

SELECTION OF ROLLER CHAIN DRIVES

The following data should be taken into consideration while selecting roller chain drives

- a)Horsepower to be transmitted
- b)RPM of the driving and driven sprocket (speed ratio)
- c)Load classification
- d)Space limitations if any
- e)Driven machine
- f)Source of power

If the pitch centre distance and number of teeth on both driving and driven sprockets are known , you can use the following formula , tables and charts to calculate chain lengths.

SELECTION PROCEDURE

For maximum service life, smooth operation and optimum performance , the following points should be considered, while determining the number of teeth in the pinion.

a)As most drives have an even number of pitches in the chain, the use of a pinion with an odd number of teeth ensures even distribution of chain and wheel tooth wear.

b)Pinions for normal , stead drives should generally not have less than 17 teeth, the reason being that a chain forms a polygon around the pinion. When the pinion speed is constant , the chain speed is subject to regular cyclic variation. The percentage of cyclic variation becomes less marked as the number of teeth increases – and in fact becomes insignificant for the majority of applications when the number of teeth in the pinion exceeds 17.

c)A minimum of 23 teeth is recommended on moderate shock drives where the speed of the pinion exceeds 50 % of the maximum rated speed, and for heavy shock drives where the speed of the pinion exceeds 25% of the maximum rated speed.

d)The pinion should be heated toHV 10- 550 for smooth drives where the pinion speeds exceeds 70% of the maximum speed and operates under full horsepower rating. For heavy shock drives, the pinion be treated in all cases.

DETERMINE THE CLASS OF LOAD

If the shock loads are expected , then first determine the class of load on the basis of the drives equipment (see table 1)

Load classifications		Table 1
UNIFORM LOAD	MODERATE SHOCK LOAD	HEAVY SHOCK LOAD
Centrifugal pumps, Agitator for liquids, Conveyors, Fans- Uniform Load	Reciprocating pumps, Wood working M/c's Grinders, Conveyors –irregular Load	Presses, Earth moving equipment Shears, Cranes & Hoists, Reciprocating and Shaker type conveyors , Crus hers, Reciprocating feeders
Generators, M/c's all types with uniform non –reversing loads	Mixers and Machines all types with moderate shock and non-reversing loads	Machines – all types with severe impact shock loads or variation and reversing service

Note : If Table 1 does not list your equipment, go by its similarity to a listed item

SELECTION OF ROLLER CHAIN DRIVES ESTABLISH THE DESIGN HORSEPOWER

Establish the design horsepower by multiplying the specified horsepower value with the service factor given in Table 2

SERVICE FACTOR		TABLE 2		
Type of Driven Load	TYPE OF INPUT POWER			
	Internal Combustion Engine with Hydraulic Drive	Electric Motor or Turbine	Internal Combustion Engine with Mechanical Drive	
Uniform	1.0	1.0	1.2	
Moderate Shock	1.2	1.3	1.4	
Heavy Shock		1.4	1.5	1.7

FINAL SELECTION OF CHAIN

Selection of multi – strand chains will become necessary if available space is limited or high speeds call for a chain with lower pitch. The strand factors are given in Table 3 . To facilitate selection of multi – strand chains, multiply the horsepower rating for single strand chains by corresponding strand factor.

ISO 10823 – 996 standard of guidance can be referred for selection of chain drive power.

Actual power = Input power x service factor x strand factor.

MULTIPLE STRAND FACTOR		TABLE 3	
No. Of Strands		Multiple Strand Factor	
2		1.7	
3		2.5	
4		3.3	
5		3.9	
6		4.6	
8		6.2	
10		7.5	

Considering the actual power and rpm of the pinion, using the horsepower rating chart select the chain for the application.

SELECT THE LARGE SPROCKET

By using the required shaft speed ratio select the number of teeth in the large sprocket. If the required shaft speed ratio cannot be obtained with a standard sprocket , increase the number of teeth in the small sprocket by one or two, to obtain an acceptable speed ratio with a slightly larger standard sprocket. The size of the large sprocket is affected by allowable wear elongation of the chain which may go up to 3% . The use of sprockets with more than 67 teeth reduces the life of the chain expressed in percentage elongation as :

Permissible wear elongation = 200/N (%). The speed ratio for single drive should not exceed 10 : 1
 A greater ratio will make it necessary to provide for two drives in series.

