

“Merchant Sections”

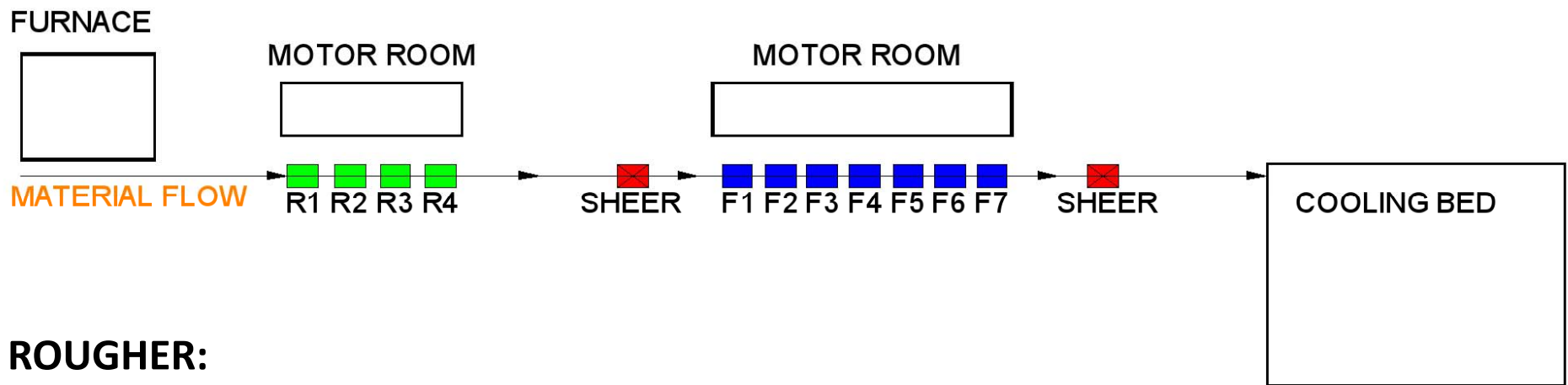
by

Johnny Adkins

SMG Master Roll Designer



Mill Info



ROUGHER:

4 STAND IN-LINE

42" HORIZONTAL /VERTICAL MILLS

2000 MAX HP MOTOR x 4

USING 1 : 1 GEAR RATIO IN CALCULATIONS

FINISHER:

7 STAND IN LINE

42" HORIZONTAL / UNIVERSAL MILLS

1500 MAX HP MOTOR x 7

Discipline 1a for IRD Certification Program “Merchants”



Sizes less than 3". Design for any 3 of the below 5 listed

a.Rounds (2.5" , 2" , 1.75" , 1.5" , 1.25")

b.Angles

c.Channel (3")

d.Flat (3" x 0.5")

e.Hex or Square

f.Design for “T”

Discipline 1a) a. Design for Rounds



Styles of passes

- Square /Oval /Round
- Slab /Box /Oval /Round
- Square /Box /Oval /Oval /Round
- Round /Oval /Round

Round / Oval / Round

Determine other sizes to run



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction														
2	ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%														
3	Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
4	1-A-0001			Billet	3.036	3.036			2250							9.217							
5	1-A-0002		H BOX (PINCH)	R1			3.036	#DIV/0!			36	#DIV/0!	#DIV/0!	#####	Iron		100.0%		#DIV/0!	23.7	#DIV/0!	#####	#####
6	1-A-0003		V SLUG	R2			0.000	#DIV/0!			36	#DIV/0!	#DIV/0!	#####	Iron		#DIV/0!		#DIV/0!	0.0	#DIV/0!	#####	#####
7	1-A-0004	2.5" ROUND	Fin Round	R3			0.000	#DIV/0!			36	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!		#DIV/0!	0.0	#DIV/0!	#####	#####
8	1-A-0005		V OVAL	R4			0.000	#DIV/0!			36	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!		#DIV/0!	0.0	#DIV/0!	#####	#####
9	1-A-0006	2" Round	Fin Round	1			0.000	#DIV/0!			24	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!	#NUM!	#DIV/0!	0.0	#DIV/0!	#####	#####
10	1-A-0007		OVAL	2			0.000	#DIV/0!			20	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!		#DIV/0!	0.0	#DIV/0!	#####	#####
11	1-A-0008	1.75" Round	Fin Round	3			0.000	#DIV/0!			24	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!	#NUM!	#DIV/0!	0.0	#DIV/0!	#####	#####
12	1-A-0009		OVAL	4			0.000	#DIV/0!			20	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!		#DIV/0!	0.0	#DIV/0!	#####	#####
13	1-A-0010	1.5" Round	Fin Round	5			0.000	#DIV/0!			24	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!	#NUM!	#DIV/0!	0.0	#DIV/0!	#####	#####
14	1-A-0011		OVAL	6			0.000	#DIV/0!			20	#DIV/0!	#DIV/0!	#####	Steel		#DIV/0!		#DIV/0!	0.0	#DIV/0!	#####	#####
15	1-A-0012	1.25" Round	Fin Round	7			0.000	#DIV/0!			24	#DIV/0!	1000	#####	Steel	1.255	#DIV/0!	18.1%	0.000	0.0	#DIV/0!	#####	#####

Calculate feeder sizes



	A	B
1		
2	W1	2.500
3	H1	3.500
4	DIAMETER OF ROUND	3.036
5	MEAN DIA. ROLLS	20
6	TEMP	1000
7	"IRON" OR "STEEL"	IRON
8	ROLLING SPEED (FT/m)	1700
9	CARBON %	0.4
10	MAGANESE %	0.8
11	CROMIUM %	1
12	W2	3.082
13	Free Radius	1.420
14	Angle (Degrees)	34.6
15	AREA (Sq. In.)	7.295
16		

Trinks uses a base formulae for calculating these measurements.

$$W_1 = 0.99 (d) - 1/16''$$

$$H_1 = 1.18 (d) + 1/16''$$

$$R = 2/3 (d) + 1/8''$$

$$W_p = 1.3 + 1/64''$$

W_1 = Width of Oval

H_1 = Height (thickness) Oval

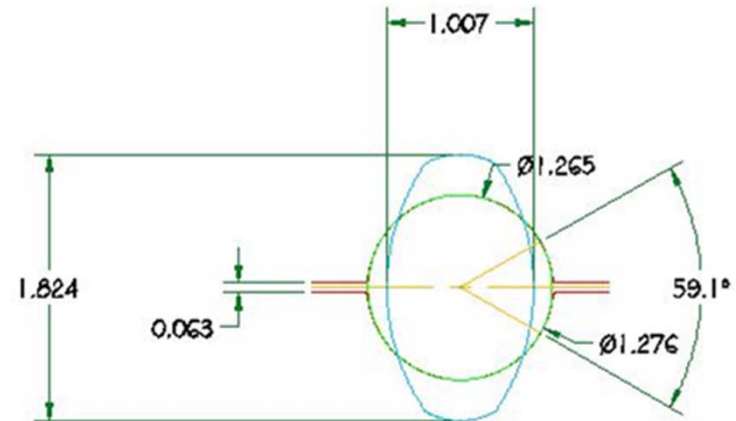
R = Radius of Oval

W_p = Width of pass

Merchant Rounds F7 Finish Pass



- 1.25" Round Double plug design.
- Elongation is at 1.17. This is close to being too small so I will keep a narrow leader entering to try to better guide bar into pass.

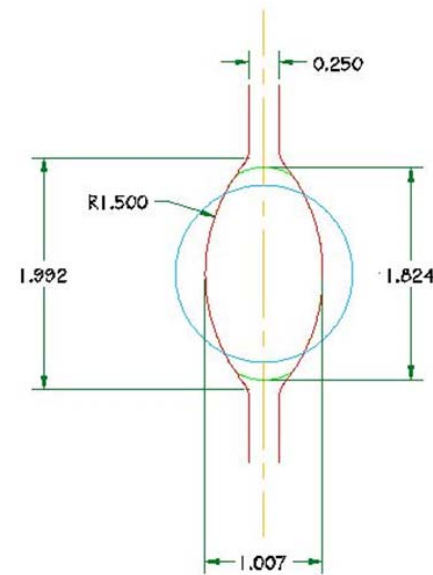


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction															
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds F6 Pre-Finish Pass



- Single radius oval.
- 1.5" Diameter Round Feeding.
- 19% Reduction.
- 1.24 Elongation.

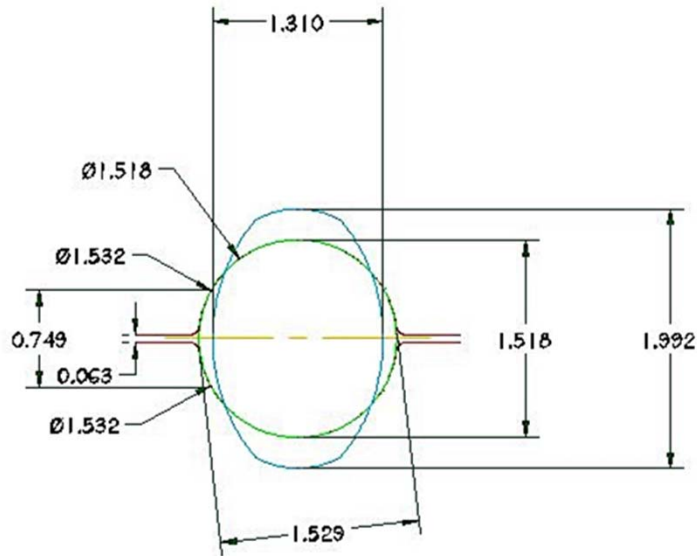


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction														
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%														
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
1-A-0001			Billet	3.036	3.036			2250							9.204							
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865

Merchant Rounds F5 Leader



- 1.5" Diameter Double Plug Finish Pass.
- 13.4% Reduction.
- 1.16 Elongation.

