REFERENCES

Armstrong, Ronald A. 1994. Total Quality Management : The Key to Business Improvement. 2nd ed. London: Chapman & Hall.

Boaaert, James L. 1991. Quality Function Deployment : A Parctioner's Approach. 1st ed. New York: Marcel Dekker.

Festo Catalog. 1997. Automation with Pneumatics. Esslingen: Festo AG & Co.

Hibbeler, R. C. 1997. Mechanics of Materials. 3rd ed. New Jersey: Prentice Hall.

Kouris, Michael. 1996. Dictionary of Paper. 5th ed. Georgia: Tappi Press.

Meriam, J. L., and Kraige, L. G. 1993. Engineering Mechanics : Statics. Vol 1. 3rd ed. Toronto: John Wiley & Sons.

NTN Catalog NO. 2704 – II, 1982. NTN Bearing Units. Japan: NTN TOYO Bearing.

Smook, Gary A. 1994. Hand Book for Pulp & Paper Technologists. 2nd ed. Vancouver: Angus Wilde Publications.

Straker, David. 1995. A Toolbook for Quality Improvement and Problem Solving. 1st ed. London: Prentice Hall.

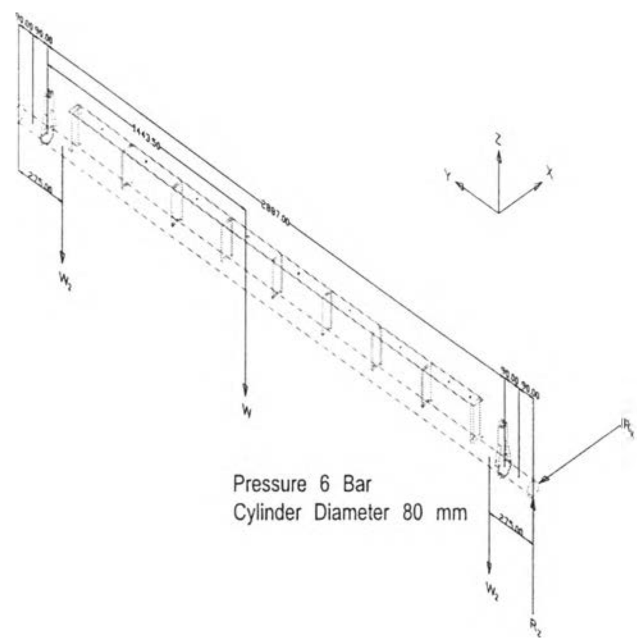
Thuesen, G. J., and Fabrycky, W. J. 1993. Engineering Economy. 8 th ed. New Jersey: McGraw-Hill.

Walter, Jan C. 1994. The Coating Processes. 1st ed. Georgia: Tappi Press.

APPENDICES

Appendix A

Calculation for Selecting Bearing



W = Weight of Rotor = 58.291 kg

W_2= Weight of Shaft = 8.456 kg

$\left[\sum F_Y = 0\right]$ $$2F\sin 36^\circ - W - 2W_2 + 2R_Z = 0$$

$$2\left[6x10^5 x\frac{\pi x 0.08^2}{4}\right]\sin 36^\circ - (58.29x9.81) - 2(8.456x9.81) + 2R_Z = 0$$

$$R_Z = -1404.57$$

$\left[\sum F_X = 0\right]$ $$2F\cos 36^\circ + 2R_X = 0$$

$$2\left[6x10^5 x\frac{\pi x 0.08^2}{4}\right]\cos 36^\circ + 2R_X = 0$$

$$R_X = -2440 \text{ N}$$

$$R = \sqrt{R^2 z + R^2 x} = 2851 \text{ N}$$

Bearing Specification

Bearing Number : UC210D1

Basic Load ratings : Dynamic 27000 N

: Static 20700 N

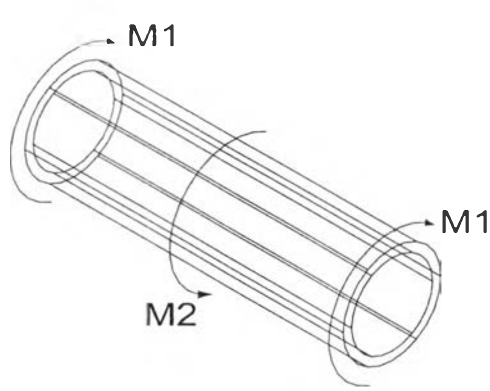
Safety factor = $\frac{20700}{2851}$

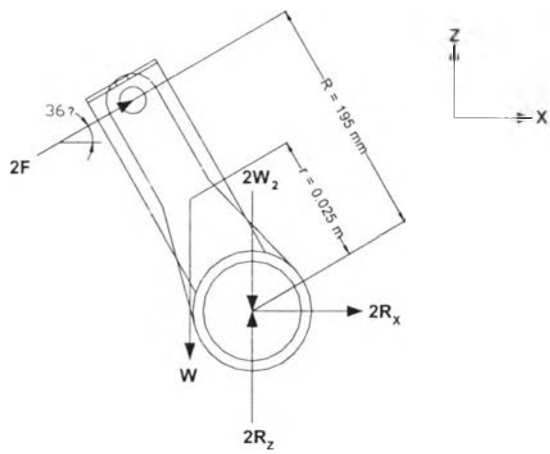
Safety fartor = 7.2

Calculation of Rotor Set

- Torsion

  Assume Rotor Set as a Pipe as shown in figure





W = Weight of Rotor = 58.291 kg

W_2= Weight of Shaft = 8.456 kg

$$M_1 = F \times R$$

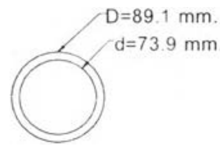
$$= 6 \times 10^5 \times \frac{\pi \times 0.08^2}{4} \times 0.195$$

$$= 588.34 Nm$$

$$M_2 = W \times r \sin 36°$$

$$= (58.29 \times 9.81) \times 0.025 \sin 36°$$

$$= 8.4023 N.m$$



$$J = \frac{\pi}{2}\left(r_o^{\,4} - r_i^{\,4}\right)$$

$$= \frac{\pi}{2}\left(\left(44.55\times10^{3}\right)^4 - \left(73.9\times10^{-3}\right)^4\right)$$

$$= 3.259\times10^{-6}\, m^4$$

$$\tau_{\max} = \frac{T\max r_o}{J} = \frac{5.8834\times0.04455}{3.259\times10^{-6}}$$

$$= 8.04 MPa$$

$$\sigma_y \text{ Steel } A36 = 250 MPa$$

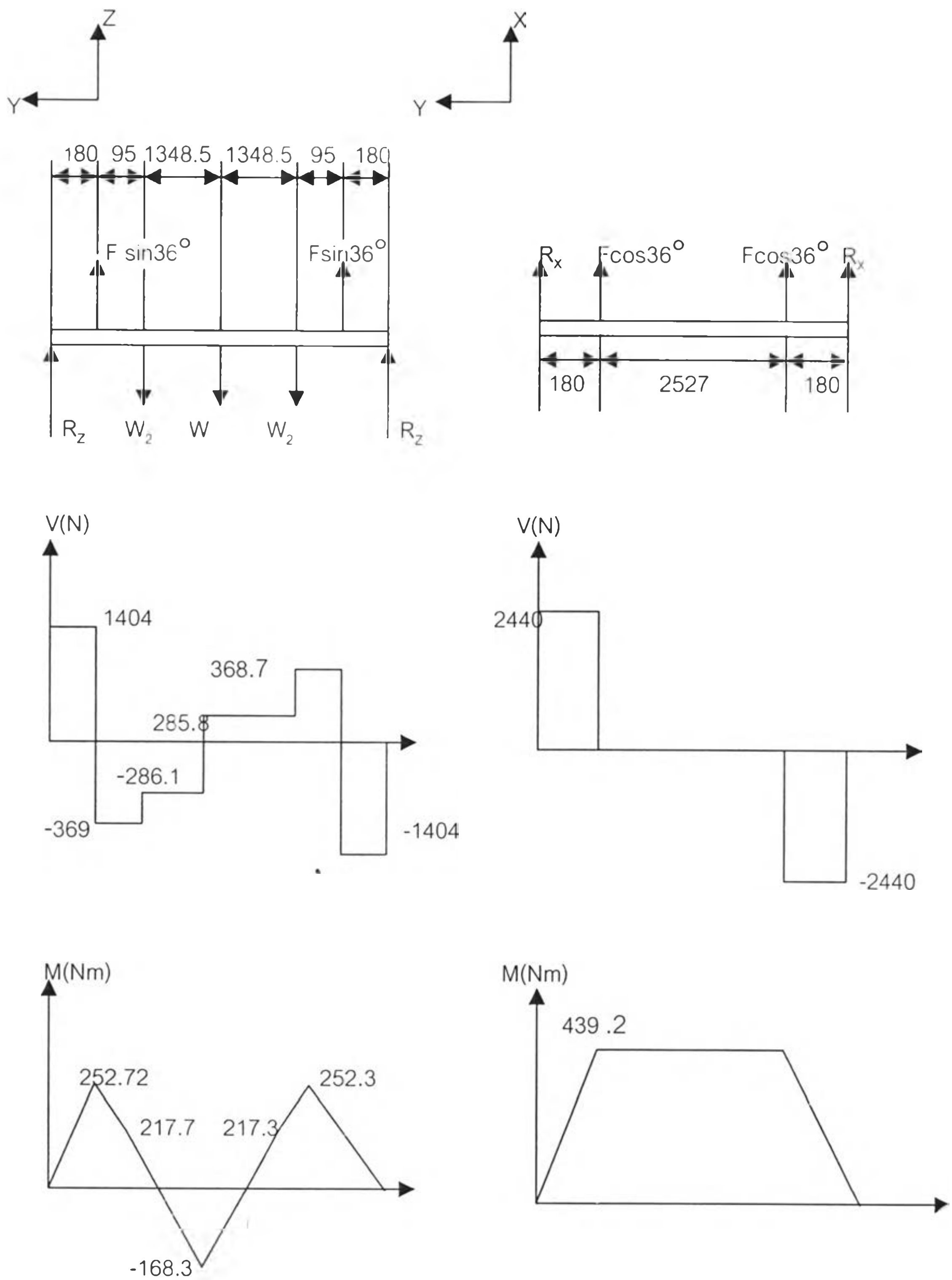
$$\tau_y = 0.5\sigma_y = 125 MPa$$

$$N = \frac{125}{8.04} = 15.54$$

Safety factor = 15.54

- Bending

Shear and Moment Diagram of Rotor



$R_Z = -1404N$, $R_X = -2440N$

$W_2 = 82.95N$, $W = 571.8N$

$F \sin 36° = 1773N$, $F \cos 36° = 2440N$

$$I_{xx} = \frac{\pi}{64}(Do^4 - Di^4) = \frac{\pi}{64}(0.0891^4 - 0.0739^4) = 1.63 \times 10^{-6}$$