DETERMINE CHAIN LENGTH

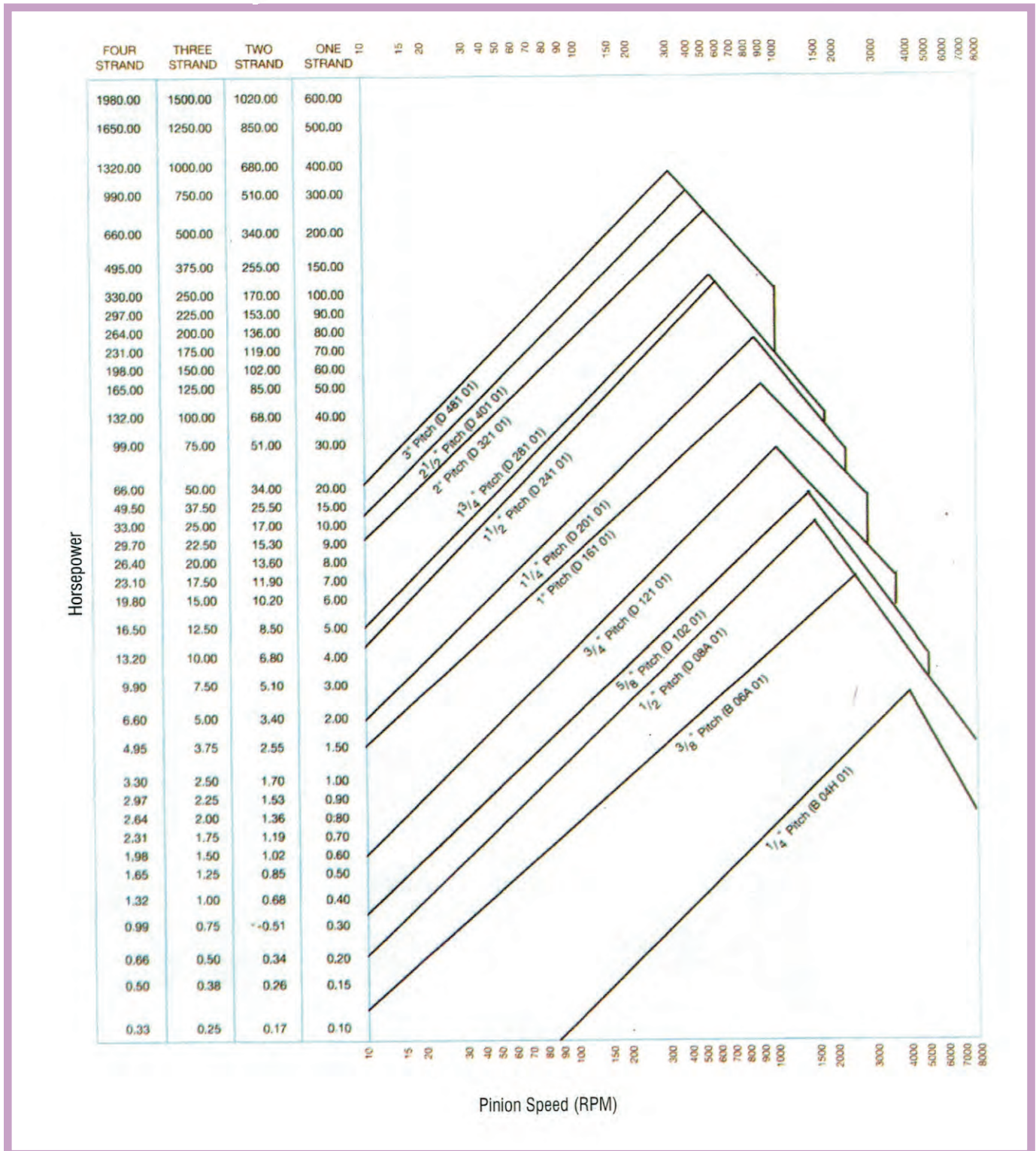
Compute the length of chain required using the formula given below. If possible, adjust the centre distance , so that the length of chain required is always in an even number of pitches. For optimum life of the chain and sprockets the centre distance between the two sprockets should be 30 to 50 times the chain pitch.

