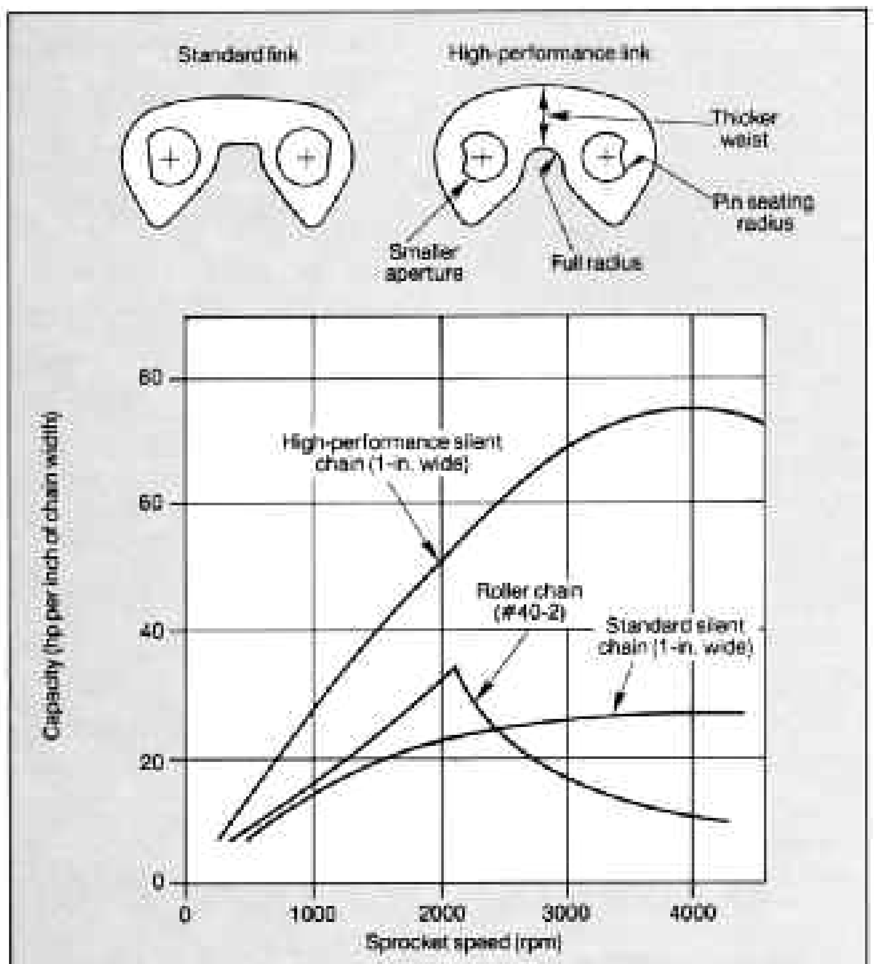

Figure 4 — Power-speed capacities of major chain types based on 30-tooth sprockets and ½-in. pitch chain.

different methods are commonly used to apply oil to the chain: manual, drip feed, and forced feed. Forced feed lubrication is always preferred where high loads and speeds are encountered. Other methods are usually appropriate under less severe conditions. Again, the specific manufacturer's recommendations should be followed.

For temperatures between 40°F and 120°F an SAE 30W oil is usually adequate. The chain manufacturer can advise on proper lubricants for other operating conditions.

Troubleshooting

Sprocket misalignment is the most frequent cause of shortened drive life. This condition causes premature and uneven chain and sprocket wear and often leads to broken sprocket teeth and chain jumping off the sprockets. Severe wear on one side of the chain guide links gives an early indication of this problem.

Excessive chain slack can lead to unusual chain loading and premature wear. A chain is properly adjusted when the slack strand can be deflected a distance that is approximately 2% of the shaft center distance. Excessive slack should be periodically removed through chain adjustment. Chain life is usually limited by wear and elongation. Generally, a chain should be replaced when the elongation reaches 3% of the original length.

As discussed, lubrication is extremely important for reliable chain operation. If a brownish, iron-oxide film (rust) forms on the chain plates, the chain is probably receiving inadequate lubrication.

*For additional information on silent chains manufactured by Ramsey Products Corp., **circle 523** on the reader service card.*

GETTING THE MOST FROM SILENT CHAIN

High-horsepower, high-speed and low-noise applications frequently require silent chain. This article will help you speed selection and maximize the benefits offered by this power transmission medium.