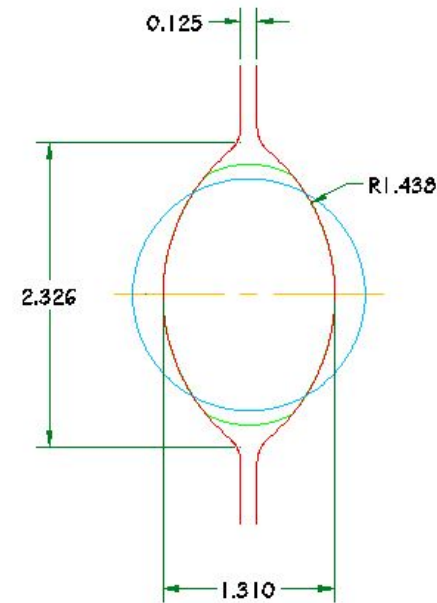


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction	ENTER BILLET AND SPEED INFO														
				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds F4 Former



- Single radius oval.
- 1.75" Diameter Round Feeding.
- 15.3% Reduction.
- 1.18 Elongation.

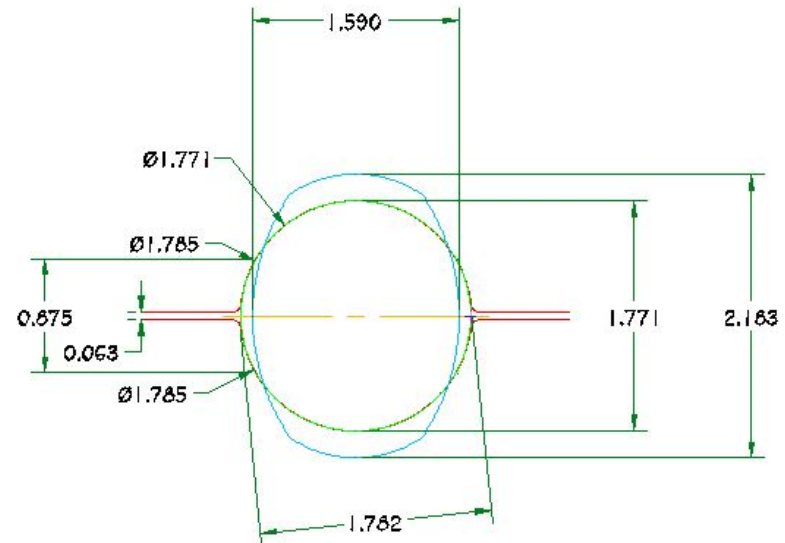


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction															
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds F3



- 1.75" Diameter Double Plug Finish Pass.
- 13.5% Reduction.
- 1.16 Elongation.

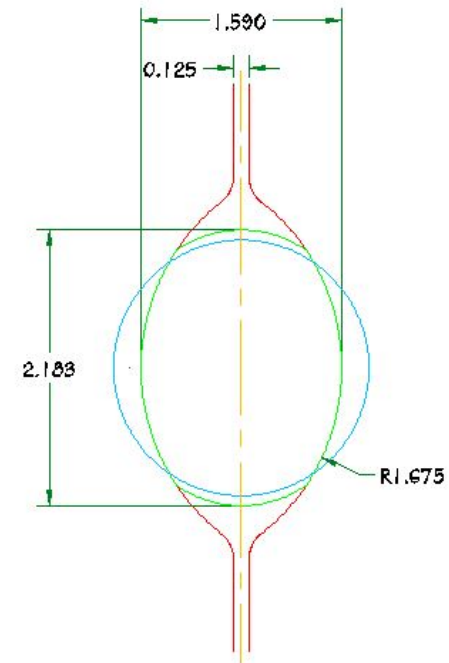


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction	ENTER BILLET AND SPEED INFO														
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds F2



- Single radius oval.
- 2" Diameter Round Feeding.
- 11.4% Reduction.
- 1.13 Elongation.

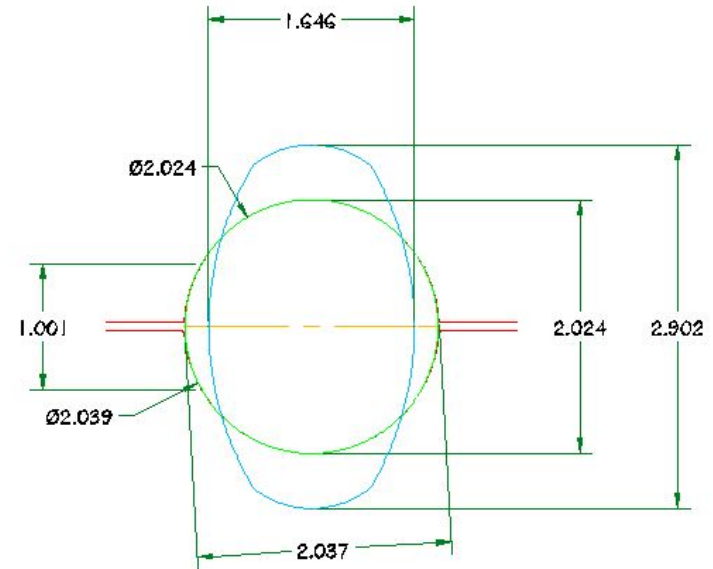


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction															
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0006	2" Round	Fin Round	1	2.023	2.024	0.879	1.588	2125	0.063	24	22.35	390	67	Steel	3.215	16.6%	23.1%	1.198	15.6	56	3450	490	
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds F1



- 2" Diameter Double Plug Finish Pass.
- 16.6% Reduction.
- 1.20 Elongation.

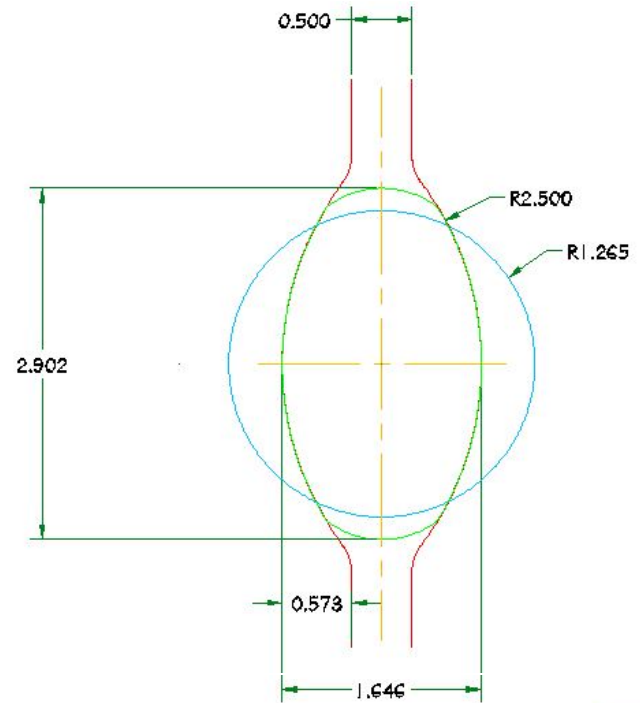


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction															
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0005		V OVAL	R4	1.646	2.902	0.884	1.328	2150	0.250	36	34.42	326	36	Iron	3.853	23.4%		1.305	12.7	96	7344	870	
1-A-0006	2" Round	Fin Round	1	2.023	2.024	0.879	1.588	2125	0.063	24	22.35	390	67	Steel	3.215	16.6%	23.1%	1.198	15.6	56	3450	490	
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds R4



- Single radius oval.
- 2.5" Diameter Round Feeding.
- 23.5% Reduction.
- 1.3 Elongation.

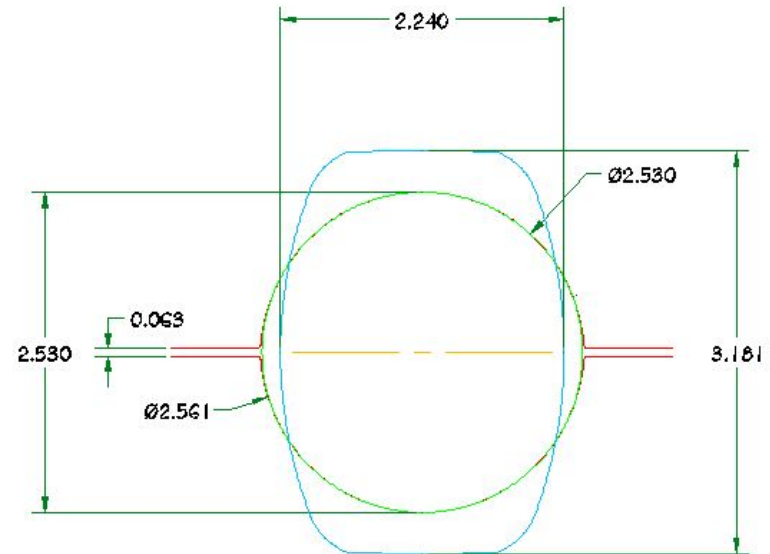


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction	ENTER BILLET AND SPEED INFO														
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0004	2.5" ROUND	Fin Round	R3	2.530	2.530	0.651	1.987	2175	0.400	36	33.61	250	28	Iron	5.027	20.3%	26.1%	1.254	10.9	78	5068	460	
1-A-0005		V OVAL	R4	1.646	2.902	0.884	1.328	2150	0.250	36	34.42	326	36	Iron	3.853	23.4%		1.305	12.7	96	7344	870	
1-A-0006	2" Round	Fin Round	1	2.023	2.024	0.879	1.588	2125	0.063	24	22.35	390	67	Steel	3.215	16.6%	23.1%	1.198	15.6	56	3450	490	
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
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1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%		1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds R3



- 2.5" Diameter Double Plug Finish Pass.
- 20.3% Reduction.
- 1.25 Elongation.

