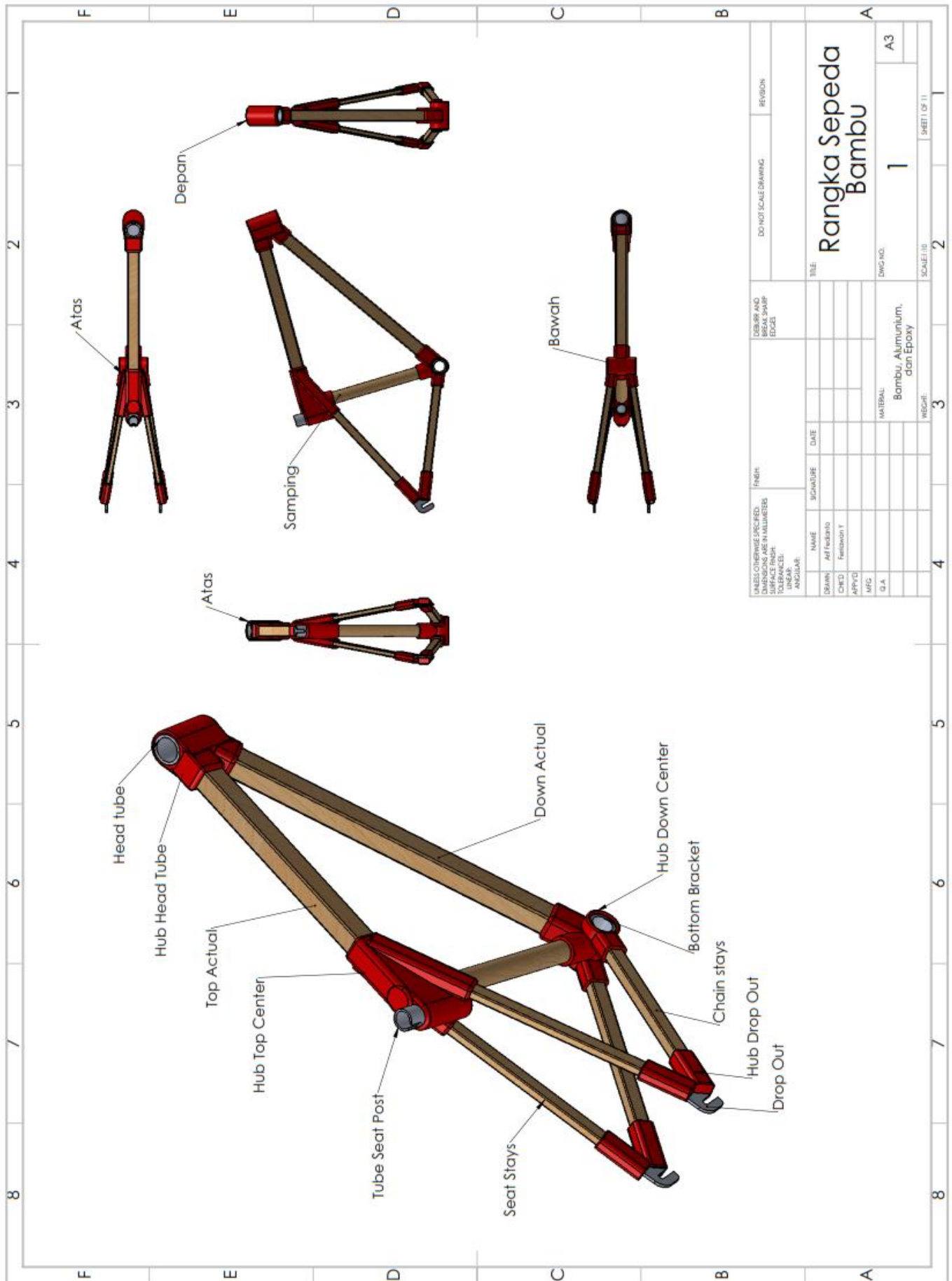
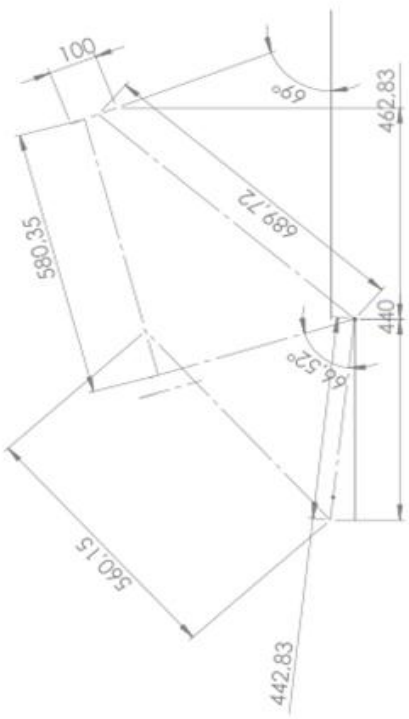
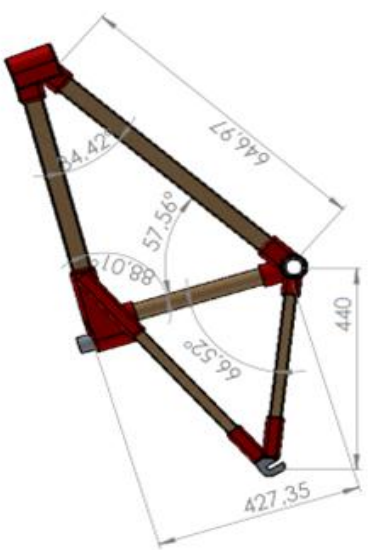