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Named for one of its major benefits — low noise — silent chain is often selected for transmitting high power at high speeds such as encounterd in pumps, mixers, rolling equipment, machine tools, plus paper and textile machinery. Some of these incorporate special applications, for example, serpentine drives made with duplex-style silent chain for driving sprockets from both sides of the chain, Figure 1.

Other applications frequently include conveyors, typically when the chain must transmit both power and products. In such instances, the chain carries products and transmits power from one end of the conveyor to the other. The driven end, in turn, through the chain powers the next section. Drilling rigs also use silent chain for turning sections of drill pipe.

Silent chains are applied to applications ranging from fractional to more than 2500 hp with speeds from zero, such as encountered in a tension linkage, to over 7000 fpm.

Link construction

Silent chains are made with flat, tooth-shaped, driving links; guide links; and joint components that fasten the links together and allow the chain to flex. Some chains may

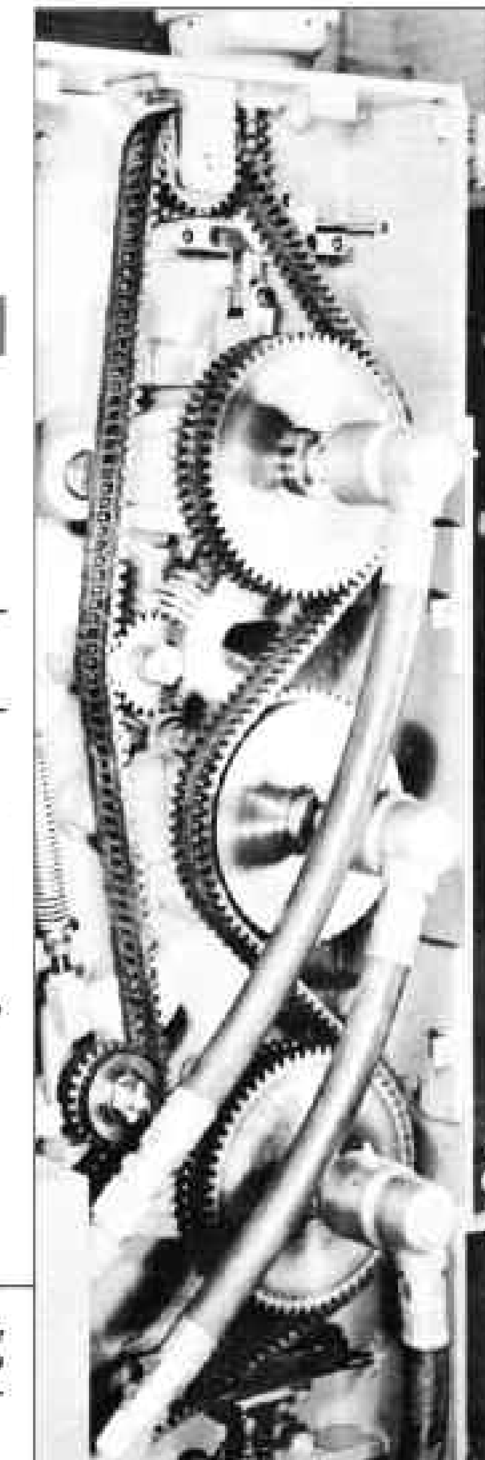
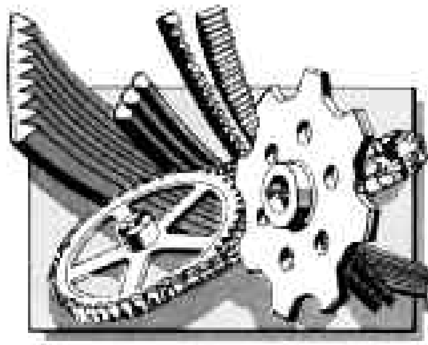


Figure 1 — Typical serpentine drive with sprockets on both sides of the silent chain.



Product supplement

BELT & CHAIN DRIVES

have additional components such as bushings, attachments, or special links.

Most common industrial silent chains are standard "SC" series chains, which are described by ANSI Standard B29.2M 1982. This standard specifies certain chain and sprocket dimensions so chains from different manufacturers are interchangeable. For a given chain pitch and width, any SC series chain will run on any manufacturer's SC series sprocket.