$$L = \frac{2C}{P} + \left\{ \frac{N+n}{2} \right\} + \left\{ \frac{N-n}{2\pi} \right\}^2 \frac{P}{C}$$

where L = Chain length in pitches
 P = Chain Pitch
 C = Contemplated centre distance
 N = Number of teeth on large sprocket
 n = Number of teeth on small sprocket

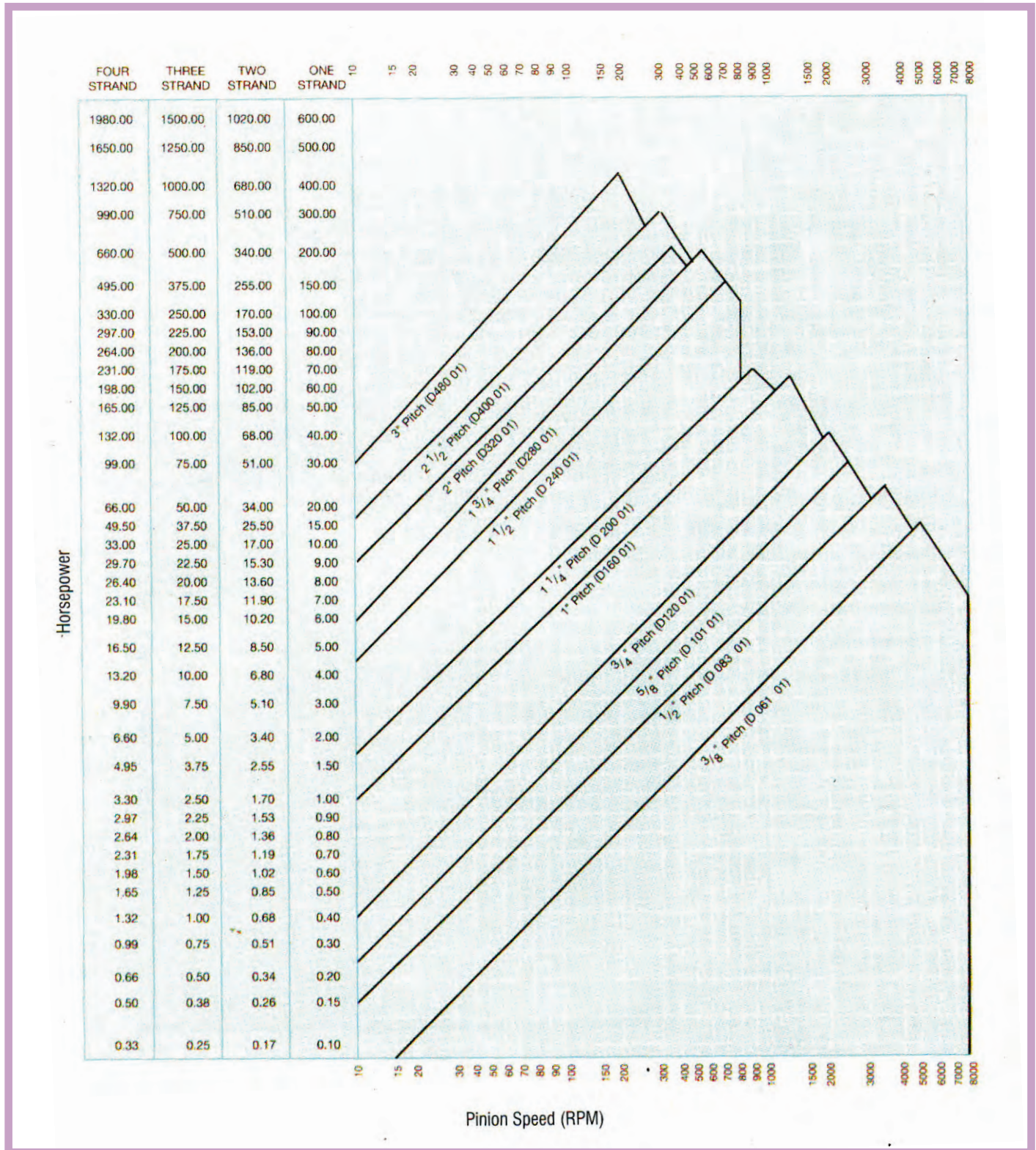
HORSE POWER RATING CHART

TENTATIVE SELECTION CHART FOR AMERICAN STANDARD CHAINS (19 TEETH PINION)