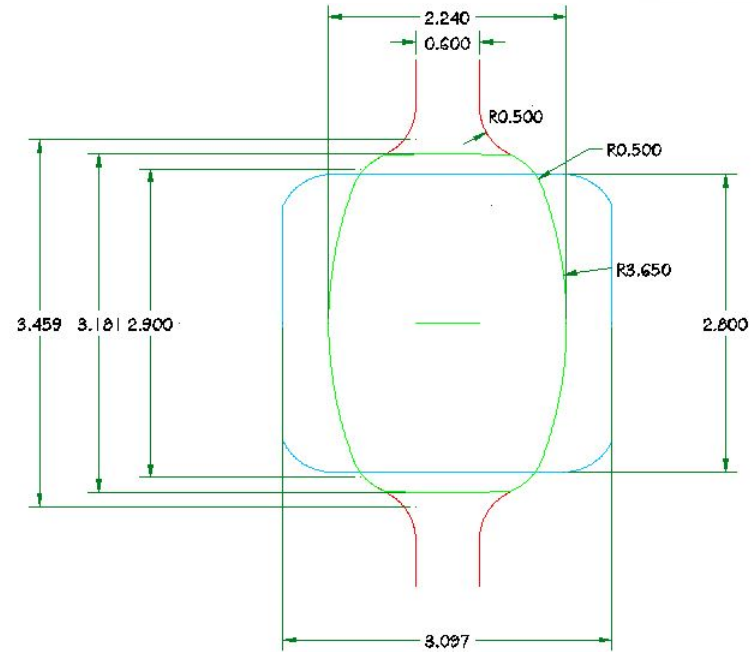


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction	ENTER BILLET AND SPEED INFO														
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0003		V SLUG	R2	2.240	3.181	0.560	1.982	2200	0.870	36	33.15	199	23	Iron	6.305	26.0%	26.1%	1.352	10.1	96	5738	415	
1-A-0004	2.5" ROUND	Fin Round	R3	2.530	2.530	0.651	1.987	2175	0.400	36	33.61	250	28	Iron	5.027	20.3%	26.1%	1.254	10.9	78	5068	460	
1-A-0005		V OVAL	R4	1.646	2.902	0.884	1.328	2150	0.250	36	34.42	326	36	Iron	3.853	23.4%		1.305	12.7	96	7344	870	
1-A-0006	2" Round	Fin Round	1	2.023	2.024	0.879	1.588	2125	0.063	24	22.35	390	67	Steel	3.215	16.6%	23.1%	1.198	15.6	56	3450	490	
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds R2



- Slug Oval
- 26.0% Reduction.
- 1.35 Elongation.

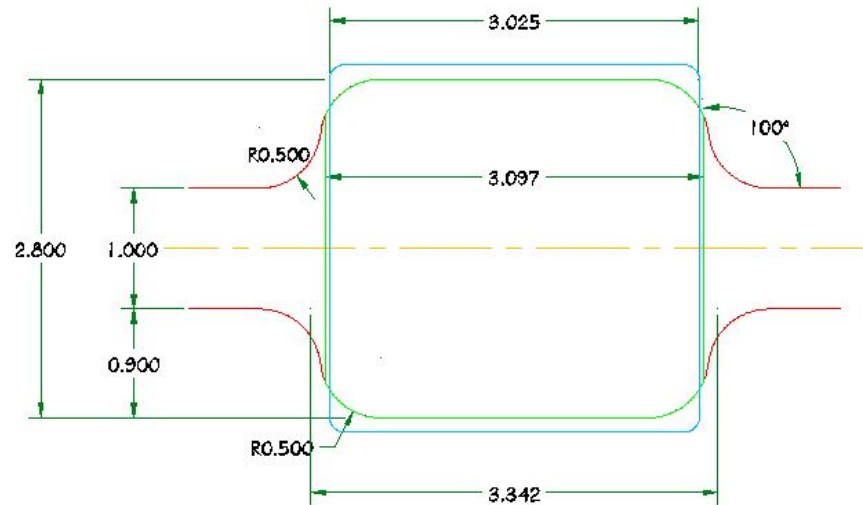


Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction															
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0002		H BOX (PINCH)	R1	2.800	3.097	0.236	2.751	2225	1.000	36	32.25	147	17	Iron	8.521	7.4%		1.080	6.6	45	1728	93	
1-A-0003		V SLUG	R2	2.240	3.181	0.560	1.982	2200	0.870	36	33.15	199	23	Iron	6.305	26.0%		1.352	10.1	96	5738	415	
1-A-0004	2.5" ROUND	Fin Round	R3	2.530	2.530	0.651	1.987	2175	0.400	36	33.61	250	28	Iron	5.027	20.3%	26.1%	1.254	10.9	78	5068	460	
1-A-0005		V OVAL	R4	1.646	2.902	0.884	1.328	2150	0.250	36	34.42	326	36	Iron	3.853	23.4%		1.305	12.7	96	7344	870	
1-A-0006	2" Round	Fin Round	1	2.023	2.024	0.879	1.588	2125	0.063	24	22.35	390	67	Steel	3.215	16.6%	23.1%	1.198	15.6	56	3450	490	
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Merchant Rounds R1



- Box Pass (Pinch)
- 7.4% Reduction.
- 1.08 Elongation.



Merchant Round				Total Number of Passes	Billet Length (in.)	Finish Speed (Fpm)	Ave Elongation	Average Reduction															
ENTER BILLET AND SPEED INFO				10	240	1000	1.22	18.1%															
Drawing Number	Product	PASS TYPE	PASS	H ₁	W ₁	Δdraft	Effective Δdraft	T (°F)	Gap	Ø of Rolls	Effective Working Ø	Velocity (Fpm)	Roll Rpm	Roll Mat'l	Area (Sq.In.)	Reduction	Avg. Area Red %	Elongation	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001			Billet	3.036	3.036			2250							9.204								
1-A-0002		H BOX (PINCH)	R1	2.800	3.097	0.236	2.751	2225	1.000	36	32.25	147	17	Iron	8.521	7.4%		1.080	6.6	45	1728	93	
1-A-0003		V SLUG	R2	2.240	3.181	0.560	1.982	2200	0.870	36	33.15	199	23	Iron	6.305	26.0%		1.352	10.1	96	5738	415	
1-A-0004	2.5" ROUND	Fin Round	R3	2.530	2.530	0.651	1.987	2175	0.400	36	33.61	250	28	Iron	5.027	20.3%	26.1%	1.254	10.9	78	5068	460	
1-A-0005		V OVAL	R4	1.646	2.902	0.884	1.328	2150	0.250	36	34.42	326	36	Iron	3.853	23.4%		1.305	12.7	96	7344	870	
1-A-0006	2" Round	Fin Round	1	2.023	2.024	0.879	1.588	2125	0.063	24	22.35	390	67	Steel	3.215	16.6%	23.1%	1.198	15.6	56	3450	490	
1-A-0007		OVAL	2	1.590	2.183	0.434	1.304	2100	0.250	20	18.45	441	91	Steel	2.847	11.4%		1.129	12.0	39	1542	247	
1-A-0008	1.75" Round	Fin Round	3	1.771	1.775	0.412	1.388	2075	0.063	24	22.55	510	86	Steel	2.463	13.5%	19.7%	1.156	10.6	45	1922	356	
1-A-0009		OVAL	4	1.310	1.992	0.465	1.048	2050	0.250	20	18.70	601	123	Steel	2.087	15.3%		1.180	12.4	48	1975	432	
1-A-0010	1.5" Round	Fin Round	5	1.517	1.516	0.475	1.192	2025	0.063	24	22.75	695	117	Steel	1.807	13.4%	18.4%	1.155	11.4	45	2074	524	
1-A-0011		OVAL	6	1.007	1.824	0.509	0.802	2000	0.250	20	18.95	858	173	Steel	1.463	19.0%		1.235	13.0	59	2536	791	
1-A-0012	1.25" Round	Fin Round	7	1.265	1.263	0.559	0.994	1975	0.063	24	22.94	1000	166	Steel	1.255	14.2%	18.1%	1.166	12.4	48	2380	865	

Discipline 1a) c. Design for Channel



There are several ways to design channels.