$$\sigma_{max} = \frac{M \max C}{I}$$

$$= \frac{439.2 \times \frac{0.0891}{2}}{1.63 \times 10^{-6}} = 12MPa$$

σy steel $= 250MPa$

$$SafetyFactor(N) = \frac{250}{12} = 20.83$$

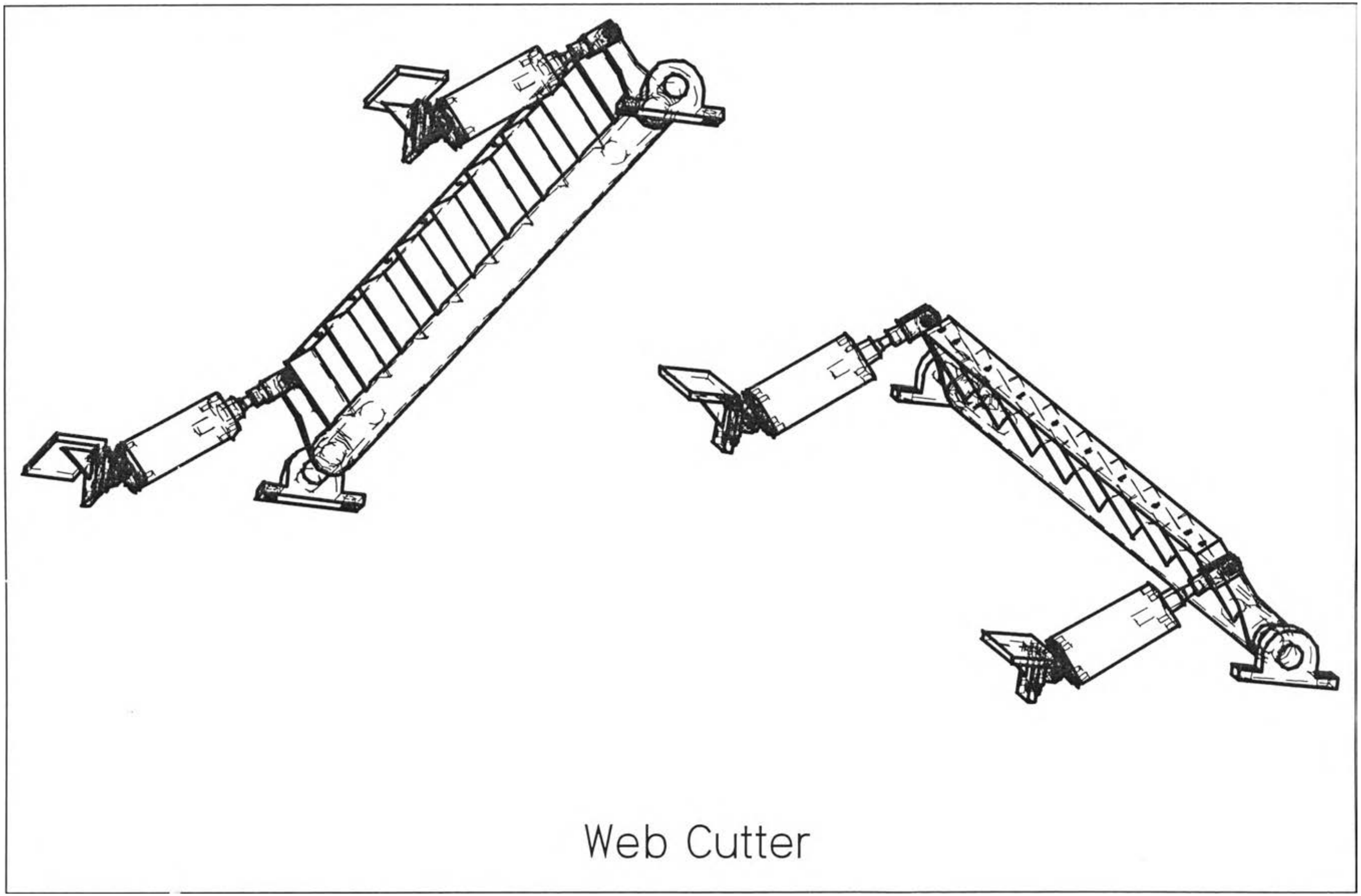


Figure A.1 : Assembly of Rotor Unit

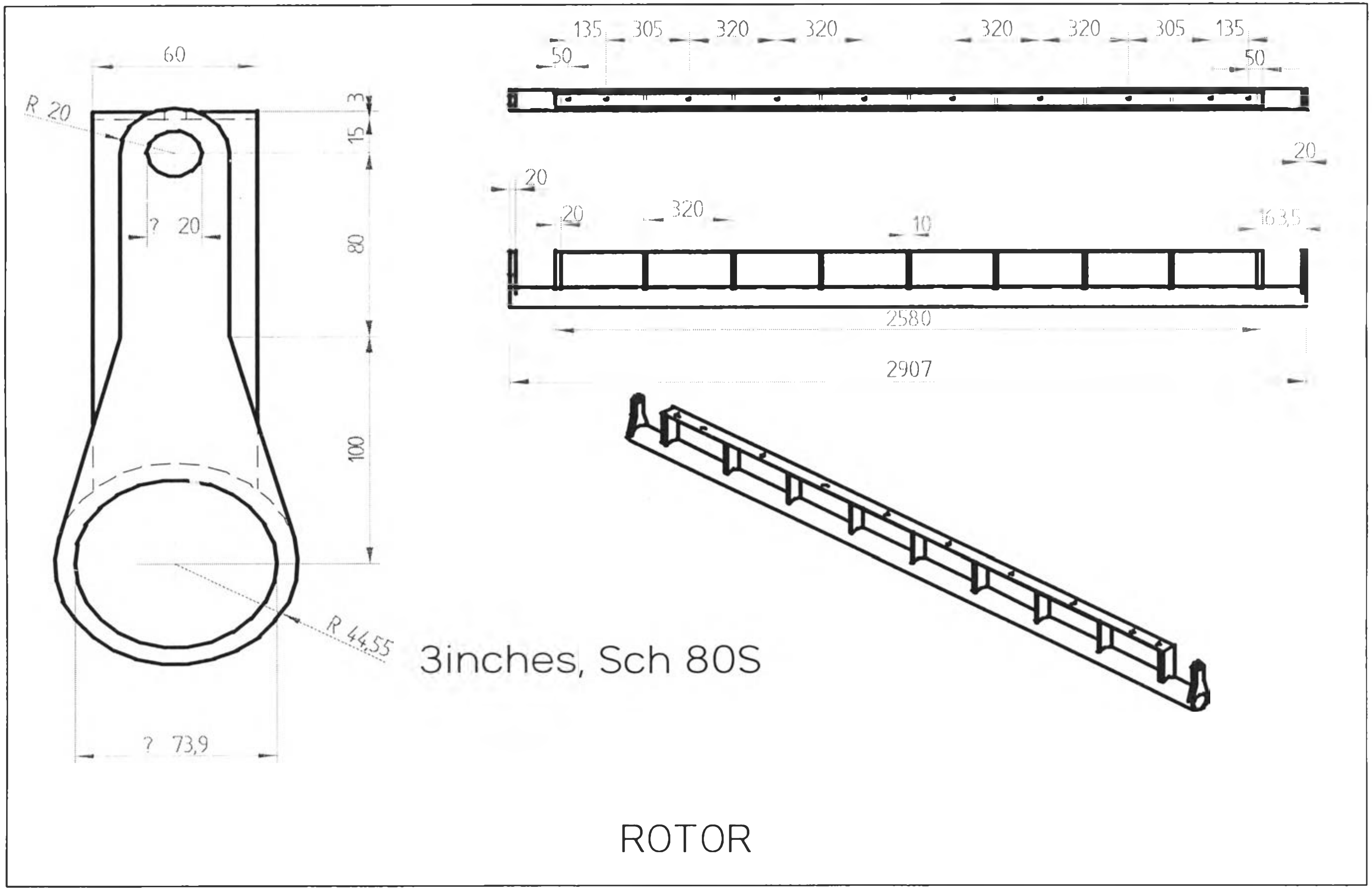