HORSE POWER RATING CHART

TENTATIVE SELECTION CHART FOR BRITISH STANDARD CHAINS (19 TEETH PINION)



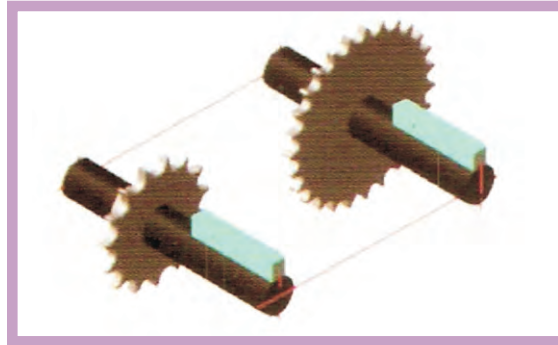
INSTALLATION AND MAINTENANCE OF CHAIN DRIVES

INSTALLATION

Careful and accurate installation is very essential for trouble free operation and long life. The following instruction should therefore be carefully observed.

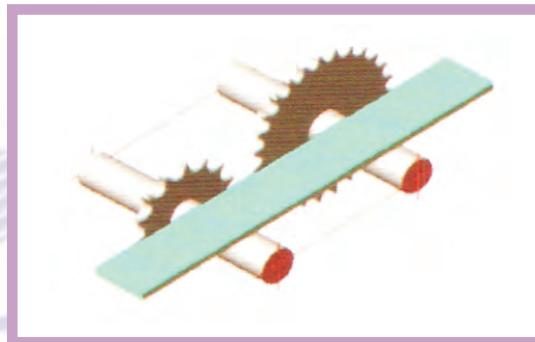
a) Shaft alignment

Make sure that all shafts are parallel and level. Check alignment with a spirit level. The shafts should be supported by sufficiently strong bearings to avoid any displacement during operation.



b) Installation of Sprockets

Align the sprockets exactly on the shafts. Check with a straight edge of a string held against the sides of the sprocket face. Improper alignment of sprockets will cause abnormal wear on the chain link plates and on the sides of the sprocket teeth. Check occasionally during operation for such wear

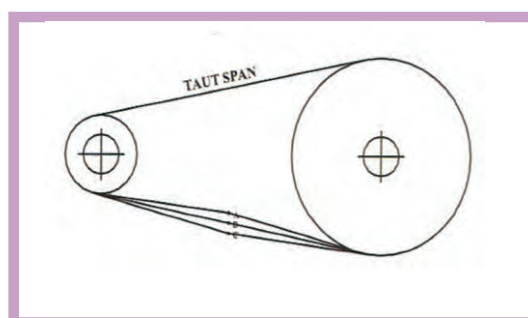


c) Mounting of Chain

Wrap the chain around the sprockets and bring the two ends together on one sprocket to connect them with a connecting link.

d) Chain Tension

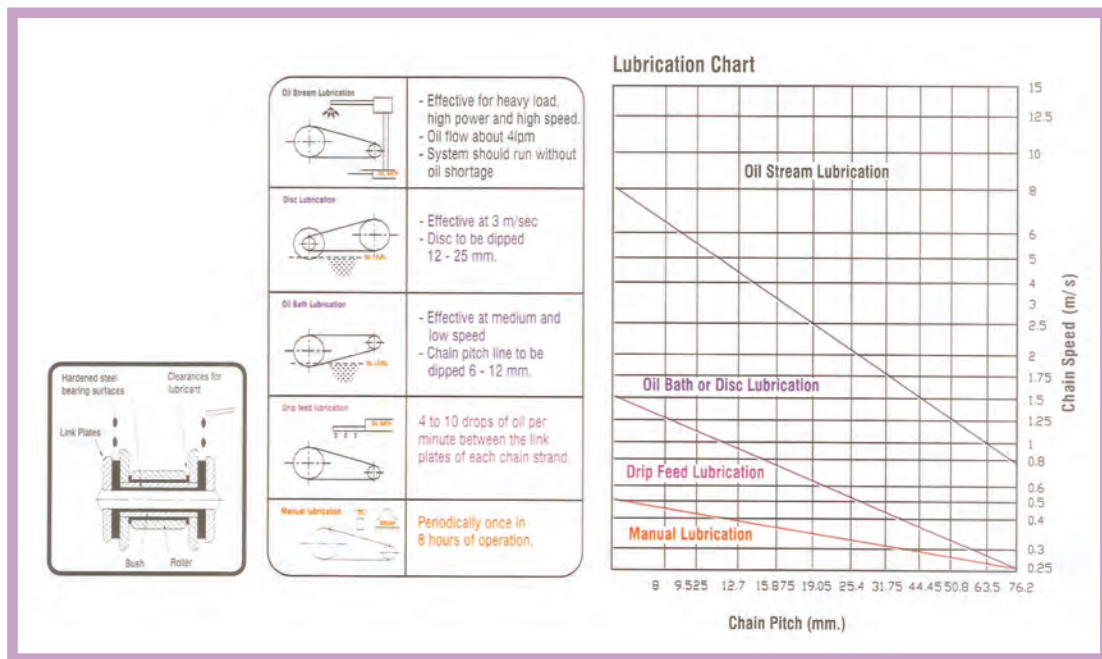
The chain should never run with both sides tight. To check tension, turn one sprocket to tighten the lower span of the chain. Then measure the sag of the lower strand which should be about 2 to 3% of the tangent to the sprockets. In an inclined drive the sag should be less. In vertical drives a chain tensioner must be provided for.