- Gothic.
- Butterfly
- Tongue and Groove
- Universal

Estimate Billet Size



C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH					Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																									
ENTER BILLET AND SPEED INFO					17.4%	240	0.00	1000	Drawing Number			PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq. In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	R O U G H E R	T G	Billet	3.036	3.036		2250															9.217											
1-C-0001			R1			3.036	2225			0.00	#DIV/0!	####	Iron											100.0%			0.000		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
1-C-0002			R2			0.000	2200			0.00	#DIV/0!	####	Iron											#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1-C-0003			R3			0.000	2175			0.00	#DIV/0!	####	Iron											#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1-C-0004	TG	R4			0.000	2150			0.00	#DIV/0!	####	Iron										#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
1-C-0005	F I N I S H E R	U	F1			0.000	2125			0.00	#DIV/0!	####	Steel									#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
1-C-0006			F2			0.000	2100			0.00	#DIV/0!	####	Steel										#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
1-C-0007			F3			0.000	2075			0.00	#DIV/0!	####	Steel											#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1-C-0008			F4			0.000	2050			0.00	#DIV/0!	####	Steel											#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1-C-0009			F5			0.000	2025			0.00	#DIV/0!	####	Steel											#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1-C-0010			F6			0.000	2000			0.00	#DIV/0!	####	Steel											#DIV/0!		#DIV/0!	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1-C-0011			F7	0.369	3.036	-0.369	1975			-0.37	1000	####	Steel	1.121	#DIV/0!	0.404	#DIV/0!							#DIV/0!		#DIV/0!	0.313	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

TOTAL ELONGATION
 $(E_t) = \text{BILLET AREA} / \text{FIN AREA}$

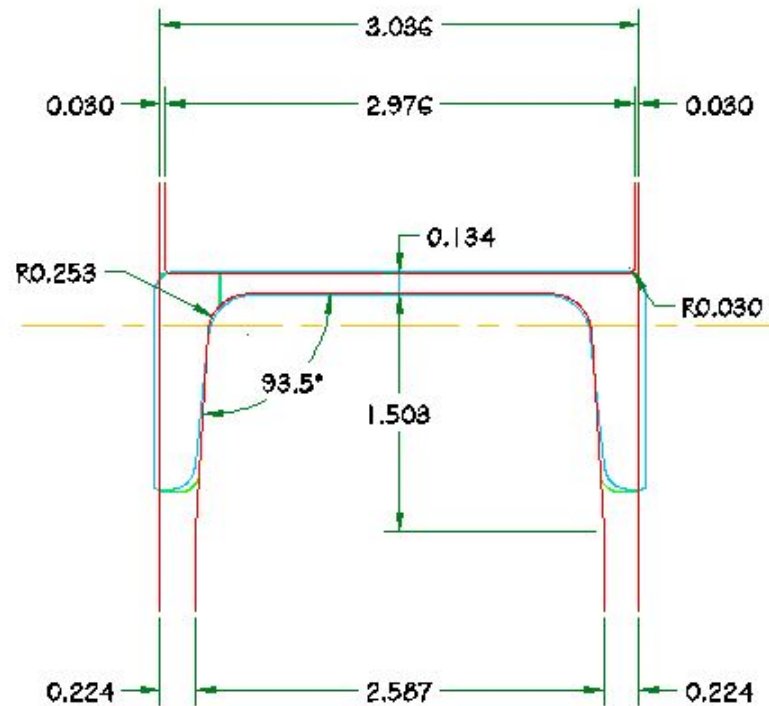
AVERAGE ELONGATION
 $(E_a) = E_t^{(1/\#PASSES)}$

AVERAGE REDUCTION =
 $[1 - (1 / E_a)] \times 100$

Merchant 3" Channel F7 Finish Pass



Rolling flanges down to keep water and scale out of the web. This channel will finish from Universal style mill. Inside of flange is kept open so to minimize roll wear so most of the reduction is from outside in. Very minimum spread here and little trace of kick-up on backside of flange.

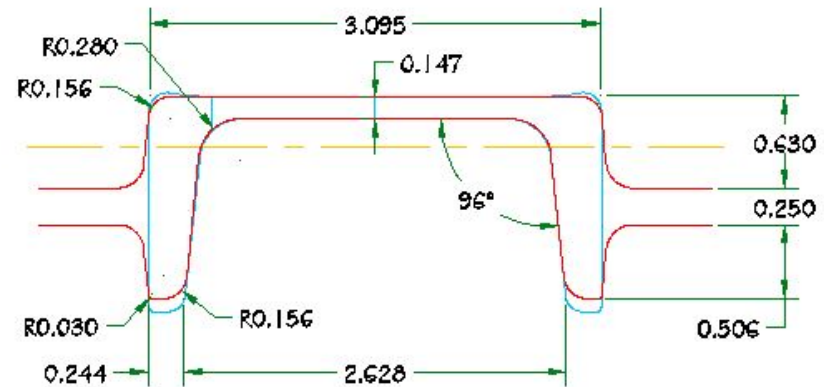


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)	ENTER BILLET AND SPEED INFO																						
				17.4%	240	1.21	1000	Drawing Number	PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq. In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	G		Billet	3.036	3.036		2250													9.217										
1-C-0010	i	E	F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71							
1-C-0011	S	U	F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134							

Merchant 3" Channel F6 Pre-Finish Pass



- 6.8% Flange Reduction
- No web reduction. Web is designed at same desired thickness.

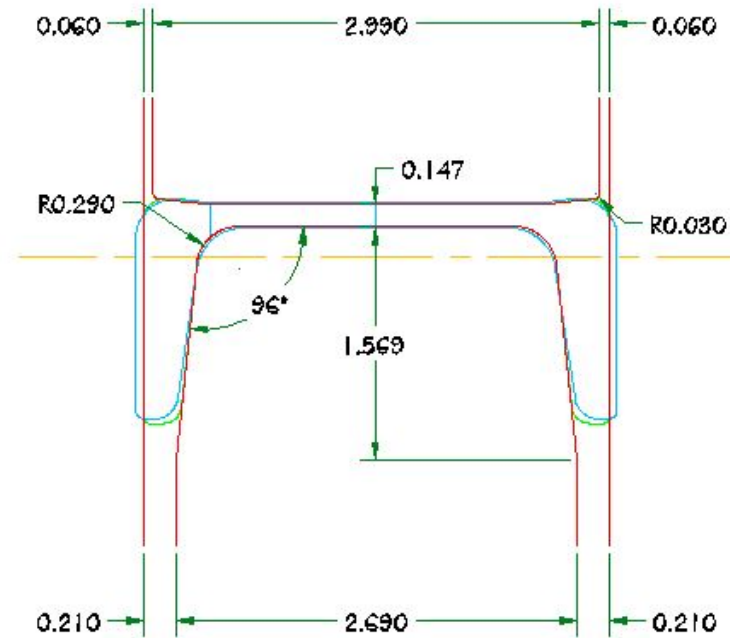


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																	
ENTER BILLET AND SPEED INFO				17.4%	240	1.21	1000																	
Drawing Number			PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	G N I S H	U E U	Billet	3.036	3.036		2250							9.217										
1-C-0009			F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142	
1-C-0010			F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71	
1-C-0011			F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134	

Merchant 3" Channel F5 Leader Pass



- Gradual increase in over all reduction.
- No kick up work here to protect overfill from live joints.

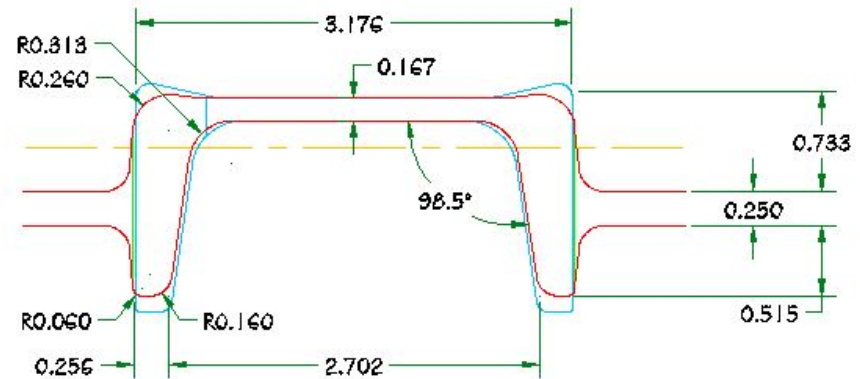


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																							
ENTER BILLET AND SPEED INFO				17.4%	240	1.21	1000	Drawing Number	PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	G I N I S H E	E U S E	Billet	3.036	3.036		2250													9.217										
1-C-0008			F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161							
1-C-0009			F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142							
1-C-0010			F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71							
1-C-0011			F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134							

Merchant 3" Channel F4 Former Pass



- Gradual increase in flange thickness.
- Here I add more kick up reduction to try to lengthen the flanges as I work back.

