SPROCKET DESIGN FOR DETACHABLE STEEL CHAIN AND STEEL PINTLE CHAIN*

The following procedure outlines the method used to design cast sprockets having the optimum tooth profile for use with steel detachable, agricultural double pitch, and agricultural replacement chains. Use of this design will produce sprockets which have:

1. Smooth, positive engagement with the chain.
2. No tendency to have chain jumping sprocket teeth under high loads, assuming there is at least N/2-1 teeth in engagement.
3. Ability to accommodate casting inaccuracies found in normal foundry practice.
4. Ability to accommodate reasonable amounts of material build-up in the tooth pockets.

STEP No. 1: Determine Pitch Diameter (PD)

PD = P x Cosec 180/N = PM
where P = Chain Pitch
N = Number of sprocket teeth
M = Cosec 180/N (see Table No. 1 for calculated values of M)

TABLE NO. 1

N	M	N	M	N	M	N	M	N	M	N	M
4	1.4142	13	4.1786	22	7.0267	31	9.8845	40	12.7455	49	15.6079
5	1.7013	14	4.4940	23	7.3439	32	10.2023	41	13.0635	50	15.9260
6	2.0000	15	4.8097	24	7.6613	33	10.5201	42	13.3815	51	16.2441
7	2.3048	16	5.1258	25	7.9787	34	10.8379	43	13.6995	52	16.5621
8	2.6131	17	5.4422	26	8.2962	35	11.1558	44	14.0175	53	16.8802
9	2.9238	18	5.7588	27	8.6138	36	11.4737	45	14.3356	54	17.1984
10	3.2361	19	6.0755	28	8.9314	37	11.7916	46	14.6536	55	17.5166
11	3.5494	20	6.3925	29	9.2491	38	12.1096	47	14.9717		
12	3.8637	21	6.7095	30	9.5668	39	12.4276	48	15.2898		

STEP No. 2: Layoff chords (P) equal to the chain pitch, on the pitch circle. (See Figure No. 1.)

STEP No. 3: Determine pitch line clearance (F)
F = .2 (P-E)
where E = Roller Diameter (for roller type chains) or 2 X Backing Radius for steel detachable chains.

STEP No. 4: Lay off 1/2 (F) on each side of the pitch points on the pitch circle. (See Figure No. 2.)

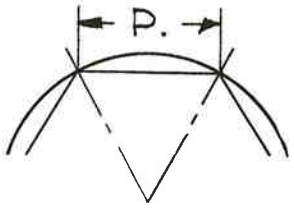


Figure No. 1

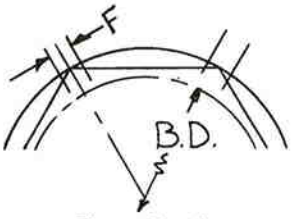


Figure No. 2

*For Special Applications, A Sprocket With Annular Ring Should Be Used.
See Pg. 14.

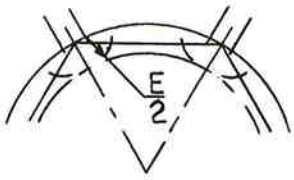


Figure No. 3

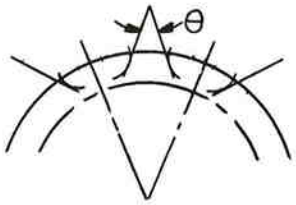


Figure No. 4

STEP No. 5: Determine Bottom Diameter (BD)
BD = PD − (E + S) where
S = .06″ up to 10″ bottom diameter.
Over 10″ Bottom Diameter
Consult Our Engineering Dept.

STEP No. 6: Locate tooth faces by striking a radius equal to 1/2 (E) from the pitch line clearance points on the pitch diameter. (See Figure No. 3.)

STEP No. 7: Construct the straight line face of the tooth, using the included angle (Θ) given in Table No. 2, drawing the lines symmetrically about the center of the teeth, tangent to the radius drawn in Step No. 6. (See Figure No. 4).