LUBRICATION OF CHAIN DRIVES

Chain life will vary appreciably depending on the way the drive is lubricated. A properly lubricated chain can last more than 100 times as long as the same chain with poor lubrication. A good grade of clean petroleum oil without additives, free flowing at the prevailing temperatures should be used. Some additives leave a varnish or gum deposit which prevents the oil from entering chain joints. Heavy oils and greases are generally too stiff to enter the chain joints and should not be used or it should be heated up indirectly and chain should be immersed in molten bath.

With proper lubrication, a separating wedge of lubricant is formed between the pins and bushings in the chain joints, much like that formed in journal bearings. The viscosity of the lubricant greatly affects its separating force and its ability to become a wedge between moving parts. The highest viscosity oil which will flow between the chain link plates and fill the pin bushing areas will provide the best wear life. This is essential to minimise metal to metal contact and, if supplied volume, the lubricant also provides effective cooling and impact dampening at higher speeds.



LUBRICANT

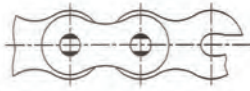
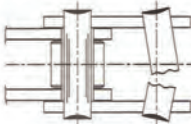
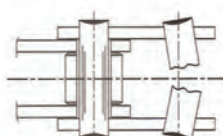

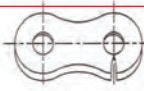
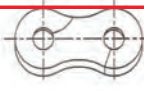



The best lubricant for most applications is a light petroleum oil. High viscosity oil and grease are suitable only for slow drives exposed to weather conditions.

The lubricant recommended by TI Diamond for the various surrounding temperatures are indicated in the following table:

Chain Pitch	-10 degree C To 0 degree C	0 degree C to 40 degree C	40 degree C to 50 degree C	50 degree C to 60 degree C
Less than 5/8"	SAE 10	SAE 20	SAE 30	SAE 40
3/4" - 1"	SAE 20	SAE 30	SAE 40	SAE 50
1 1/4"				
1 1/2" & ABOVE	SAE 30	SAE 40	SAE 50	

Chain drives should be protected from dust, dirt and moisture. Depending on the type of application and type of lubrication, systems should be cleaned and oil change is recommended after the first 500 operating hours, to be repeated every 2500 hours

TROUBLE SHOOTING HINTS

PROBLEM	POSSIBLE CAUSES OF PROBLEM	SUGGESTED REMEDY
 Fracture Plate	Overloading	Inspect the drive to determine the cause of high load and eliminate Or Redesign drive for larger pitch chain
 Broken Pins	Overloading	Inspect the drive to determine the cause of high load and eliminate or Redesign drive for larger pitch chain
 Broken Pins (Centre)	Loading is greater than pins dynamic capacity	Inspect the drive to determine the cause of high load and eliminate or Redesign drive for larger pitch chain
 Broken Pins (Offset Pin)	Overloading	Inspect the drive to determine the cause of high load and eliminate or Redesign drive for larger pitch chain
 Fatigue Failure	Loading is greater than pins dynamic capacity	Single pitch offset link is to be eliminated Redesign drive using a higher capacity chain
 Cracking	Stress corrosion cracking	Inspect the drive to determine the cause of high load and eliminate or Select anti – corrosive chain
 Broken Roller	Speed too high Sprockets too small Chain riding too high on sprocket teeth	Replace chain, reduce speed Use larger sprockets or possibly redesign drive for small sprocket
 Worn Contour	Chain rubbing on casing, guide or obstruction	Replace chain if 5% or more height worn out Inspect and redesign casing, guide and eliminate interference
 Pin or Bushing Galling	Speed or load too high Inadequate lubrication	Reduce speed or load Redesign drive for smaller pitch chain Provide proper lubrication system