All SC series chains are composed of driving links having a 60° included angle between the link flanks, Figure 2. The link flank is normally the driving surface of the chain, and SC sprockets have a similar tooth angle for proper meshing. In addition to the driving links, larger guide links align the chain onto sprockets and maintain proper tracking. Depending on the chain pitch and width, SC series center-guide chains have one or two guide links in the center, and side-guide chains are made with guide links on the two outside edges.

Standard chains are identified by an alpha-numeric code. The prefix "SC" denotes silent chain, a second number denotes the chain pitch distance between centers of successive joints in eighths of an inch, and the last two digits indicate chain width in fourths of an inch. For example, SC408, identifies a silent chain which is $\frac{1}{2}$-in. pitch and 2-in. wide. Similarly, a standard sprocket to run with this chain is identified by the same code followed by the number of teeth in the sprocket. SC408-23 identifies a matching 23-tooth sprocket. Standard chains are available with pitch distances from $\frac{3}{16}$ to 2 in.

The ANSI standard does not specify a particular type of silent chain joint; therefore each chain manufacturer has its own design. Consequently, chains from different manufacturers usually cannot be connected together.

There are two basic joint designs used in industrial silent chain: single pin and double pin. Single-pin joints usually consist of a round pin and a bushing, which acts as a bearing surface. In some low-speed chains, the pin may be oval rather than round and bushings may not be used. Advantages of the single-pin joint include simplicity of chain connection and strength.

Designed to operate at higher speeds with less vibration, two-pin joints are made with two pins that roll together as the chain flexes. This rolling action minimizes frictional losses in the chain and compensates for the effects of chordal action (see box).

The operating speeds for the different types of chains vary with the manufacturer; therefore specifying engineers should consult product information when selecting these chains.

Special chains

In addition to standard SC chains, some manufacturers offer other chains with features to improve performance and satisfy the needs of special applications. Examples include duplex, high-performance, and conveyor-duty constructions. Some of these are made to operate on standard SC sprockets, but others are not. Therefore, the specifier should determine from the manufacturer the type of sprocket required.

Some designs differ from standard SC chains only in width or location of the guide links. Others use special crotch contact links designed to compensate for chordal action without using a two-pin joint, Figure 3.

Heavy-duty or high-performance silent chains are designed for applications with unusually high loads and speeds, or where very compact drives are desired, Figure 4. These chains incorporate special link and joint designs to increase chain strength and reduce vibration and wear. The horsepower capacity of heavy-duty chains (per inch of width) is often more than twice the capacity of comparable pitch roller chains, timing belts, and standard chains.

Table 1 summarizes some of the additional options available for silent chains.

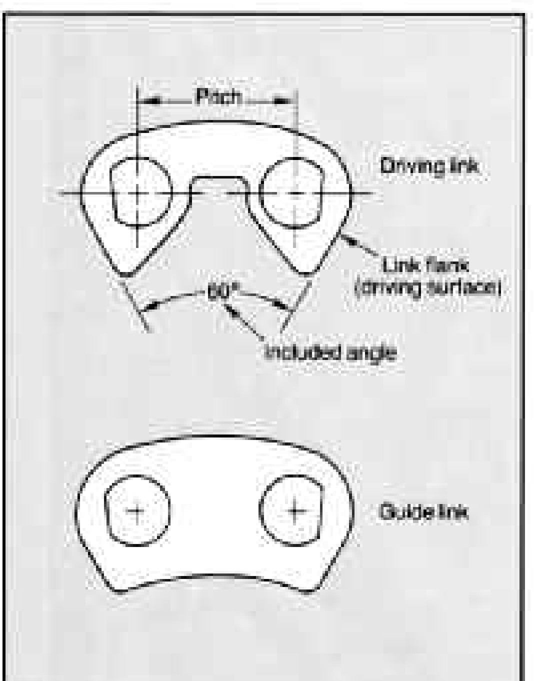


Figure 2 — Driving and guide links for silent chain.