Figure A.2 : Drawing of Rotor

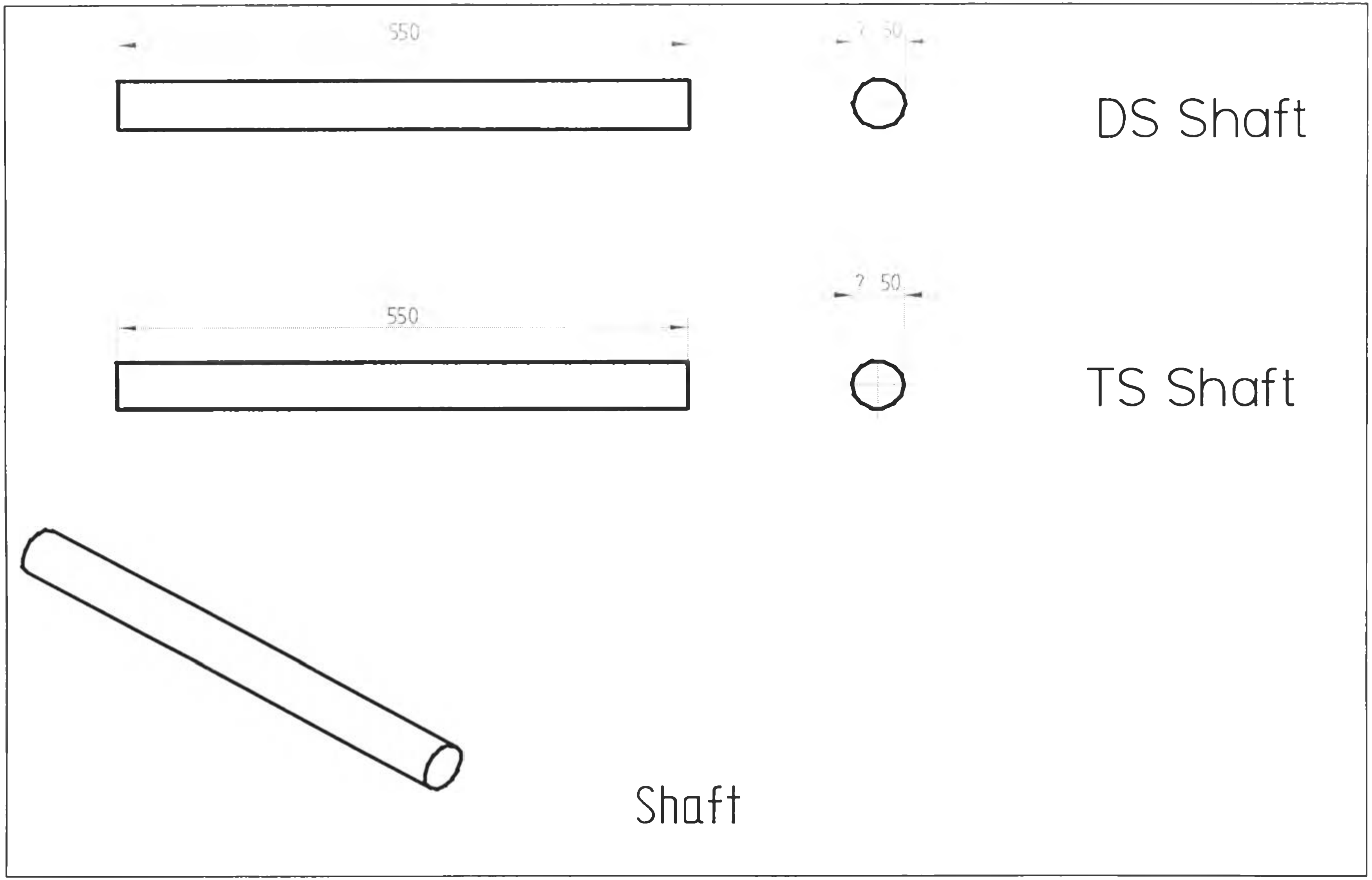


Figure A.3 : Drawing of Rotor Shaft

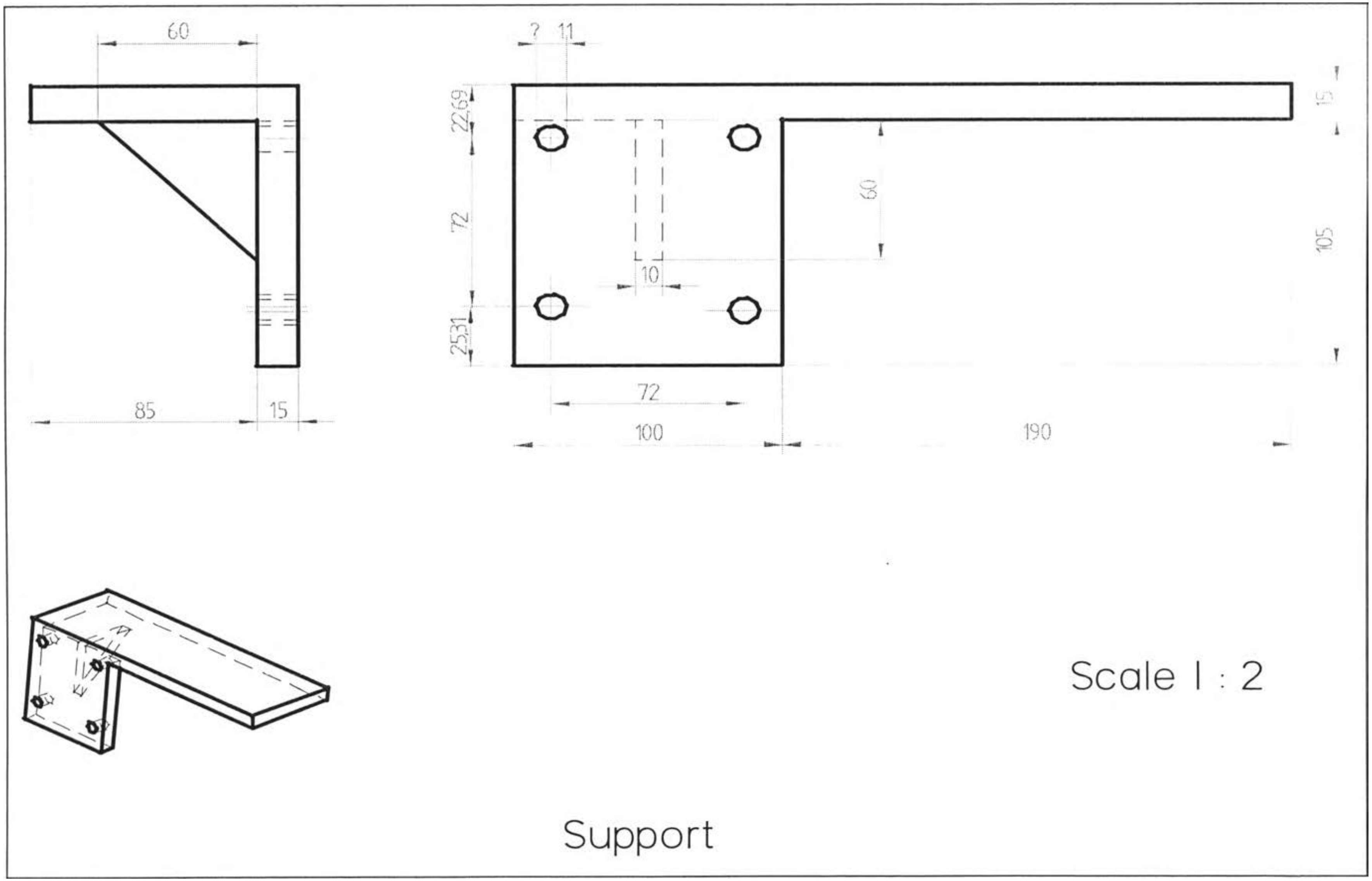


Figure A.4 : Drawing of Pneumatic Cylinder Support (Drive Side)

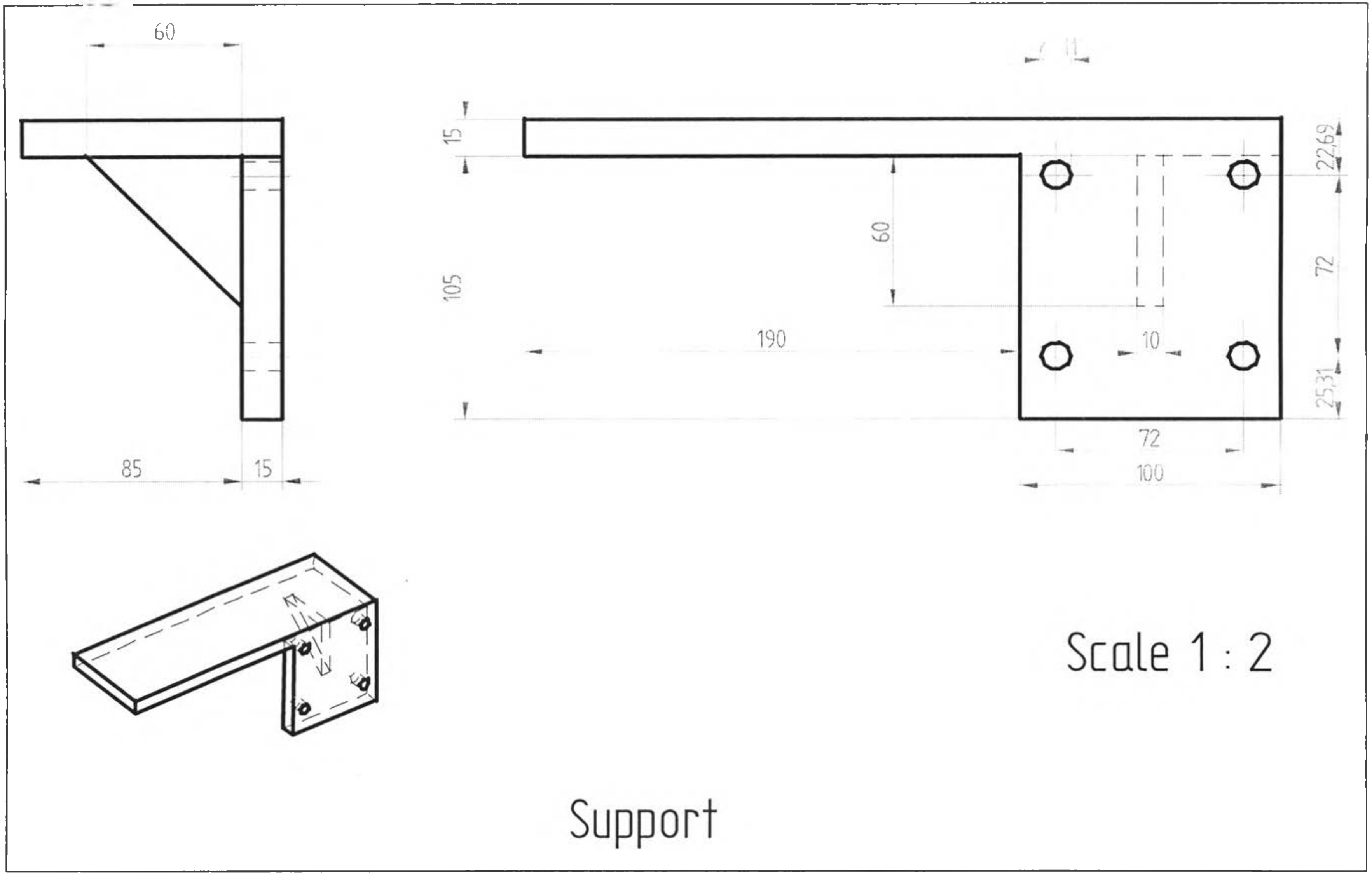


Figure A.5 : Drawing of Pneumatic Cylinder Support (Tender Side)