TABLE NO. 2

No. of Teeth -N-	Tooth Angle Θ	No. of Teeth -N-	Tooth Angle Θ	No. of Teeth -N-	Tooth Angle Θ	No. of Teeth -N-	Tooth Angle Θ
6	22	12	33	17-18	42	32-37	50
7	24	13	35	19-20	43	38-47	52
8	26	14	36	21-23	44	48-65	54
9	28	15	38	24-26	46	66-79	56
10	30	16	40	27-31	48	80-143	58
11	31						

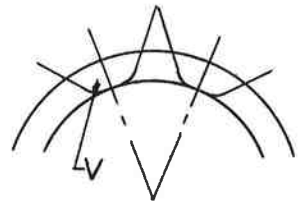


Figure No. 5

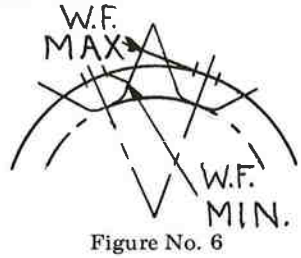


Figure No. 6

STEP No. 8: Draw the pocket radius (V) equal to E/3, tangent to the working face and to the bottom diameter. (See Figure No. 5).

STEP No. 9: Determine length of straight working face (WF). WF = .01 X P X N, but must not exceed WF Maximum.

Location of WF Maximum is found by drawing a line perpendicular to the tooth face from the pitch line clearance point farthest from the tooth face in the adjacent tooth pocket. (See Figure No. 6).

The location of the bottom of the working face (WF) is found by drawing a line perpendicular to the tooth face from the pitch line clearance point nearest to the face.

STEP No. 10: Draw topping radius (R) which is equal to P/2 and is tangent to the end of the working face. Since the topping radii intersect at a sharp point, a small fillet radius is used to round off the tips of the teeth. (See Figure No. 7).

For long pitch chains, such as agricultural double pitch chains, and for sprockets to be used with conveyor chains having attachments such as the K-1, it is necessary to limit the height of the teeth. (See Figure No. 8). This can be done without ill effect as long as the length of working face is not affected. If it is necessary to reduce the working face length, the sprocket will not accept as much chain elongation due to wear.

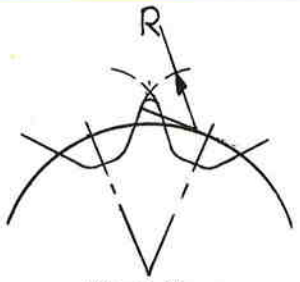


Figure No. 7

The pitch of the driven sprocket must be less than the pitch of the chain, allowing the chain to pull on the last outgoing tooth of the sprocket, with the balance of the chain in the arc of contact resting loose on the root of the sprocket out of contact with the teeth. (See Figure No. 8).

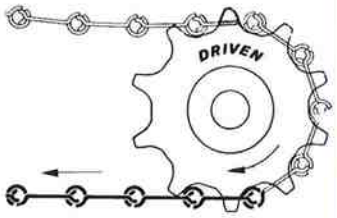


Figure No. 8

If the pitch of the sprocket is larger than the pitch of the chain, the pull of the chain will be on the entering tooth rather than the outgoing tooth. As the pitch of the chain is too short to reach the next tooth, it will tend to ride up on the next entering tooth of the sprocket causing it to run off the sprocket. (See Figure No. 9).

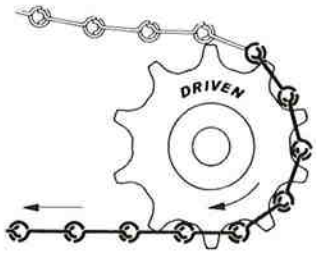


Figure No. 9

The teeth of the sprocket at the pitch diameter should be wide enough to fill the space between the side bars of the chain, but not so wide as to interfere with smooth operation of the chain. Also, from the pitch diameter to the top of the teeth should be rounded or beveled to help the sprocket enter the chain smoothly.

The pitch of the driving sprocket may be larger or smaller than the pitch of the chain. Sprockets with either condition are giving good service.

When the pitch of the driver is smaller than the pitch of the chain, the pull is on the entering tooth and the chain being long, fits loosely around the arc of contact. The next link which swings into contact with the next entering tooth is too long to swing down to the root of the sprocket and will ride out on the tooth to a larger pitch circle. Each succeeding link will do the same so that the chain will find its true pitch circle (see Figure No. 10) and run there satisfactorily.