WARNING

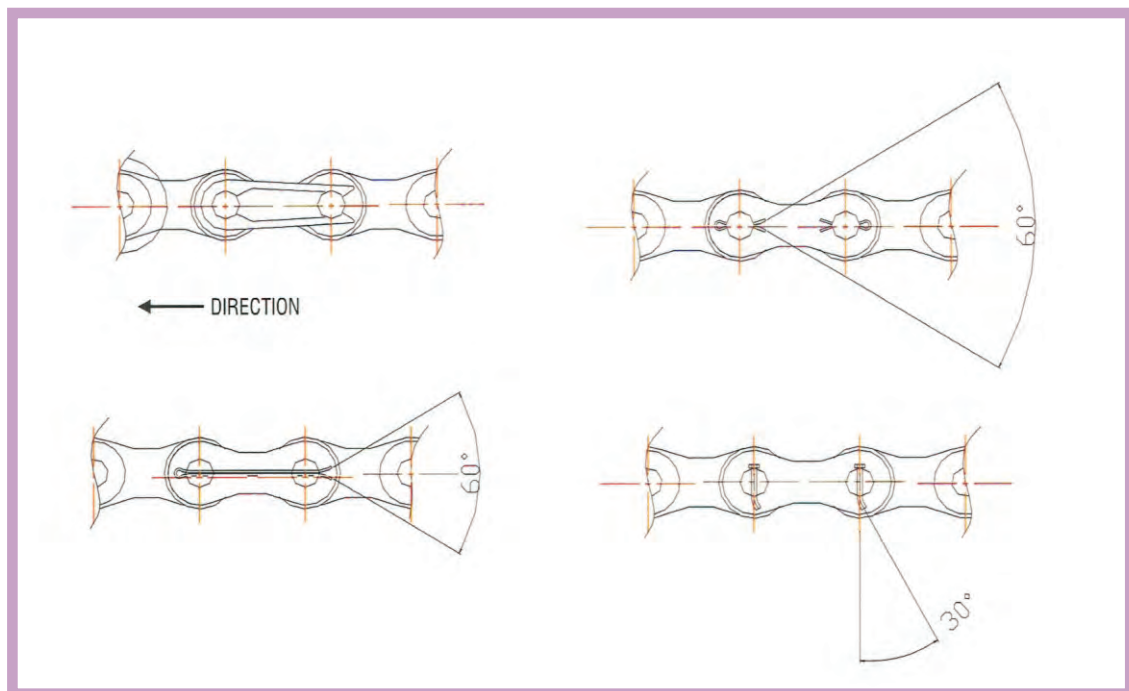
COMPLY WITH THE FOLLOWING TO AVOID SERIOUS PERSONAL INJURY AND CRITICAL ACCIDENTS.

- Guards must be provided on all chain and sprocket installation as per ANSI/ ASME B 15.1 – 1984 and ANSI ASME B 20.1 1990 or other applicable safety standards. As ns when these standards are revised, the updated edition should be followed.
- Power should be switched off before installation, removal, lubrication or service of a chain system.
- When connecting or disconnecting chain
 - i) Wear safety glasses, protective clothing, gloves and safety shoes
 - ii) Support the chain to prevent movement
 - iii) Use appropriate tools for connecting and disconnecting chains and sprockets

Do not attempt to connect or disconnect chain unless the drive mechanism is well understood.

Chain and sprocket selection should be made in accordance with our horse power rating chart or our recommendations.