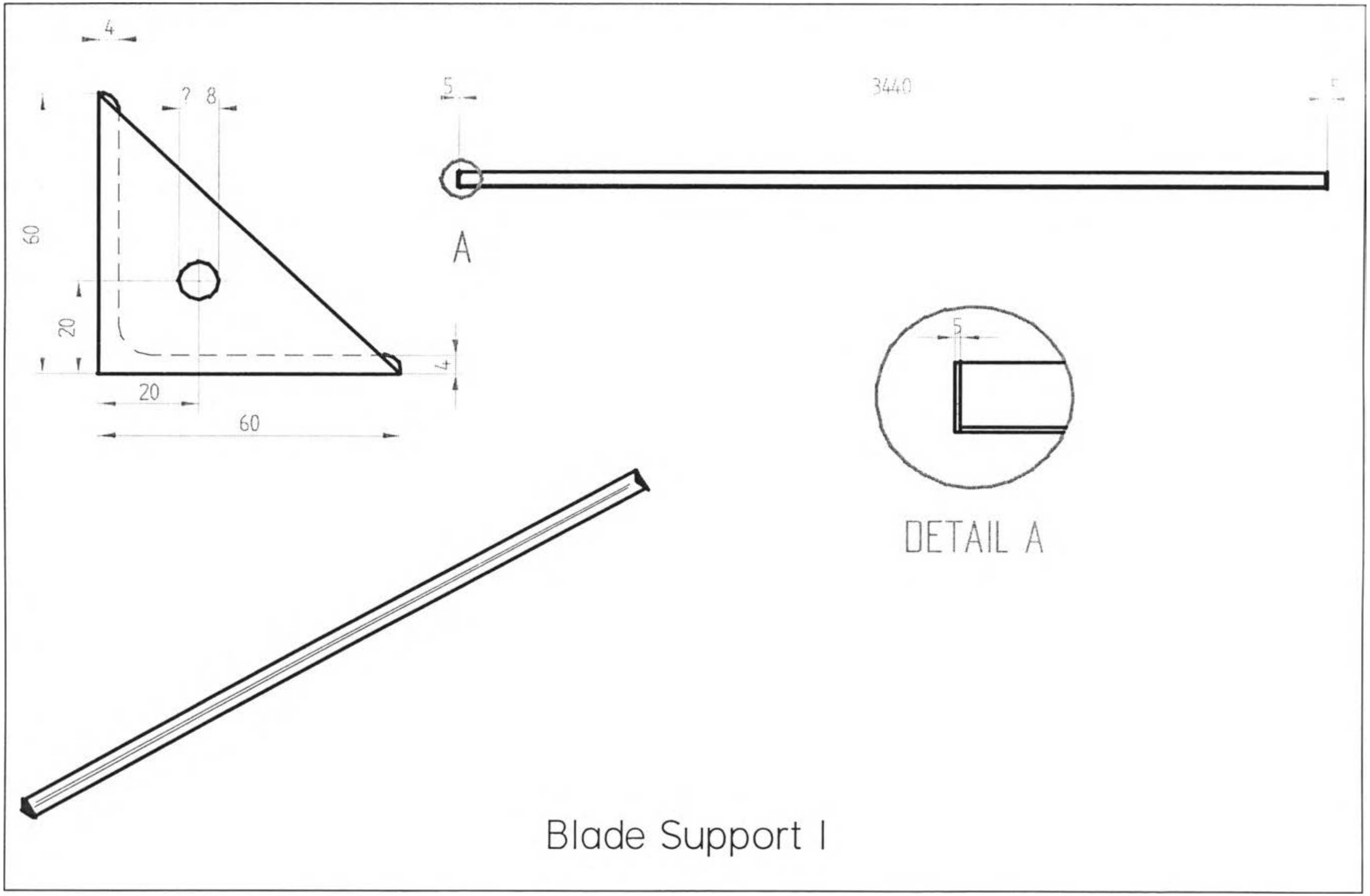


Figure A.6 : Drawing of Stator

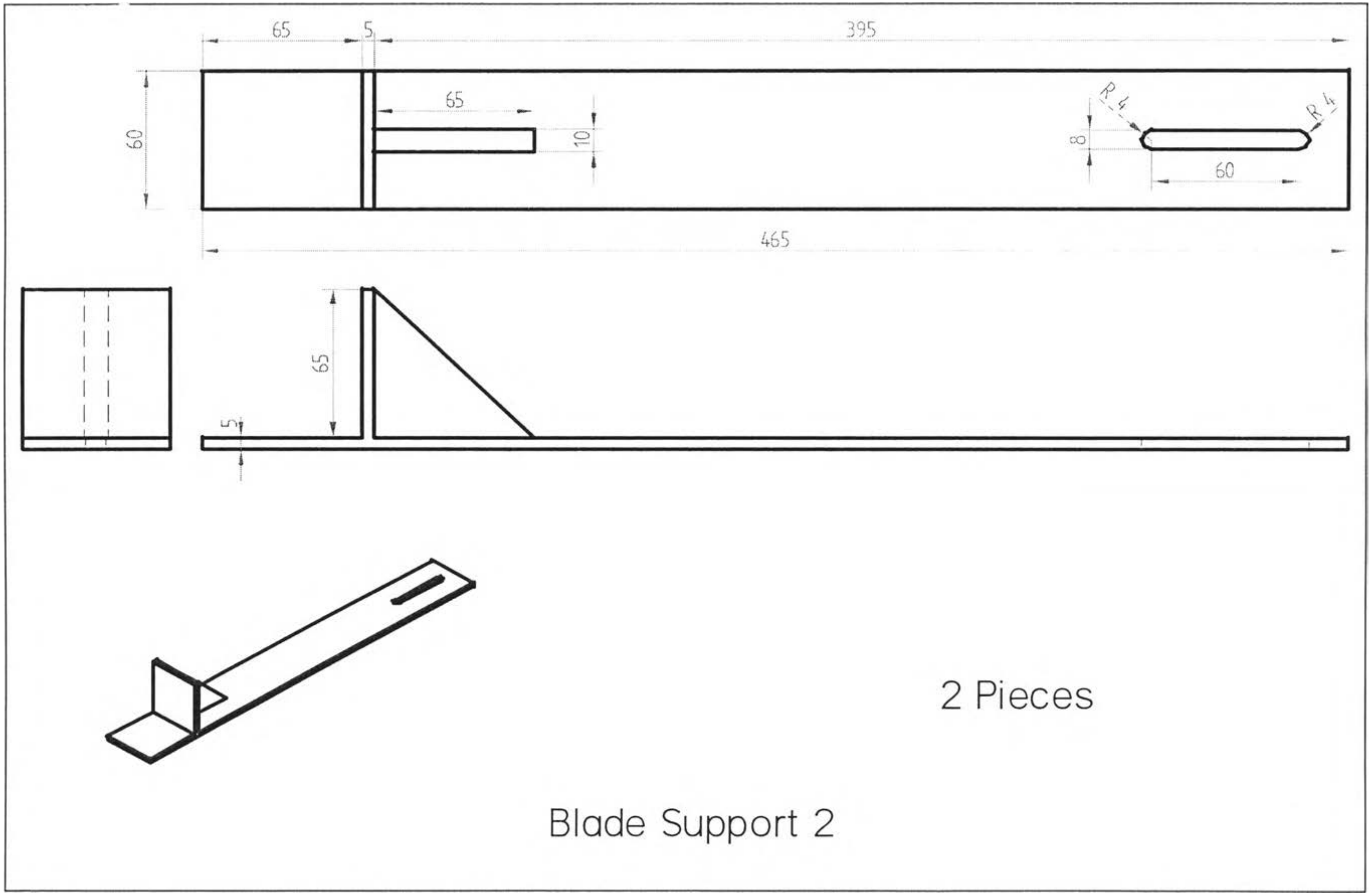


Figure A.7 : Drawing of Stator Support

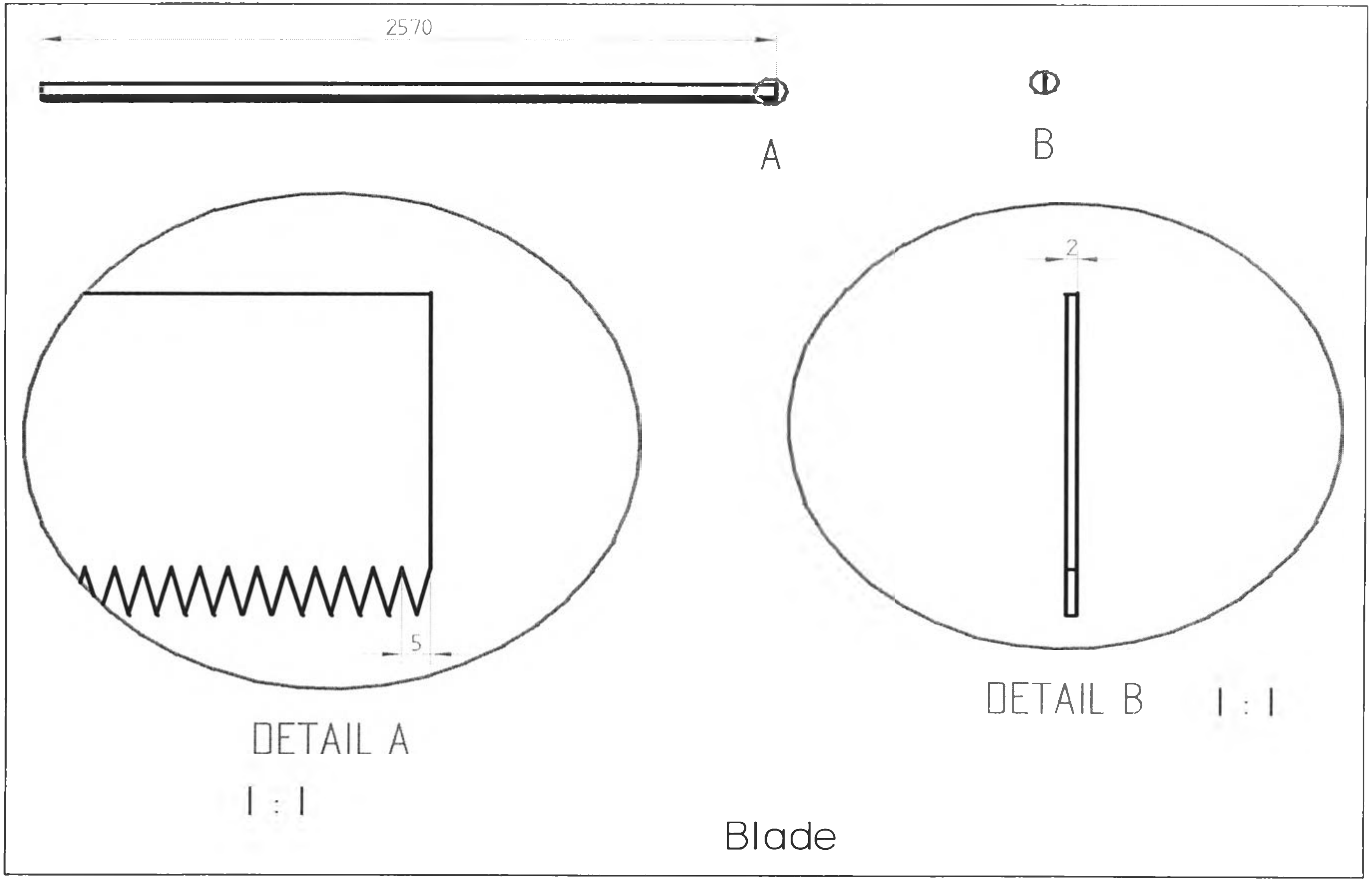


Figure A.8 : Drawing of Cutting Blade