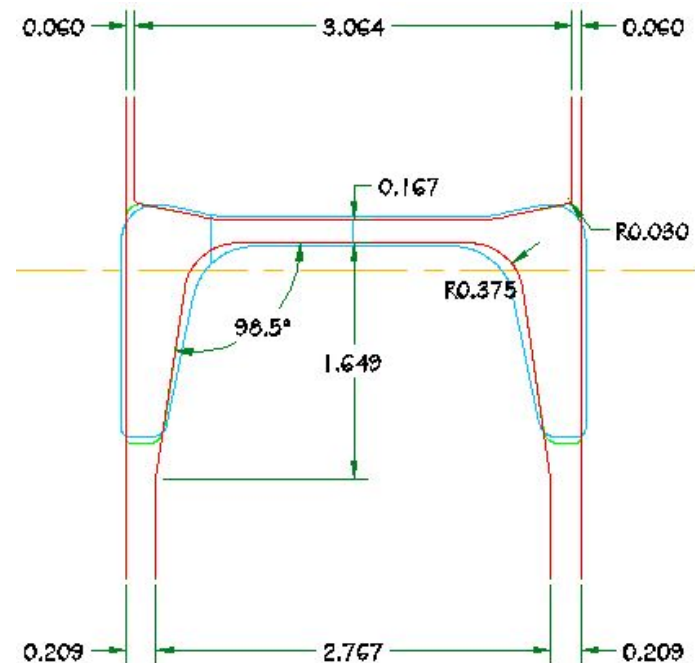


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																
ENTER BILLET AND SPEED INFO				17.4%	240	1.21	1000																
Drawing Number		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq. In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	G R I N I S H E	Billet	3.036	3.036		2250							9.217										
1-C-0007		U	F3	0.510	3.184	0.091	2075		24	23.49	690	112	Steel	1.625	16.8%	0.623	17.3%	0.380	15.1%	5.0	56	1145	287
1-C-0008		E	F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161
1-C-0009		U	F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142
1-C-0010		E	F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71
1-C-0011		U	F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134

Merchant 3" Channel F3



- Inside of chamber begins to narrow more here. With gradually more overall reduction.



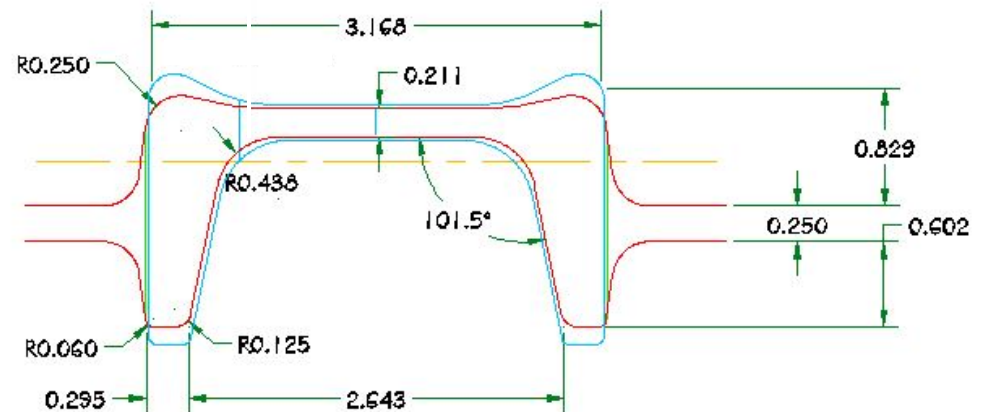
C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH	Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)
ENTER BILLET AND SPEED INFO	17.4%	240	1.21	1000

Drawing Number		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	G F I N I S H E R	Billet	3.036	3.036		2250							9.217										
1-C-0006		E	F2	0.602	3.247	0.121	2100		20	19.40	574	113	Steel	1.954	15.7%	0.753	15.9%	0.447	15.0%	6.3	50	1071	224
1-C-0007		U	F3	0.510	3.184	0.091	2075		24	23.49	690	112	Steel	1.625	16.8%	0.623	17.3%	0.380	15.1%	5.0	56	1145	287
1-C-0008		E	F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161
1-C-0009		U	F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142
1-C-0010		E	F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71
1-C-0011		U	F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134

Merchant 3" Channel F2



- Chamber widths almost match.
- Keeping flange reduction height below flange thickness.

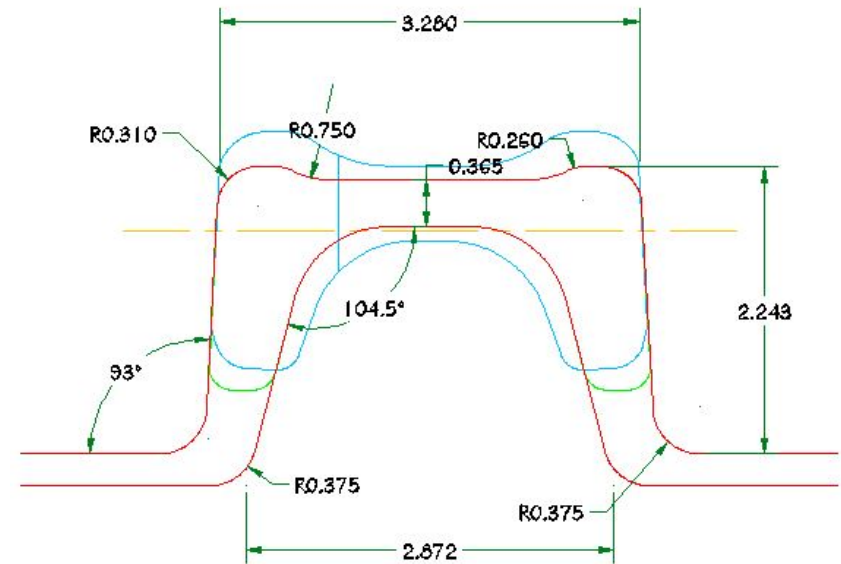


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																	
ENTER BILLET AND SPEED INFO				17.4%	240	1.21	1000																	
Drawing Number			PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	G		Billet	3.036	3.036		2250							9.217										
1-C-0005	F I N I S H E R	U	F1	0.722	3.207	0.176	2125		24	23.28	484	79	Steel	2.317	22.6%	0.895	21.9%	0.526	25.0%	6.9	65	1834	323	
1-C-0006		E	F2	0.602	3.247	0.121	2100		20	19.40	574	113	Steel	1.954	15.7%	0.753	15.9%	0.447	15.0%	6.3	50	1071	224	
1-C-0007		U	F3	0.510	3.184	0.091	2075		24	23.49	690	112	Steel	1.625	16.8%	0.623	17.3%	0.380	15.1%	5.0	56	1145	287	
1-C-0008		E	F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161	
1-C-0009		U	F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142	
1-C-0010		E	F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71	
1-C-0011		U	F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134	

Merchant 3" Channel R4



- Nice open collars.
- 3° angle on sides.
- Plenty of reduction from kick up to push legs up.

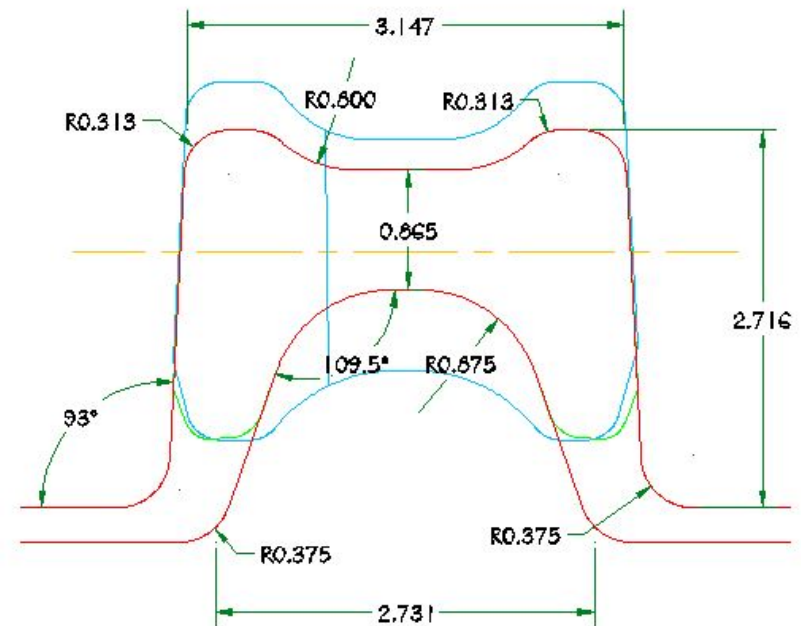


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																									
ENTER BILLET AND SPEED INFO				17.4%	240	1.21	1000	Drawing Number			PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	ROUGHER	E	Billet	3.036	3.036		2250															9.217										
1-C-0003			R3	1.211	3.319	0.293	2175		24	22.79	279	47	Iron	4.018	17.5%	1.542	15.3%	0.934	24.0%	9.0	55	1971	200									
1-C-0004			R4	0.898	3.334	0.313	2150		24	23.10	374	62	Iron	2.994	25.5%	1.146	25.7%	0.702	24.8%	9.3	70	2622	357									
1-C-0005	FINISHER	U	F1	0.722	3.207	0.176	2125		24	23.28	484	79	Steel	2.317	22.6%	0.895	21.9%	0.526	25.0%	6.9	65	1834	323									
1-C-0006			F2	0.602	3.247	0.121	2100		20	19.40	574	113	Steel	1.954	15.7%	0.753	15.9%	0.447	15.0%	6.3	50	1071	224									
1-C-0007			F3	0.510	3.184	0.091	2075		24	23.49	690	112	Steel	1.625	16.8%	0.623	17.3%	0.380	15.1%	5.0	56	1145	287									
1-C-0008			F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161									
1-C-0009			F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142									
1-C-0010			F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71									
1-C-0011			F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134									

Merchant 3" Channel R2



- Highest reducing pass here.
- Flanges in this pass will look a bit rough here.