Regular maintenance is required for all chain drives



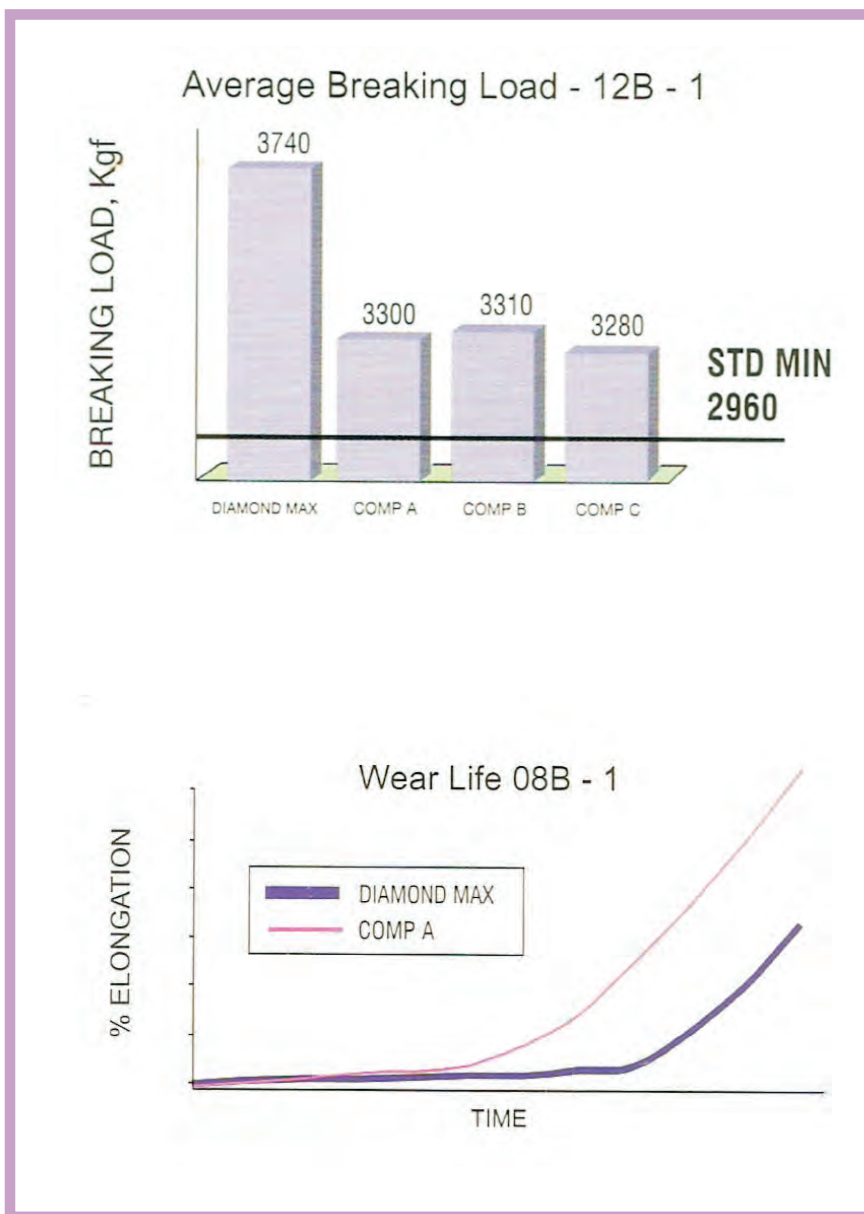
- Plating, welding and other operations may reduce strength and can cause breakage. Consult our engineers for recommendation.
- Do not re- use disassembled chain parts. Do not use reworked chain or join reworked chain with a new chain.
- Never use acid, alkali or general rust removal solvents to clean a chain. It may cause hydrogen embrittlement.
- Never use a new chain on an old sprocket. Replace chains and sprockets together.