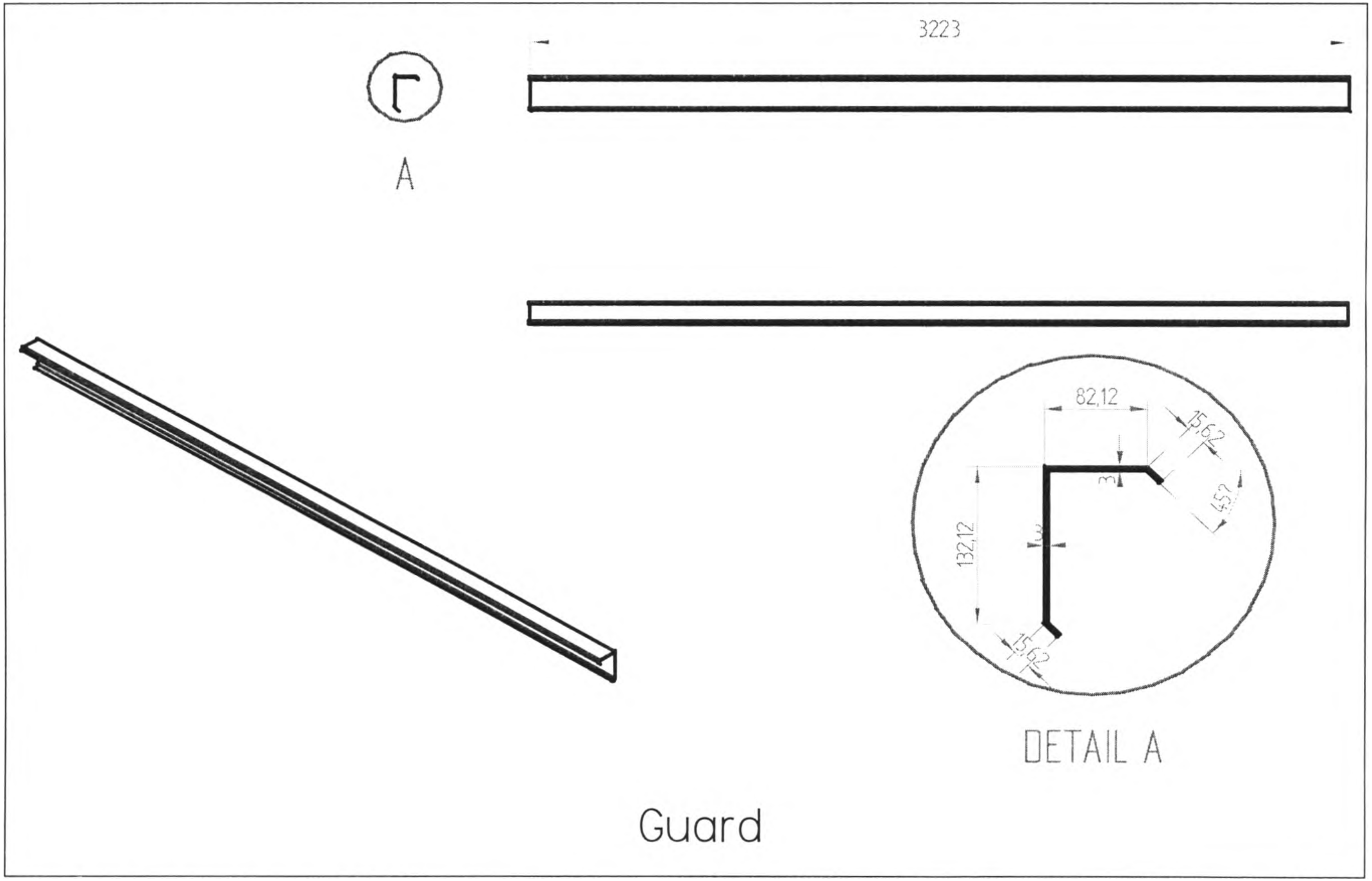


Figure A.9 : Drawing of Guard

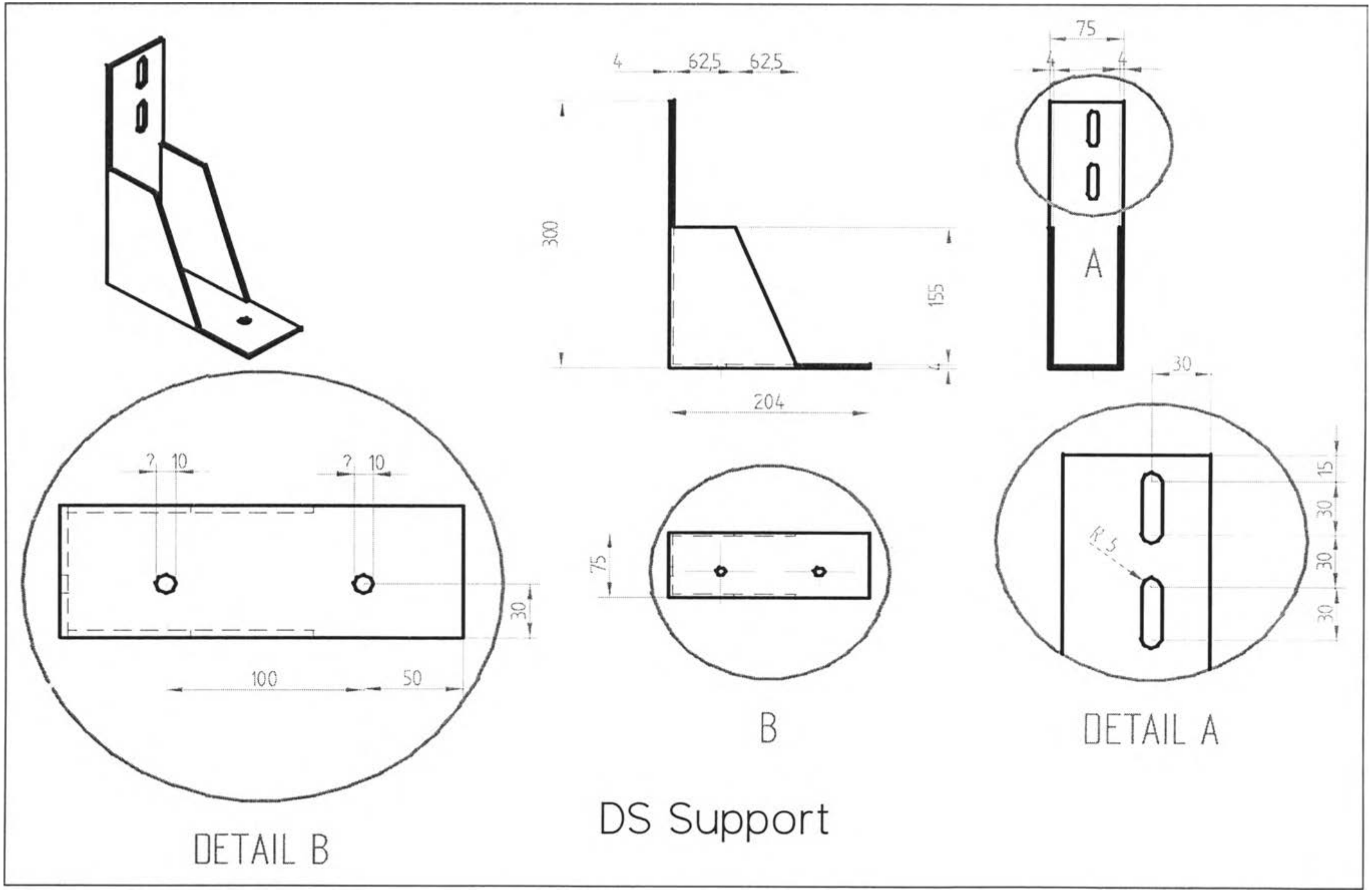


Figure A.10 : Drawing of Guard Support (Drive Side)

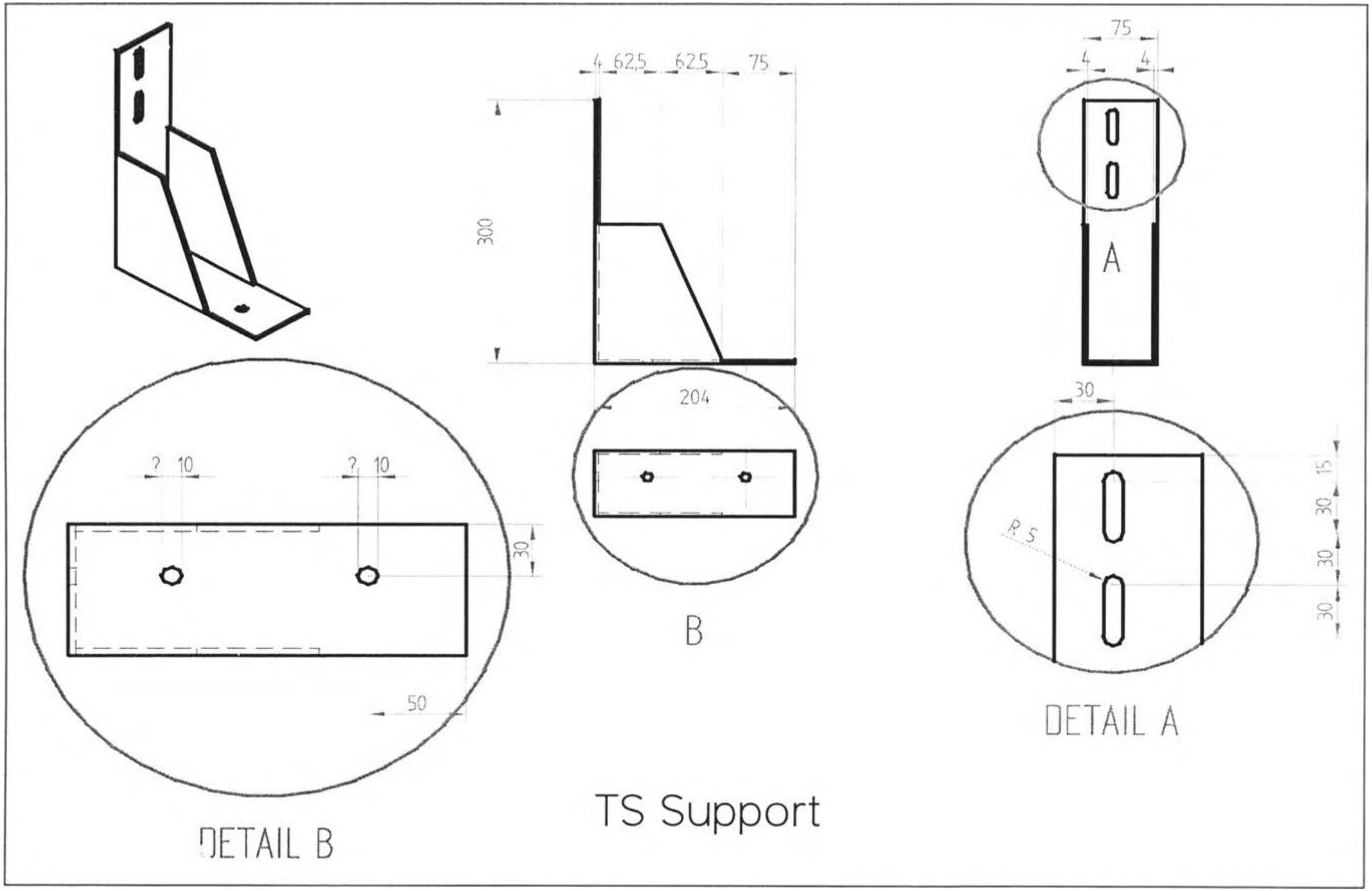


Figure A.11 : Drawing of Guard Support (Tender Side)