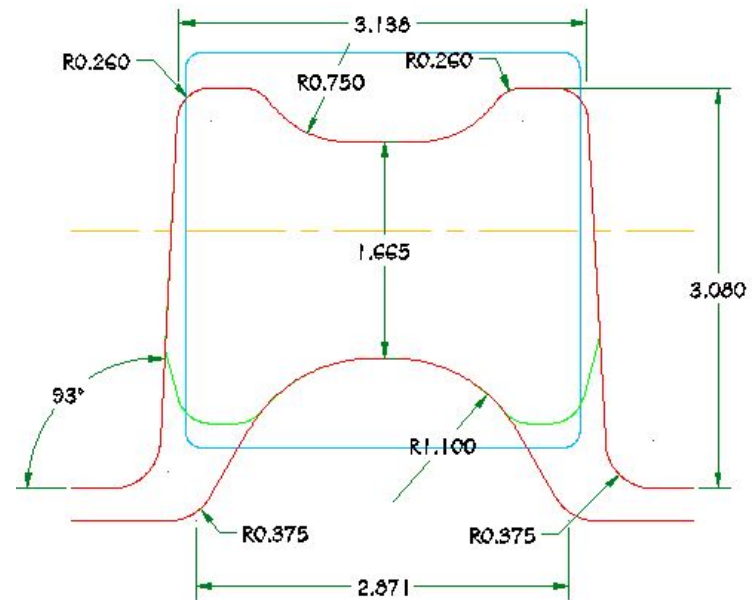


C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																							
ENTER BILLET AND SPEED INFO				17.4%	240	1.21	1000	Drawing Number	PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	ROUGHER	Billet	3.036	3.036		2250														9.217										
1-C-0001		TG	R1	2.128	3.255	0.908	2225		24	21.87	162	28	Iron	6.926	24.9%	2.5085		1.909		15.8	69	4274	252							
1-C-0002		TG	R2	1.504	3.239	0.624	2200		24	22.50	230	39	Iron	4.871	29.7%	1.821	27.4%	1.229	35.6%	13.1	73	3787	317							
1-C-0003		E	R3	1.211	3.319	0.293	2175		24	22.79	279	47	Iron	4.018	17.5%	1.542	15.3%	0.934	24.0%	9.0	55	1971	200							
1-C-0004	FINISHER	TG	R4	0.898	3.334	0.313	2150		24	23.10	374	62	Iron	2.994	25.5%	1.146	25.7%	0.702	24.8%	9.3	70	2622	357							
1-C-0005		U	F1	0.722	3.207	0.176	2125		24	23.28	484	79	Steel	2.317	22.6%	0.895	21.9%	0.526	25.0%	6.9	65	1834	323							
1-C-0006		E	F2	0.602	3.247	0.121	2100		20	19.40	574	113	Steel	1.954	15.7%	0.753	15.9%	0.447	15.0%	6.3	50	1071	224							
1-C-0007		U	F3	0.510	3.184	0.091	2075		24	23.49	690	112	Steel	1.625	16.8%	0.623	17.3%	0.380	15.1%	5.0	56	1145	287							
1-C-0008		E	F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161							
1-C-0009		U	F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142							
1-C-0010		E	F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71							
1-C-0011	U	F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134								

Merchant 3" Channel R1



- Angle of bite within spec.
- Decent reduction here.
- Billet will track well
- Set pitch line high enough so bar wont stick.



C3 x 3.5 BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH								Average Area Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)														
ENTER BILLET AND SPEED INFO								17.4%	240	1.21	1000														
Drawing Number			PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	Flange Area (Sq. In.)	Flange Red %	Web Area (Sq. In.)	Web Red %	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1		
1-A-0001	ROUGHER	TG	Billet	3.036	3.036		2250							9.217											
1-C-0001		TG	R1	2.128	3.255	0.908	2225		24	21.87	162	28	Iron	6.926	24.9%	2.5085		1.909		15.8	69	4274	252		
1-C-0002		TG	R2	1.504	3.239	0.624	2200		24	22.50	230	39	Iron	4.871	29.7%	1.821	27.4%	1.229	35.6%	13.1	73	3787	317		
1-C-0003		TG	R3	1.211	3.319	0.293	2175		24	22.79	279	47	Iron	4.018	17.5%	1.542	15.3%	0.934	24.0%	9.0	55	1971	200		
1-C-0004		TG	R4	0.898	3.334	0.313	2150		24	23.10	374	62	Iron	2.994	25.5%	1.146	25.7%	0.702	24.8%	9.3	70	2622	357		
1-C-0005	FINISHER	U	F1	0.722	3.207	0.176	2125		24	23.28	484	79	Steel	2.317	22.6%	0.895	21.9%	0.526	25.0%	6.9	65	1834	323		
1-C-0006		E	F2	0.602	3.247	0.121	2100		20	19.40	574	113	Steel	1.954	15.7%	0.753	15.9%	0.447	15.0%	6.3	50	1071	224		
1-C-0007		U	F3	0.510	3.184	0.091	2075		24	23.49	690	112	Steel	1.625	16.8%	0.623	17.3%	0.380	15.1%	5.0	56	1145	287		
1-C-0008		E	F4	0.453	3.224	0.057	2050		20	19.55	767	150	Steel	1.461	10.1%	0.539	13.4%	0.383	-0.9%	4.3	39	577	161		
1-C-0009		U	F5	0.418	3.110	0.035	2025		24	23.58	863	140	Steel	1.300	11.1%	0.479	11.1%	0.341	11.0%	3.1	36	453	142		
1-C-0010		E	F6	0.396	3.122	0.022	2000		20	19.60	907	177	Steel	1.236	4.9%	0.447	6.8%	0.342	-0.4%	2.7	23	214	71		
1-C-0011		U	F7	0.369	3.036	0.027	1975		24	23.63	1000	162	Steel	1.121	9.3%	0.404	9.6%	0.313	8.6%	2.7	34	370	134		

Discipline 1a) d. Design for Flats



There are a few ways to design flats.

- Using Box Passes.
- Open Passes
- Diagonal

Flat Calculator for 3" x 0.5" Flat

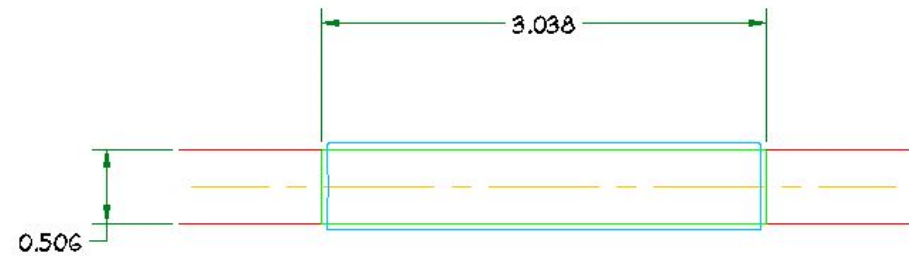


3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)	Carbon	Mg	Cr																					
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000	0.4	0.8	1.1	Drawing Number	Product		PASS	H ₁	W ₁	W ₂	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
1-A-0001	3" x 0.5" FLAT	R O U G H E R	Billet	3.036	3.036			2250																	9.204						
1-D-0001			F	R1	2.500	3.209	3.217	0.536	2225	0.200	24	21.37	197	35	Iron	7.785	15.4%	12.1	55	2725	195										
1-D-0002			F	R2	1.520	3.754	3.766	0.980	2200	0.170	24	22.33	272	47	Iron	5.633	27.6%	16.4	88	5567	551										
1-D-0003			E	R3	1.654	3.000	1.641	0.754	2175	1.231	20	15.78	311	75	Steel	4.938	12.3%	15.8	32	1480	167										
1-D-0004		F	R4	1.200	3.289	3.301	0.454	2150	1.100	24	21.70	388	68	Steel	3.958	19.8%	11.2	78	3360	474											
1-D-0005		F	F1	0.900	3.526	3.509	0.300	2125	0.700	24	22.40	483	82	Steel	3.173	19.8%	9.1	83	3007	529											
1-D-0006		E	F2	0.956	3.100	0.980	0.426	2100	1.800	20	15.11	519	131	Steel	2.957	6.8%	11.8	17	610	115											
1-D-0007		F	F3	0.700	3.337	3.331	0.256	2075	0.600	24	22.70	657	111	Steel	2.336	21.0%	8.4	92	3054	729											
1-D-0008		E	F4	0.711	3.100	0.735	0.237	2050	1.100	20	15.83	703	170	Steel	2.182	6.6%	8.8	11	329	84											
1-D-0009		F	F5	0.590	3.227	3.226	0.121	2025	0.590	24	22.82	802	134	Steel	1.914	12.3%	5.8	65	1426	416											
1-D-0010		E	F6	0.604	2.948	0.628	0.279	2000	1.288	20	15.81	877	212	Steel	1.750	8.6%	9.6	13	414	132											
1-D-0011	F	F7	0.506	3.038	3.061	0.098	1975	0.506	24	22.99	1000	166	Steel	1.534	12.3%	5.2	65	1296	471												