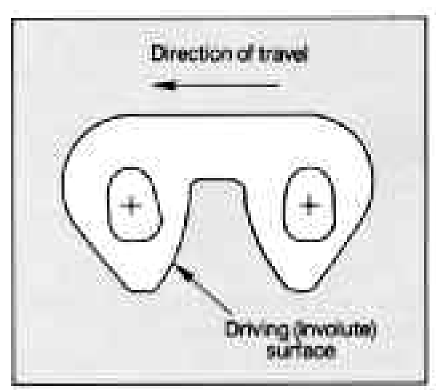


Figure 3 — Crotch driving link that is made with an involute profile on the driving surface.

Selection

Drive selection involves choosing the proper chain pitch, width and sprockets to deliver the required speeds and horsepower. Chain pitch is selected according to the speed of the faster shaft plus load and shock capacity.

Sprocket sizes are selected to deliver the desired speed ratios and to comply with restrictions on space or shaft sizes. For best results, the smaller sprocket should have at least 21 teeth and the drive ratio should not exceed 7 to 1. In general, larger ratios require two-stage drives.

For a given chain pitch, sprocket size, and speed, horsepower tables indicate chain capacity in horsepower per inch of width. The minimum overall chain width is determined by dividing design hp by the hp rating per inch of width.

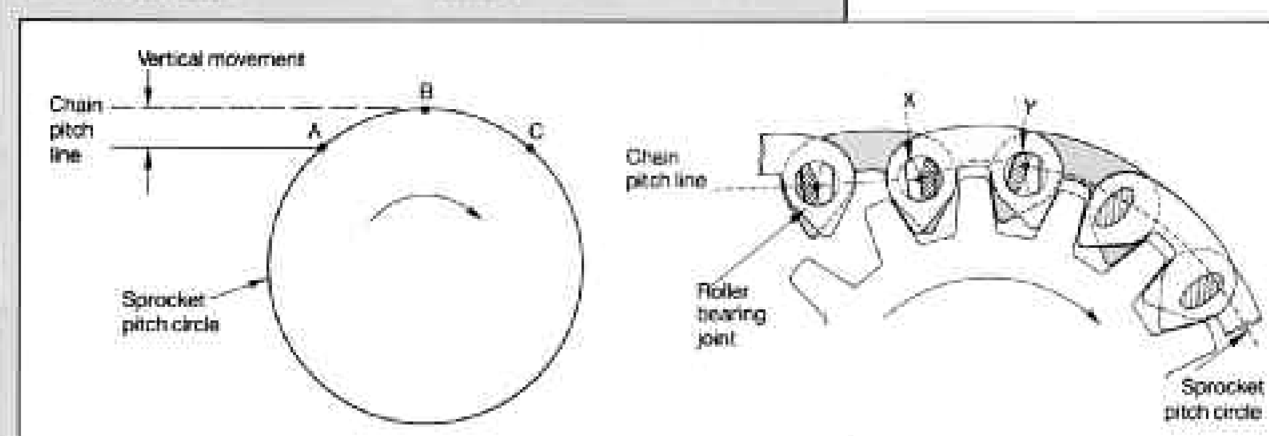
In most cases, more than one chain pitch-width combination will satisfy the application requirements. Therefore, other factors — cost and availability of stock components — should be considered. To simplify drive selection, chain manufacturers offer design manuals and telephone assistance. Information needed to select a drive includes the following:

1. The horsepower to be transmitted.
2. The power source: diesel engine, electric motor, etc.
3. Degree of shock loading (low, medium, high).
4. Speed of driving and driven shafts.
5. Shaft diameters and keyway sizes.
6. Distance between shaft centers.
7. Special conditions such as available space, idlers, etc.

Chordal action

All chains wrap around sprockets in segments (pitches) rather than following a continuous smooth arc. Thus, in moving from position A to position B, the sprocket moves the chain upward and increases the velocity. Farther sprocket rotation drops the chain back down to position C. This up and down movement, known as chordal action, produces vibration, velocity variations, and high stresses.

In a roller-bearing joint, pins roll against each other to reduce chordal action. In moving from position X to position Y, the shaded pin rolls on the clear pin and moves the point of pin contact up and out to the sprocket pitch circle. By internally moving the chain pitch point, the roller-bearing joint reduces the need for the entire chain to move up and down. Thus chordal action, vibration, and link stresses are reduced. Reduced stresses allow higher operating speeds and loads.



Lubrication

After proper component selection, adequate lubrication is probably the single most important factor to prolong drive life and reduce maintenance costs. Three