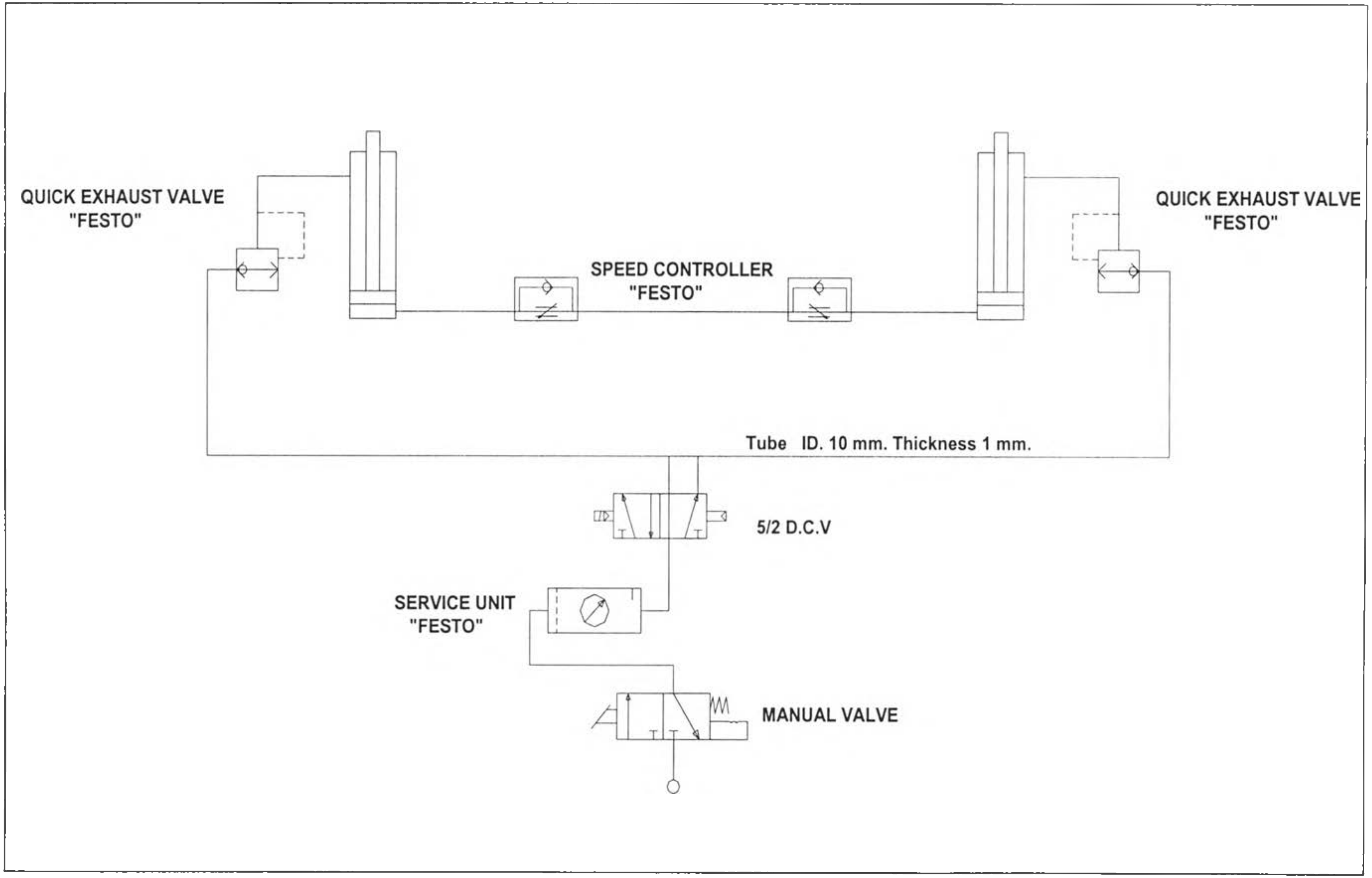
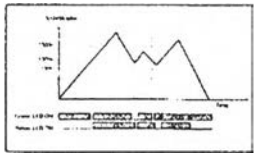


Figure A.12 : Pneumatic Diagram of Web Cutter System

Signal stability indication

The stability indication gives an indication of the level of received light.
The purpose of this feature is to facilitate adjustment as well as to have a dirt alarm.
For the sensor to operate in a stable condition the green LED must be steadily ON.
For the green LED to be steadily ON, please see the table below.

Signal Stability



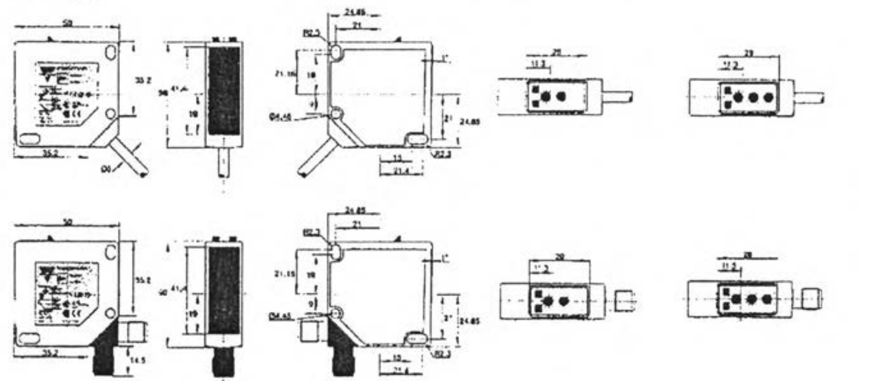
Excess gain	Green LED	Yellow LED Target present	Comments
≤ 0.7	ON	OFF	Supply OK
> 0.7 < 1.0	OFF	OFF	Alignment help
> 1.0 < 1.5	OFF	ON	Output function OK
> 1.5	ON	ON	Stable function

Please notice! ⚠

The PC 50 photoelectric sensors are not designed for personal safety applications

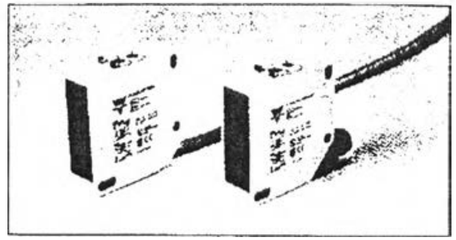
Clean only with a soft damp cloth. Do not use detergents or alcohol.

Dimensions



CARLO GAVAZZI

Photoelectric Switch Type PC 50



User Manual

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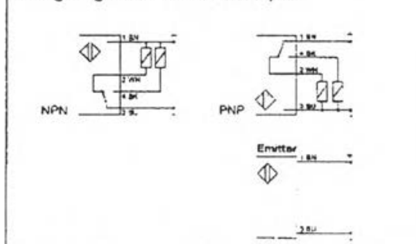
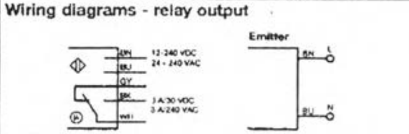
Certified in accordance with ISO 9001

Wiring diagrams - transistor output



Wiring diagrams - relay output



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MAN PC50 MUL 10.07.00
Villen Bogtryk A/S 86 91 08 99

(GB)

Optical alignment and sensitivity adjustment

Retro-reflective and polarised Retro-reflective sensor:
Mount the reflector and the sensor in the required positions.
Turn the distance potentiometer clockwise to maximum.
Adjust the sensor horizontally and vertically until the yellow and the green LEDs go ON to ensure that the beam hits the reflector.
Turn the distance potentiometer counter clockwise until both LEDs go OFF.
For correct adjustment turn the distance potentiometer clockwise until both LEDs are steadily ON again.

(D)

Einstellung der optischen Achse und der Empfindlichkeit

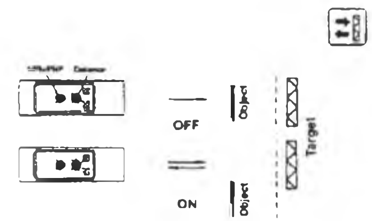
Reflexions-Lichtschranke (mit Polarisationsfilter):
Den Reflektor und die Lichtschranke in der gewünschten Position montieren.
Das "Distance"-Potentiometer in die Maximalposition drehen.
Die Lichtschranke vertikal und horizontal bewegen, bis die gelbe und die grüne LED's aufleuchten. Damit wird sichergestellt, dass der Lichtstrahl den Reflektor trifft.
Das "Distance"-Potentiometer entgegen dem Uhrzeigersinn drehen, bis beide LED's erlöschen.
Zur korrekten Einstellung muss das "Distance"-Potentiometer im Uhrzeigersinn gedreht werden, bis beide LED's konstant aufleuchten.

(DK)

Optisk indstilling og følsomhedsjustering

Retro-reflektiv og polariseret, retro-reflektiv fotoaftaster:
Monter reflektbrikken og fotoaftasteren i de ønskede positioner.
Drej afstandspotentiometeret med uret til maximum.
Juster aftasteren horisontalt og vertikalt indtil den gule og den grønne lysdiode lyser; således sikres, at lysstrålen rammer refleksbrikken.
Afstandspotentiometeret drejes mod minimum indtil begge lysdioder slukker.
Derefter drejes mod maximum indtil begge lysdioder lyser konstant.

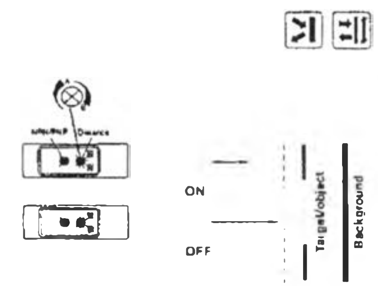
Detection - Make switching (NO)



Diffuse-reflective and diffuse-reflective with background suppression:
Mount the sensor in the required position pointing at the target.
Turn the distance potentiometer counter clockwise to minimum.
Turn the distance potentiometer clockwise until the yellow LED and green LEDs go ON (pos A)
Remove target.
Yellow LED goes OFF.
Turn the distance potentiometer slightly clockwise until yellow LED goes ON again. The background is now detected (pos B) (without background the yellow LED remains OFF).
For correct adjustment turn distance potentiometer to a position midway between pos A and pos B.

Reflexions-Lichttaster und Reflexions-Lichttaster mit Hintergrundausblendung
Den Lichttaster in der gewünschten Position montieren.
Das "Distance"-Potentiometer in die Minimalposition drehen.
Das "Distance"-Potentiometer im Uhrzeigersinn drehen, bis die gelbe und die grüne LED's aufleuchtet (Pos. A)
Das Objekt wegnehmen. Die gelbe LED erlischt.
Das "Distance"-Potentiometer im Uhrzeigersinn drehen, bis die gelbe LED wieder aufleuchtet.
Jetzt wird der Hintergrund detektiert (Pos. B). Ohne Hintergrund bleibt die gelbe LED erloschen.
Zur korrekten Einstellung muss das "Distance"-Potentiometer in die Mittelposition zwischen Pos. A und Pos. B gedreht werden.

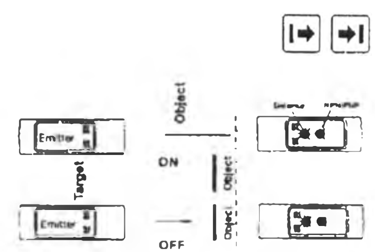
Objektaftaster og objektaftaster med baggrundsudblænding:
Placer aftasteren og objektet i de ønskede positioner.
Drej afstandspotentiometeret mod uret til minimum.
Drej afstandspotentiometeret med uret (mod maximum) indtil den gule og den grønne lysdiode lyser (pos A).
Fjern objektet. Den gule lysdiode slukker. Drej afstandspotentiometeret mod maximum indtil den gule lysdiode igen lyser. Baggrunden er nu detekteret (pos B)
Uden baggrund forbliver den gule lysdiode slukket, når afstandspotentiometeret står i maximum.
For korrekt justering drejes afstandspotentiometeret til en position midt imellem pos A og pos B.