Merchant 3" x 0.5" Flat F7



- Follow spread sheet
- Finish pass is open end

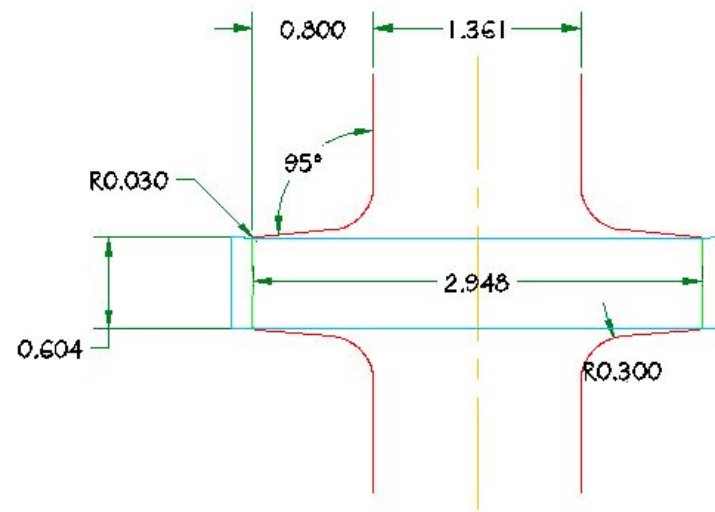


3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)												
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000												
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
1-A-0001	3" x 0.5" FLAT	R I S S	Billet	3.036	3.036		2250												
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481

Merchant 3" x 0.5" Flat F6

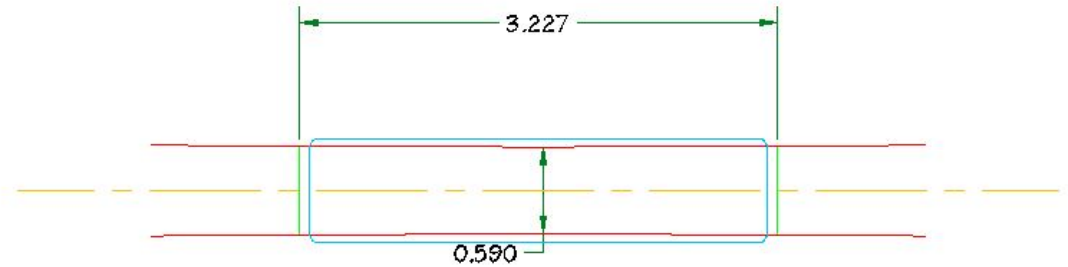


- Using cassette for edger.
- Slight convex in bottom of pass.



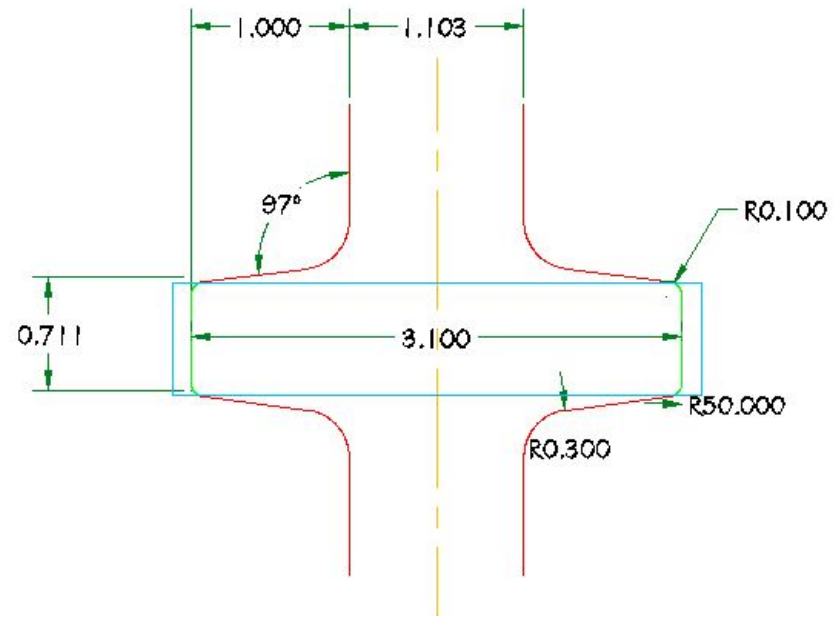
3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)												
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000												
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
1-A-0001	3" x 0.5" FLAT	R	Billet	3.036	3.036		2250							9.204					
1-D-0009		F	F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426
1-D-0010		E	F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142
1-D-0011		H	F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481

Merchant 3" x 0.5" Flat F5



3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)	ENTER BILLET AND SPEED INFO												
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	3" x 0.5" FLAT	R I N I S H E	Billet	3.036	3.036		2250							9.204						
1-D-0008			F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90	
1-D-0009			F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426	
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142	
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481	

Merchant 3" x 0.5" Flat F4



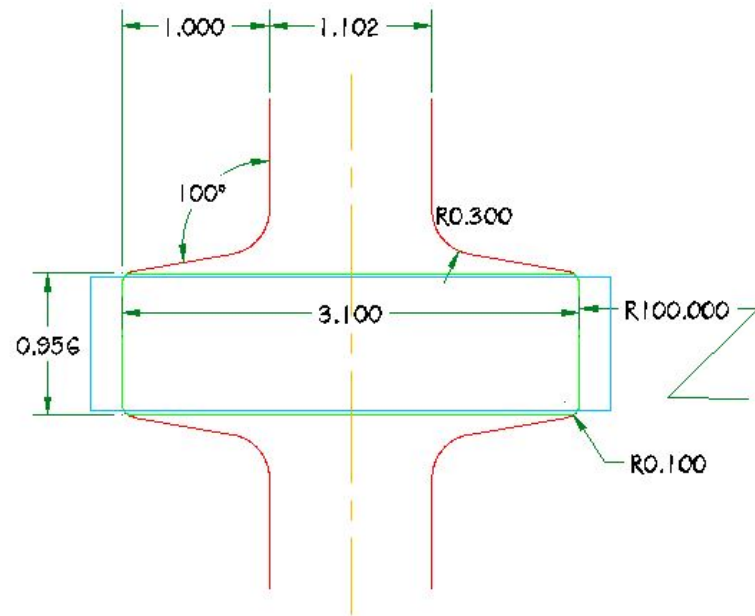
3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)													
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000													
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	3" x 0.5" FLAT	R F I N I S H E D	Billet	3.036	3.036		2250							9.204						
1-D-0007			F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750	
1-D-0008			F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90	
1-D-0009			F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426	
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142	
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481	

Merchant 3" x 0.5" Flat F3



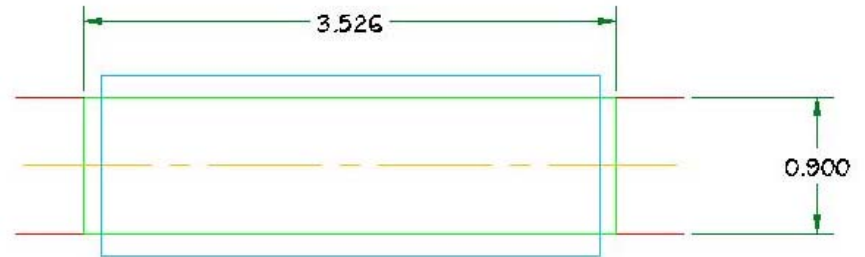
3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)	ENTER BILLET AND SPEED INFO												
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	3" x 0.5" FLAT	R F I N I S H E R	Billet	3.036	3.036		2250							9.204						
1-D-0006			F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128	
1-D-0007			F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750	
1-D-0008			F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90	
1-D-0009			F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426	
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142	
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481	

Merchant 3" x 0.5" Flat F2



3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)												
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000												
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
1-A-0001	3" x 0.5" FLAT	R	Billet	3.036	3.036		2250							9.204					
1-D-0005		F	F1	0.900	3.526	0.300	2125	0.700	24	24.00	483	77	Steel	3.173	19.8%	9.1	83	3113	547
1-D-0006		F	F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128
1-D-0007		F	F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750
1-D-0008		F	F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90
1-D-0009		F	F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426
1-D-0010		F	F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142
1-D-0011		F	F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481

Merchant 3" x 0.5" Flat F1



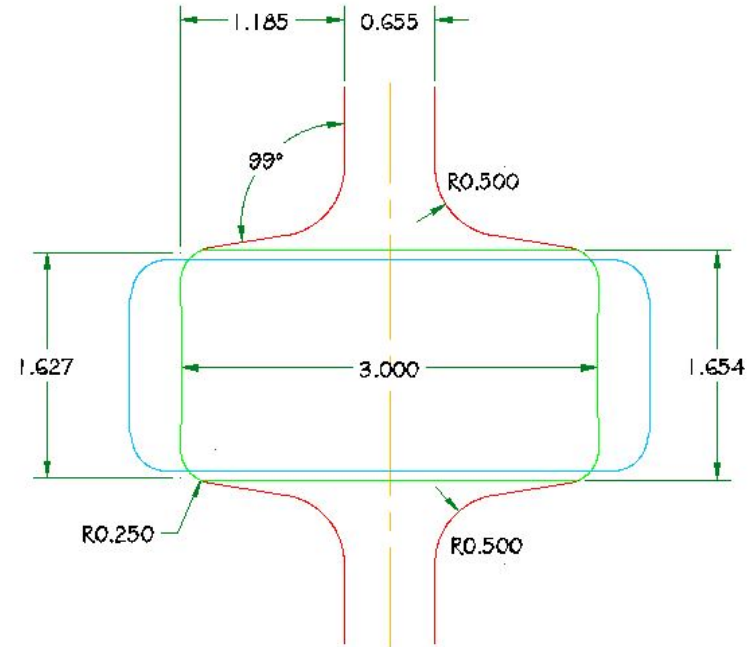
3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)																
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000																
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1				
1-A-0001	3" x 0.5" FLAT	H E R F I N I S H E R	Billet	3.036	3.036		2250												9.204				
1-D-0004			R4	1.200	3.289	0.454	2150	1.100	24	24.00	388	62	Steel	3.958	19.8%	11.2	78	3534	498				
1-D-0005			F1	0.900	3.526	0.300	2125	0.700	24	24.00	483	77	Steel	3.173	19.8%	9.1	83	3113	547				
1-D-0006			F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128				
1-D-0007			F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750				
1-D-0008			F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90				
1-D-0009			F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426				
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142				
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481				