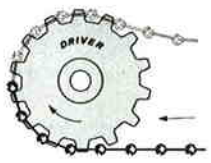


Figure No. 10

When the pitch of the driver is larger than the pitch of the chain, the pull is on the outgoing tooth and the next link is too short to make contact with the following tooth. As the last link is stripped from the tooth, the chain slides back until the next link and tooth are in contact. This condition is multiplied with each succeeding link, so that the chain rides on the root of the sprocket and the entering tooth on the opposite side of the sprocket is out of contact with the chain and enters freely. If the face of the tooth has the proper clearance angle, and the sprocket is not too large for the chain, the stripping will be easy, and the chain will slide back easily.

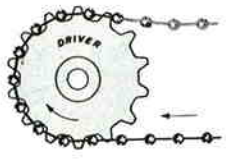
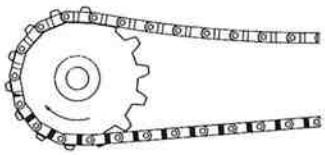


Figure No. 11

DRIVES

STEEL PINTLE CHAIN

Patent Nos. 3,054,301 and 3,153,897

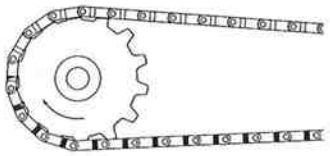


DRIVES PINTLE CHAIN

Drives open barrel construction automatically cleans out the sprocket, eliminates dirt build-up and allows the chain to run free. This unique feature is found only in Drives Pintle Chain.

Drives Pintle Chains were designed and engineered to have comparable strength to roller chain of similar pin size with a pin that can not freeze due to corrosion. The open or half barrel construction is a new, and very important discovery because it cleans out materials that tend to pack in the root of the sprocket, thereby eliminating overloading tension that may cause fatigue in full barrel chains. Drives Steel Pintle Chain only pulls the load placed on it and never has to overcome pre-loading or tensions caused by packed roots of sprockets. This feature adds to life and trouble free performance on the job.

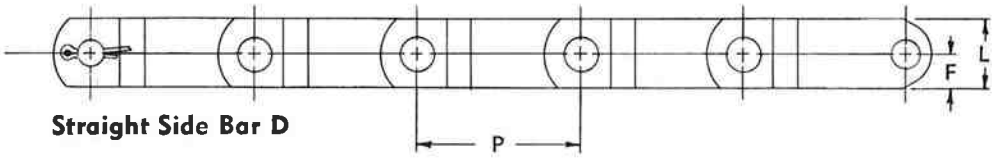
This chain is recommended for applications requiring high tensile strength, corrosion resistant pin construction, excellent fatigue life, root cleaning action to eliminate material build-up, and trouble free performance.



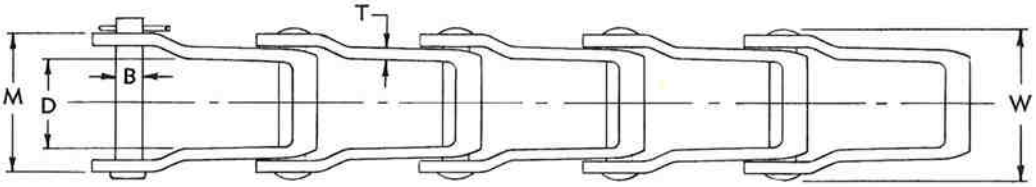
ORDINARY PINTLE CHAIN

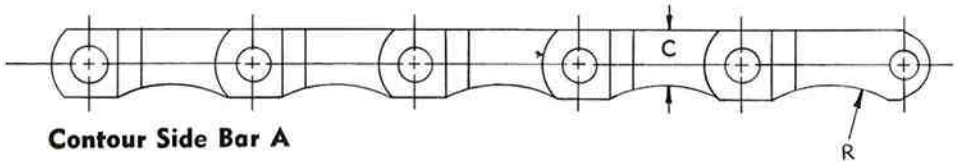
Ordinary Pintle Chain allows dirt build-up between teeth on sprocket, causing chain to ride high and tighten up, thereby increasing the danger of overloading and breakage.

Special sizes and attachments can be developed and quoted per your request.

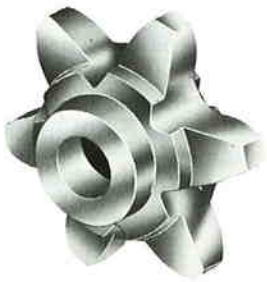


Straight Side Bar D





Contour Side Bar A



SPROCKET WITH ANNULAR RINGS

For Improved Chain and Sprocket Life, We Recommend A Sprocket With Annular Rings. Contact Our Engineering Department For Further Information