Through-beam sensor:
Mount the emitter and the receiver in the required positions.
Turn the distance potentiometer on the receiver clockwise to maximum.
Move the receiver (and the emitter, if necessary) horizontally and vertically until the yellow and the green LEDs go ON and fix the sensors.
Turn the distance potentiometer counter-clockwise until both LEDs go OFF.
For correct adjustment turn the distance potentiometer clockwise until both LEDs are steadily ON.

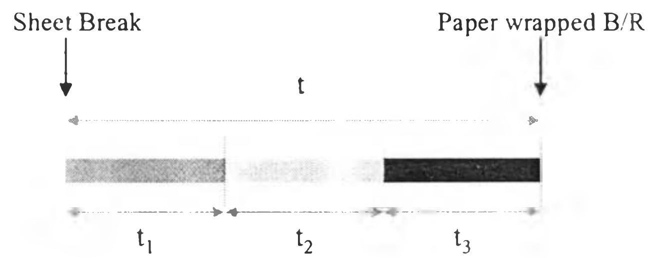
Einweg-Lichtschranke:
Den Sender und den Empfänger in den gewünschten Positionen montieren.
Das "Distance"-Potentiometer des Empfänger's in die Maximalposition drehen.
Die Lichtschranken vertikal und horizontal bewegen, bis die gelbe und die grüne LED's aufleuchten. Damit sind die Lichtschranken korrekt installiert.
Das "Distance"-Potentiometer gegen dem Uhrzeigersinn drehen, bis beide LED's erlöschen.
Zur korrekten Einstellung muss das "Distance"-Potentiometer im Uhrzeigersinn gedreht werden, bis beide LED's kontinuierlich aufleuchtet.

Fotoaftaster med separat sender og modtager:
Monter senderen og modtageren i de ønskede positioner.
Drej afstandspotentiometere: på modtageren til maximum.
Bevæg modtageren (og evt. senderen) horisontalt og vertikalt indtil den gule og den grønne lysdiode lyser.
Fastgør modtager og sender.
Afstandspotentiometere: drejes mod minimum (mod uret) indtil begge lysdioder slukker.
Drej afstandspotentiometeret mod maximum indtil begge lysdioder lyser konstant.



Appendix D

Calculation of Total Duration time of Web Cutter System



t_1 = Response Time of Photoelectric Sensor

t_2 = Duration Time of Pneumatic System

t_3 = Duration Time of Mechanic System

t = Total Duration Time of Web Cutter System

t_1 = 0.001 second (response time of photoelectric switch)

t_2 = Ta + Tb + Tc

Ta = Duration time of Air in tube

Tb = Duration time of Solenoid Valve = 0.1 second

Tc = Friction Loss Time of Pneumatic system = 0.1 second

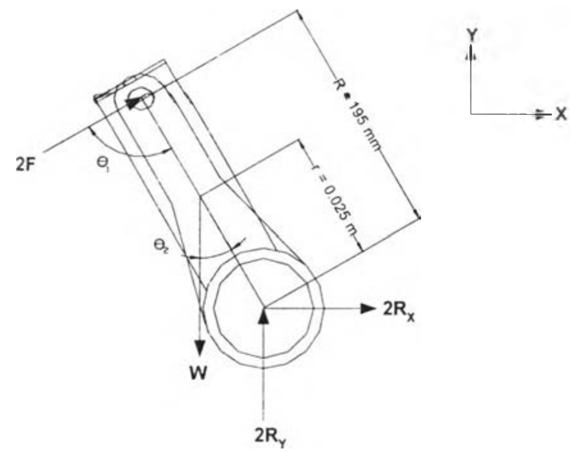
Air flow from Service Unit = 542 l/min @ 5 bar

Diameter of air tube = 10 mm.

Length of air tube = 5.9 m.

$Ta = (5.9\Pi x0.01^2/4) / (542x10^{-3}/60) = 0.0513$ second

t_2 = 0.0513 + 0.1 +0.1 = 0.2513 second



Beginning position θ_1= 90 degree , θ_2= 36 degree

$[\sum M = I\alpha]$, $2FR\sin\theta_1 - Wr\sin\theta_2 = I\alpha$

$I = I_1 + mr^2$

I_1 = 78.75 kg.m^2 (calculation by solid edge)

$I = 78.75 + (75.75x0.025^2 x\alpha)$

$$\left[\frac{(2x6x10^5 x\pi x0.08^2 x0.18x\sin 90)}{4}\right] - (75.75x9.81x0.025x\sin 36) = 78.75 + (75.75x0.025^2 x\alpha)$$

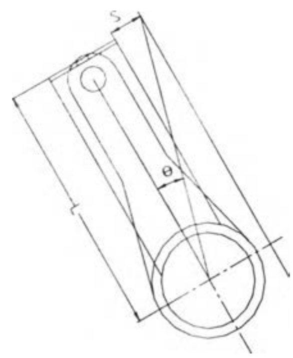
;

α = 13.65 rad/s^2

Ending position θ_1= 60.67 degree , θ_2= 3.53 degree

$$\left[\frac{(2x6x10^5 x0.08^2 x0.18x\sin 60.67)}{4}\right] - (75.75x9.81x0.025x\sin 3.53) = 78.75 + (75.75x0.025^2 x\alpha)$$

α = 12.00 rad/s^2



$S=L\theta$ $50 = 195x\ \theta$; $\theta = 0.2564$ rad

$\theta = vt+0.5\alpha t^2$

$0.2564 = 0t + (0.5x12.86xt^2)$; $t = 0.141$ sec

$t_3= 0.141+0.1 = 0.241$ sec.

Therefore,

Total duration time of web cutter system was

$t = t_1 + t_2 + t_3$

$t = 0.001 + 0.2531 + 0.241$

$t = 0.4933$ second.

Calculation of Required duration time of Web Cutter System

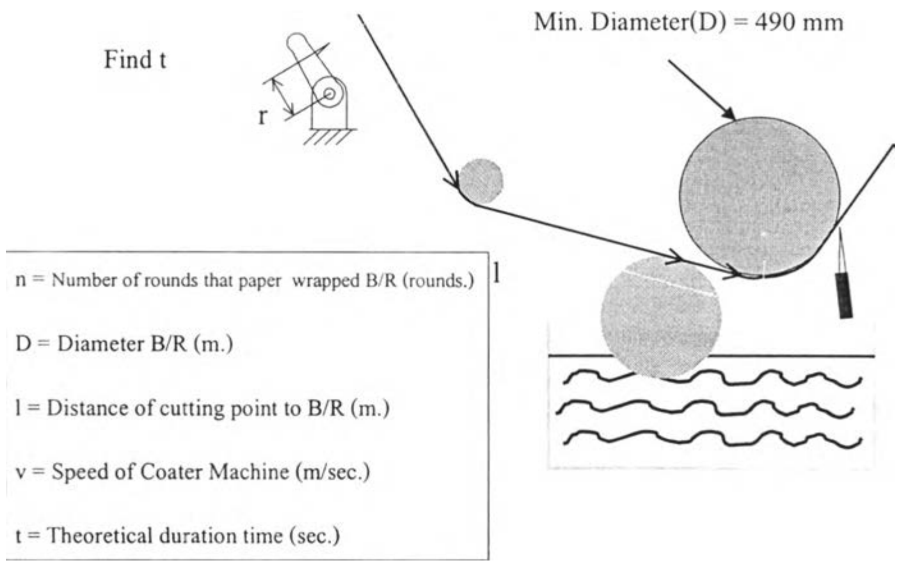


Figure A.15 : Distance from cutter to backing roll

From distance = speed X time

$$S = vt$$

From Figure A.15 , Paper wrapped (jammed) at backing roll for a distance (l)

$$S = vt + l$$

and at backing roll; Paper wrapped (jammed) at backing roll for a distance

$$S = n\pi D$$

Therefore,

$$n\pi D = vt + l$$

The Required duration time of web cutter system was

$$t = \frac{(n\pi D - l)}{v} \qquad (A)$$

From Equation A, the required time of web cutter system could be calculate as shown in Table A.1.

Table A.1 The calculation of required time of web cutter system

Paper Grade	MCT 105	MCT 130	MCT 160
Machine Speed (m/min)	310	300	290
n (rev.)	t (second)		
0	-0.4935	-0.5100	-0.5276
1	-0.1956	-0.2021	-0.2091
2	0.1023	0.1058	0.1094
3	0.4006	0.4140	0.4 283
4	0.6987	0.7220	0.7468
5	0.9962	1.029	1.065
10	2.486	2.569	2.657
13	3.380	3.492	3.613
17	4.572	4.724	4.887

D = 490 mm

l = 2.55 m

Table A.1 is calculated based on the worst case where sheet break occurs exactly at the backing roll.

As shown in Table A.1, the total duration time of the system (t = 0.4933 sec.) would result in about 4 rounds of paper wrapping around the backing roll.

Table A 2 Number of rounds of wrapped paper that damaged backing roll

Paper Grade	[illegible]	Speed (m/min)	Thickness of paper that damaged B.R (mm)	Number of round
1. MCT 105	0.115	310	2	17
2. MCT 130	0.145	300	2	13
3. MCT 160	0.185	290	2	10

From Table A.2, backing roll would be damaged when the paper wrapped at backing roll more than 10 rounds. From the above analysis, the paper is likely to wrap for only 4 rounds. Therefore, the web cutter system installed at coating head no#2 could prevent the damage of backing roll.