Merchant 3" x 0.5" Flat R4



3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)													
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000													
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	Ø of Rolls	Working Ø	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	3" x 0.5" FLAT	G H E R	Billet	3.036	3.036		2250							9.204						
1-D-0003			R3	1.654	3.000	0.754	2175	1.231	20	18.25	311	65	Steel	4.938	12.3%	15.8	32	1591	180	
1-D-0004			R4	1.200	3.289	0.454	2150	1.100	24	24.00	388	62	Steel	3.958	19.8%	11.2	78	3534	498	
1-D-0005		F I N I S H E R	F1	0.900	3.526	0.300	2125	0.700	24	24.00	483	77	Steel	3.173	19.8%	9.1	83	3113	547	
1-D-0006			F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128	
1-D-0007			F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750	
1-D-0008			F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90	
1-D-0009			F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426	
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142	
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481	

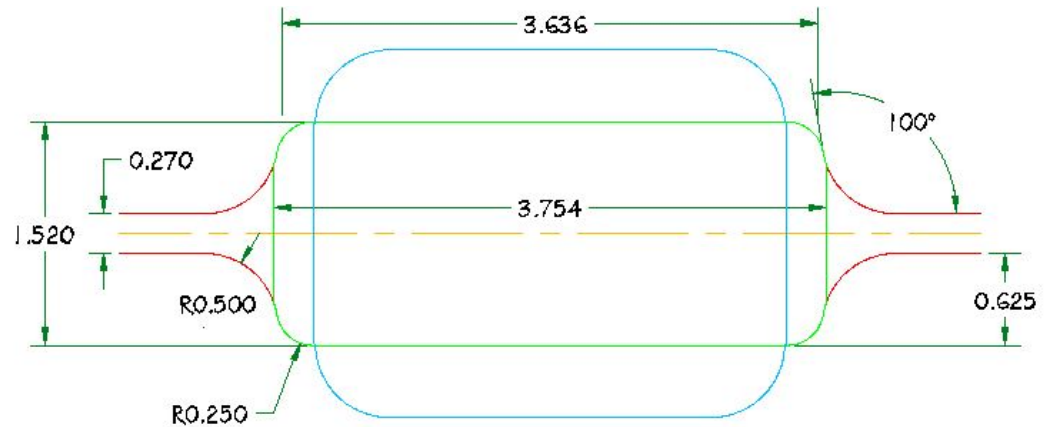
Merchant 3" x 0.5" Flat R3



3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000

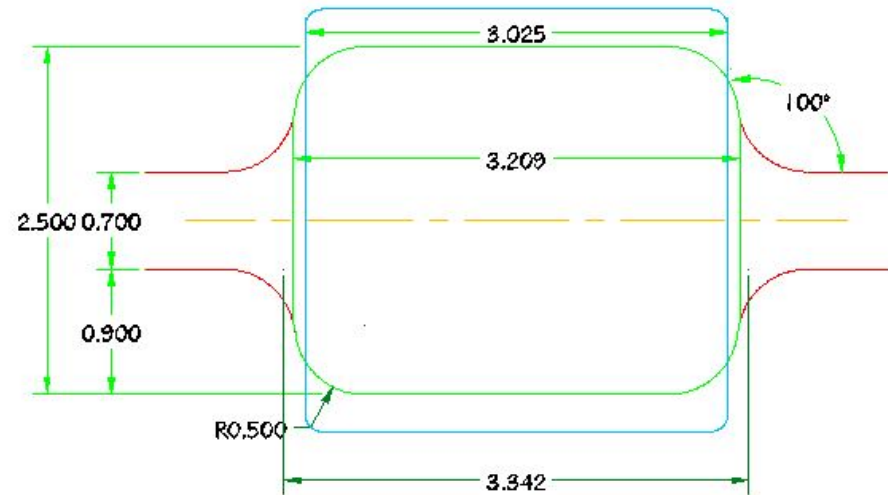
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	3" x 0.5" FLAT	ROUGHER	Billet	3.036	3.036		2250							9.204						
1-D-0002			F	R2	1.520	3.754	0.980	2200	0.170	24	22.67	272	46	Iron	5.633	27.6%	16.4	88	5609	555
1-D-0003			F	R3	1.654	3.000	0.754	2175	1.231	20	18.25	311	65	Steel	4.938	12.3%	15.8	32	1591	180
1-D-0004			F	R4	1.200	3.289	0.454	2150	1.100	24	24.00	388	62	Steel	3.958	19.8%	11.2	78	3534	498
1-D-0005		FINISHER	F	F1	0.900	3.526	0.300	2125	0.700	24	24.00	483	77	Steel	3.173	19.8%	9.1	83	3113	547
1-D-0006			F	F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128
1-D-0007			F	F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750
1-D-0008			F	F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90
1-D-0009			F	F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426
1-D-0010			F	F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142
1-D-0011			F	F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481

Merchant 3" x 0.5" Flat R2



3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)												
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000												
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1
1-A-0001	3" x 0.5" FLAT	ROUGHEN	Billet	3.036	3.036		2250							9.204					
1-D-0001			R1	2.500	3.209	0.536	2225	0.200	24	21.77	197	35	Iron	7.785	15.4%	12.1	55	2750	197
1-D-0002			R2	1.520	3.754	0.980	2200	0.170	24	22.67	272	46	Iron	5.633	27.6%	16.4	88	5609	555
1-D-0003			R3	1.654	3.000	0.754	2175	1.231	20	18.25	311	65	Steel	4.938	12.3%	15.8	32	1591	180
1-D-0004		R4	1.200	3.289	0.454	2150	1.100	24	24.00	388	62	Steel	3.958	19.8%	11.2	78	3534	498	
1-D-0005		FINISH	F1	0.900	3.526	0.300	2125	0.700	24	24.00	483	77	Steel	3.173	19.8%	9.1	83	3113	547
1-D-0006			F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128
1-D-0007			F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750
1-D-0008			F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90
1-D-0009			F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426
1-D-0010			F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142
1-D-0011			F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481

Merchant 3" x 0.5" Flat R1



3" x 0.5" FLAT BASED ON HOR/VERTICAL ROUGHER, HOR/UNIV FINISH				Average Reduction %	Billet Length (in.)	Ave Elongation	Finish Speed (Fpm)													
ENTER BILLET AND SPEED INFO				15%	240	1.16	1000													
Drawing Number	Product		PASS	H ₁	W ₁	Δdraft	T (°F)	Gap	∅ of Rolls	Working ∅	Velocity (Fpm)	Roll Rpm	Type of Rolls	Area (Sq.In.)	Reduction	° of Bite	Roll Load (T)	Torque (ft.lb.)	HP 1:1	
1-A-0001	3" x 0.5" FLAT	R O U G H E R	Billet	3.036	3.036		2250							9.204						
1-D-0001			F	R1	2.500	3.209	0.536	2225	0.200	24	21.77	197	35	Iron	7.785	15.4%	12.1	55	2750	197
1-D-0002			F	R2	1.520	3.754	0.980	2200	0.170	24	22.67	272	46	Iron	5.633	27.6%	16.4	88	5609	555
1-D-0003			F	R3	1.654	3.000	0.754	2175	1.231	20	18.25	311	65	Steel	4.938	12.3%	15.8	32	1591	180
1-D-0004		F	R4	1.200	3.289	0.454	2150	1.100	24	24.00	388	62	Steel	3.958	19.8%	11.2	78	3534	498	
1-D-0005		F	F I N I S H E R	F1	0.900	3.526	0.300	2125	0.700	24	24.00	483	77	Steel	3.173	19.8%	9.1	83	3113	547
1-D-0006		F		F2	0.956	3.100	0.426	2100	1.800	20	18.71	519	106	Steel	2.957	6.8%	11.8	17	679	128
1-D-0007		F		F3	0.700	3.337	0.256	2075	0.600	24	24.00	657	105	Steel	2.336	21.0%	8.4	92	3141	750
1-D-0008		F		F4	0.711	3.100	0.237	2050	1.100	20	18.03	703	149	Steel	2.182	6.6%	8.8	11	351	90
1-D-0009		F		F5	0.590	3.227	0.121	2025	0.590	24	24.00	802	128	Steel	1.914	12.3%	5.8	65	1462	426
1-D-0010		F		F6	0.604	2.948	0.279	2000	1.288	20	18.39	877	182	Steel	1.750	8.6%	9.6	13	447	142
1-D-0011		F		F7	0.506	3.038	0.098	1975	0.506	24	24.00	1000	159	Steel	1.534	12.3%	5.2	65	1324	481

The End

NUCOR

Wake up its over...go eat