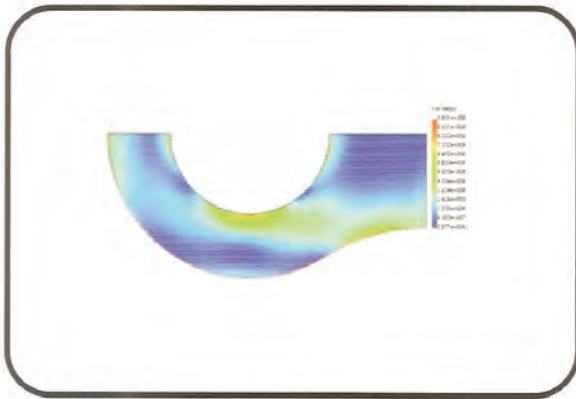
ROLLER CHAINS

The Diamond Max Series

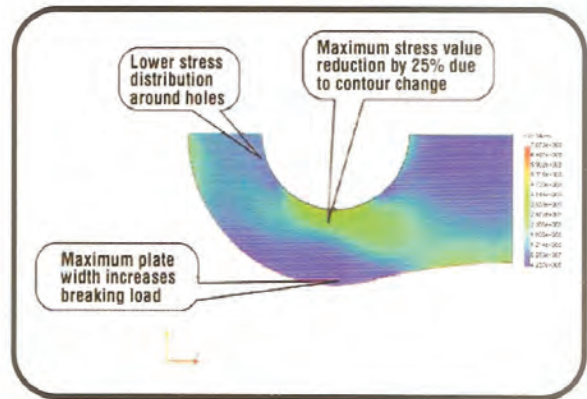
This special series of hi – life, special characteristic chains has been created for rugged applications, where the standard chains have always fallen short. They feature unique properties such as high breaking load, increased fatigue strength & wear life, close length tolerance and more.

Diamond Max Roller Chains have been specifically developed with exceptional strength and endurance. They get their extra endurance from the inspiration in the detail of the plates, pins, bushes and rollers, manufacture to close tolerance, and assembly with care.

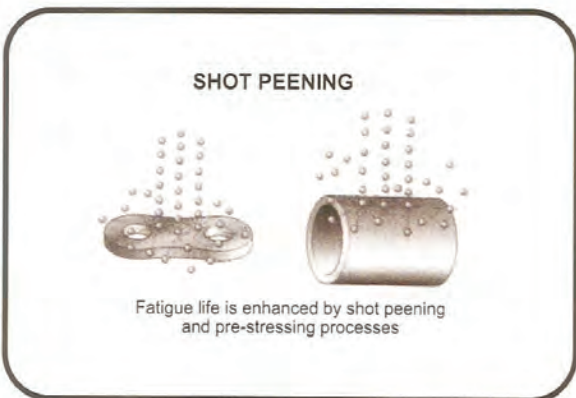




REGULAR CONTOUR



NEW CONTOUR



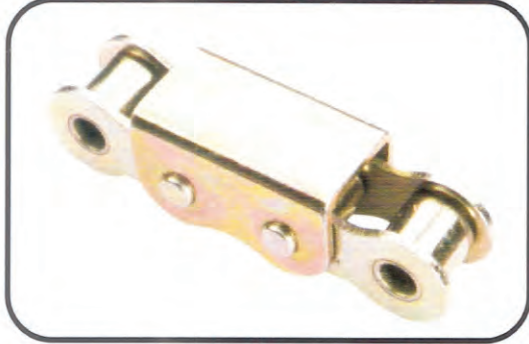
SHOT PEENED PLATES



HIGH PERFORMANCE CHAINS

Chains with more Life

Work Standard Attachment Chains



'U' ATTACHMENT



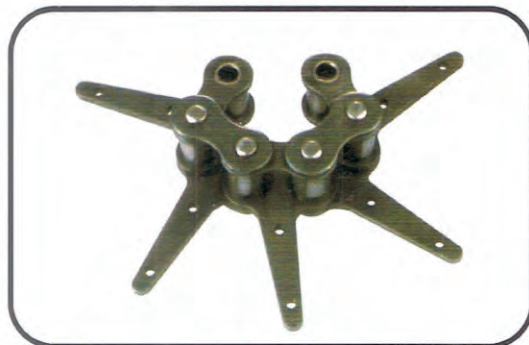
SPIKE ATTACHMENT



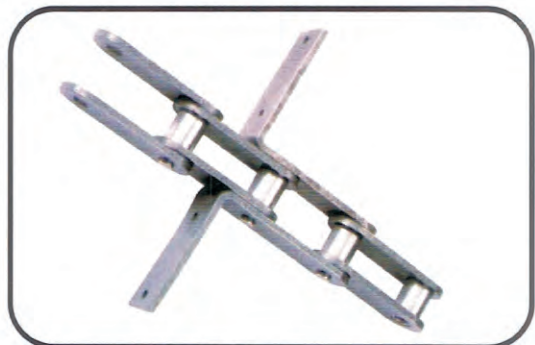
WELDED ATTACHMENT WITH TEFLON WASHER



WELDED ATTACHMENT



SPECIAL ATTACHMENT



REDLER ATTACHMENT