Table A.3 Summary Sheet Break Loss Time Data in June 2002 to February 2003

		Before Modification					After Modification		Improvement 1		AVG. before	AVG. After	Diff.
Uint		Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03			
time	Sheet Break	66	70	60	56	60	60	60	58	46			
	wrapped CH1	18	21	18	24	27	25	16	18	15			
	wrapped CH2	14	15	11	14	16	110	115	40	55	14	80	-66
Mintues	Loss Time	2170	2260	2305	1985	2185	1785	2020	1580	1475			-471.43
	wrapped CH1	545	690	575	805	780	560	415	565	410			
	wrapped CH2	450	475	525	565	540	110	115	40	55			
Coating	Repair B/R	85				95			90				
Head 1	Change B/R	125				180			120				
Coating	Repair B/R		100	95	75								
Head 2	Change B/R		185	190	200								
	total loss time	2380	2545	2590	2260	2460	1785	2020	1790	1475	2447	1767.5	679.5
	loss time wrapp 1	755	690	575	805	1055	560	415	775	410			27.77
	loss time wrapp 2	450	760	810	840	540	110	115	40	55			

Table A.4 Summary Machine Runnability from November 2003 to February 2003

	Nov-02	Dec-02	Jan-03	Feb-03
Number of Sheet Break (times)	60	60	58	46
Web Cutter System Functional	60	60	58	46
Paper Web tear by Cutting Kinfe	28	32	55	45
wrapped head1	25	16	18	15
wrapped head2	6	3	2	2
% Cutting Efficiency	46.67	53.33	94.83	97.83

Table A.5 Sheet Break Loss Time Data in June 2002

	Jun-02									
Day	Number of Sheet Break (times)	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
		CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	4	2		2	105	60		60		
2	9	2	1	2	290	85	45	85		
3	4				115					
4	3	2	2	2	115	75	75	75		
5										
6	4				95					
7	3				90					
8	2	2		2	70	70		70		
9										
10										
11										
12	3				120					
13	1	1	1	1	30	30	30	30		
14	2	1	1	1	65	20	20	20		
15	1				40					
16	1				25					
17										
18	3		1	1	125		45	45		
19	1				40					
20	2				70					
21	4	2	2	2	120	50	50	50		
22	3				140					
23										
24	1				40					
25	7	2	2	2	215	30	60	60	85	125
26	2	1	1	1	55	25	25	25		
27	1	1	1	1	40	40	40	40		
28										
29	3	2	2	2	105	60	60	60		
30	2				60					
31										
TOTAL	66	18	14	19	2170	545	450	620	85	125

CH1 = Coating Head No#1

CH2 = Coating Head No#2

(shaded box) Repaired/Changed Backing Roll

Table A.6 Sheet Break Loss Time Data in July 2002

	Jul-02									
Day	Number of Sheet Break (times)	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
		CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	2	2	1	2	60	60	30	60		
2	4	2		2	205	115		115		
3	1				30					
4	1				30					
5	4				115					
6	3				95					
7	2		1	1	80		50	50		
8	3	1		1	120	50		50		
9	4	1		1	125	30		30		
10	3				80					
11	1				20					
12										
13										
14	1				40					
15	1	1	1	1	35	35	35	35		
16	3				85					
17	1				45					
18	5				150					
19	4	3	3	3	95	70	20	70	100	185
20	3	2	1	2	125	90	45	90		
21	1	1		1	65		65	65		
22	3	1	1	1	75	25	25	25		
23	1	1	1	1	15	20	20	20		
24	2				60					
25	2	1	1	1	45	25	15	25		
26										
27	2	1	1	1	85	50	50	50		
28	2				70					
29	4				100					
30	2				70					
31	5	4	4	4	140	120	120	120		
TOTAL	70	21	15	22	2260	690	475	805	100	185

CH1 = Coating Head No#1

CH2 = Coating Head No#2

(shaded box) Repaired/Changed Backing Roll

Table A.7 Sheet Break Loss Time Data in August 2002

Day	Aug-45									
	Number of Sheet Break (times)	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
		CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	3	1	1	1	110	50	50	50		
2	1				20					
3	2	2	1	2	140	140	40	140		
4	3				80					
5	3		1	1	130		70	70		
6	2				40					
7	4				140					
8	2	2		2	75		75	75		
9	3				75					
10	2				55					
11	4	2		2	100	45		45		
12	3				105					
13	1	1		1	45	45		45		
14										
15	3				110					
16	1				30					
17	1	1		1	45		45	45		
18	2	1	1	1	110	40	40	40		
19	4				245					
20	1				35					
21	3	3	2	3	90	90	30	90	95	190
22	1				70					
23	1				75					
24										
25	1	1		1	25	25		25		
26										
27	1	1	1	1	35	35	35	35		
28	3	1	1	1	130	30	30	30		
29	1		1	1	35		35	35		
30	3	2	2	2	125	75	75	75		
31	1				30					
TOTAL	60	18	11	20	2305	575	525	800	95	190

CH1 = Coating Head No#1

CH2 = Coating Head No#2

(shaded box) Repaired/Changed Backing Roll

Table A.8 Sheet Break Loss Time Data in October 2002

Day	Oct-02									
	Number of Sheet Break (times)	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
		CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	2	1	1	1	60	25	25	25		
2	1	1		1	35		35	35		
3	10	5	1	5	325	145	35	145		
4	6	3	2	3	190	100	25	100		
5	1	1	1	1	30	30	30	30		
6	1				100					
7	1	1	1	1	35	35	35	35		
8	1				40			40		
9										
10										
11										
12	3				95					
13										
14	3	3	2	3	120	120	20	120	95	180
15	2	1	1	1	75		35	35		
16	2	1		1	80		45	45		
17	3				105					
18	4				105					
19	4		1	1	230		50	50		
20	3				75					
21	4	4	3	4	115	115	100	115		
22										
23										
24	1	1	1	1	40	40	40	40		
25	1	1	1	1	20	20	20	20		
26										
27	2				65					
28	3	2	1	2	175	150	45	150		
29	2	2		2	70					
30										
31										
TOTAL	60	27	16	28	2185	780	540	985	95	180

CH1 = Coating Head No#1

CH2 = Coating Head No#2

(shaded box) Repaired/Changed Backing Roll

Table A.9 Sheet Break Loss Time Data in November 2002

	Nov-02										
Day	Number of Sheet Break (times)	paper web tear by knife	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
			CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	5	2	4	1	4	160	160	20	160		
2	2	2	2	0	2	55			55		
3	1	1	1	0	1	40			40		
4	1	1				25					
5	1	1				25					
6	1					45					
7	2	1				85					
8	5	2	2	1	2	170	65	20	65		
9	6	3	1		1	140			30		
10	2					55					
11	3	1	1	0	1	100			25		
12	1		1	0	1	35			35		
13	1					25					
14											
15	3	1	2	1	2	85	60	20	60		
16	2	1	1		1	65			35		
17	2	1				50					
18	2	1	1	0	1	70					
19											
20											
21											
22											
23											
24											
25											
26	1					25					
27	8	3	3	1	3	210	85	15	85		
28	5	3	3	1	3	145	95	20	95		
29	3	1	3	1	3	95	95	15	95		
30	3	3				80					
31											
TOTAL	60	28	25	6	25	1785	560	110	780	0	0

CH1 = Coating Head No#1

CH2 = Coating Head No#2

Table A.10 Sheet Break Loss Time Data in September 2002

Sep-02										
Day	Number of Sheet Break (times)	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
		CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	4	2	1	2	165	85	40	85		
2	2	1		1	65		25	25		
3	3	3	1	3	105	105	35	105		
4	2			1	65		45	45		
5	5				155					
6	2	2	1	2	50	50	30	50		
7	2	1	1	1	55	25	25	25		
8	2	1	1	1	55	20	20	20		
9	2	1	2	2	75	20	45	45		
10	2				55					
11										
12										
13										
14	1	1		1	40	40		40		
15	2	1	1	1	55	30	30	30		
16	3	2	1	2	120	85	40	85		
17	1	1	1	1	30	30	30	30		
18	2	1	1	1	70	70	70	70		
19	3				100					
20	7				235					
21										
22										
23	2	2	1	2	85	40	85	85		
24	3	3	1	3	135	135		135	75	200
25	2	1	1	1	85	45	45	45		
26	3	1			150	25		25		
27										
28	1				35					
29										
30										
31										
TOTAL	56	24	14	25	1985	805	565	945	75	200

CH1 = Coating Head No#1

CH2 = Coating Head No#2

(shaded box) Repaired/Changed Backing Roll

Table A.11 Sheet Break Loss Time Data in December 2002

	Dec-02										
Day	Number of Sheet Break (times)	paper web tear by knife	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
			CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	6	4				200					
2	4	2				115					
3	1	1				35					
4											
5	1					55					
6	2	1				85					
7	1	1	1	1	1	25	25	25	25		
8											
9	4	3	2		2	145	45		45		
10	5	3	3		3	150	60		60		
11	2	1				65					
12	3	2				100					
13	1	1	1		1	30	30		30		
14	3	2				90					
15	2	1	1		1	55	25				
16	2	1	1		1	60	25				
17	1	1				50					
18	2	1	1		1	80	20				
19	2		1		1	75	30				
20	2	1	1		1	75	25				
21	1					25					
22	2		1	1	1	45	25	25	25		
23	3	1	2		2	105	40		40		
24	1					30					
25	1	1				30					
26	1					40					
27											
28											
29											
30	3	2				100					
31	4	2	1	1	1	155	65	65	65		
TOTAL	60	32	16	3	16	2020	415	115	290	0	0

CH1 = Coating Head No#1

CH2 = Coating Head No#2

Table A.12 Sheet Break Loss Time Data in January 2003

	Jan-03										
Day	Number of Sheet Break	paper web	PEPER WRAPPED B/R (times)			LOSS TIME (minutes)					
	(times)	tear by knife	CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	REPAIRED B/R	CHANGED B/R
1	2	2	2	1	2	80	80	20	80		
2	6	5									
3	3	2	1	0	1	100	100			90	120
4	6	6				200					
5	2	2	1	0	1	60	30		30		
6	2	2	1		1	70	30		30		
7	1	1				30					
8	2	2									
9											
10											
11	1	1	1		1	25					
12	2	2				75					
13	3	3	2		2	60	45		45		
14	3	3	2		2	100	40		45		
15	1	1				25					
16	4	4	2		2	100	50		50		
17											
18											
19											
20	4	4	2		2	140	40		40		
21	5	4	3	1	3	175	120	20	120		
22	2	2		0	0	65					
23	1	1				25					
24	1	1				25					
25											
26											
27	1	1				35					
28	3	3	1		1	80	30		30		
29	1	1				40					
30											
31	2	2				70					
TOTAL	58	55	18	2	18	1580	565	40	470	90	120

CH1 = Coating Head No#1

CH2 = Coating Head No#2

[ ] Repaired/Changed Backing Roll

Table A.13 Sheet Break Loss Time Data in February 2003

Day	Number of Sheet Break (times)	paper web tear by knife	PEPER WRAPPED B/R (times)			LOSS TIME (minute					
	Feb-03		CH1	CH2	CH1&CH2	SHEET BREAK	CH1	CH2	CH1&CH2	RE PAIRED B/R	CHANGED B/R
1	1	1				45					
2											
3											
4	2	2	1	0	1	85	50		50		
5	3	3	1		1	100	25		25		
6	4	4	2	1	2	135	60	20	60		
7	2	2				55					
8	1	1				35					
9	1	1				15					
10	2	2				70					
11	5	5	2		2	125	45		45		
12	2	2	1	1	1	60	35	35	35		
13	3	3	1		1	90	30		30		
14	2	2				85					
15	2	2	1		1	90	30		30		
16											
17											
18											
19											
20	1	1				45					
21	3	3	2		2	80	35		35		
22											
23	2	2				45					
24	3	2	1		1	75	30		30		
25	2	2	1		1	60	25		25		
26	2	2	1		1	80	20		20		
27	1	1				20					
28	2	2	1		1	80	25		25		
29											
30											
31											
TOTAL	46	45	15	2	15	1475	410	55	410	0	0

CH1 = Coating Head No#1

CH2 = Coating Head No#2

BIOGRAPHY

Thitiwat Tananuprawat was born on January 6th, 1974 in Bangkok, Thailand. He graduates from Kasetsart University, School of Engineering in 1996 with a Bachelor degree in Mechanical engineering. He has been working at Thai Union Paper Public Company Limited in Paper and Packaging Business of Siam Cement Group as a Process Engineer since 1996.