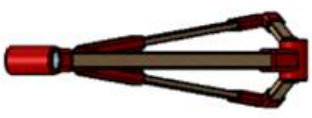
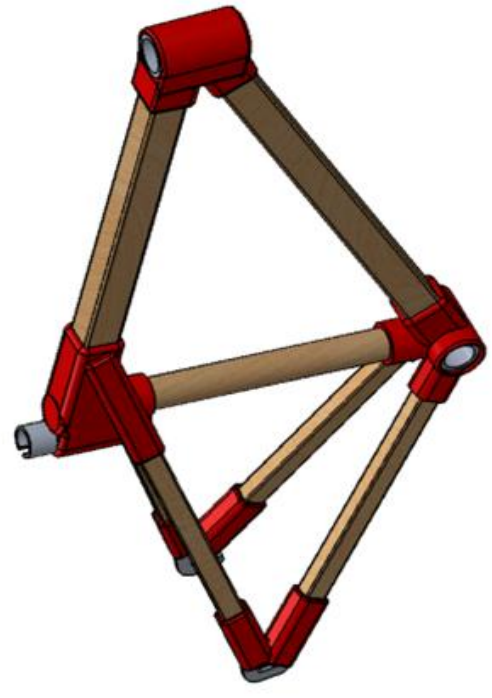
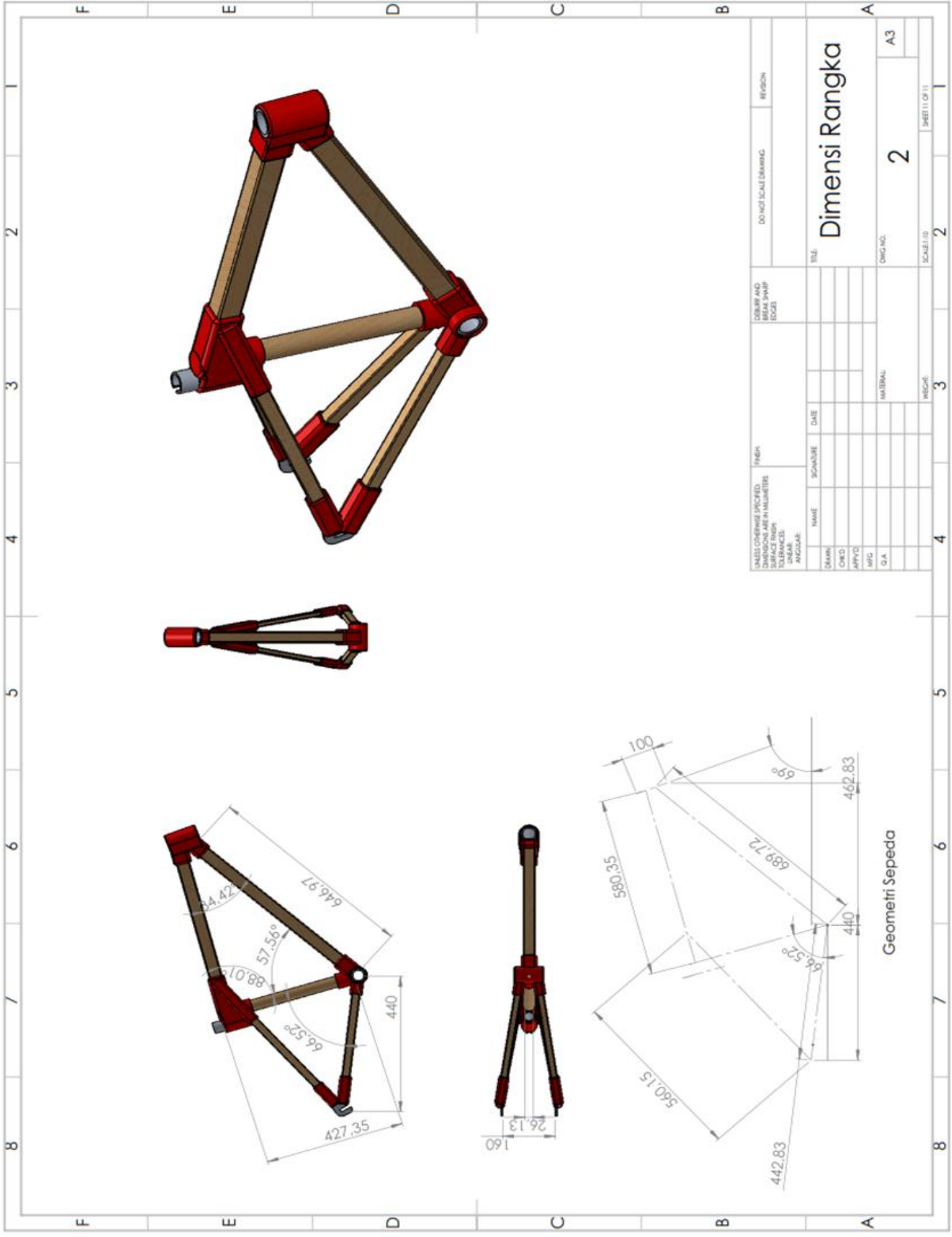


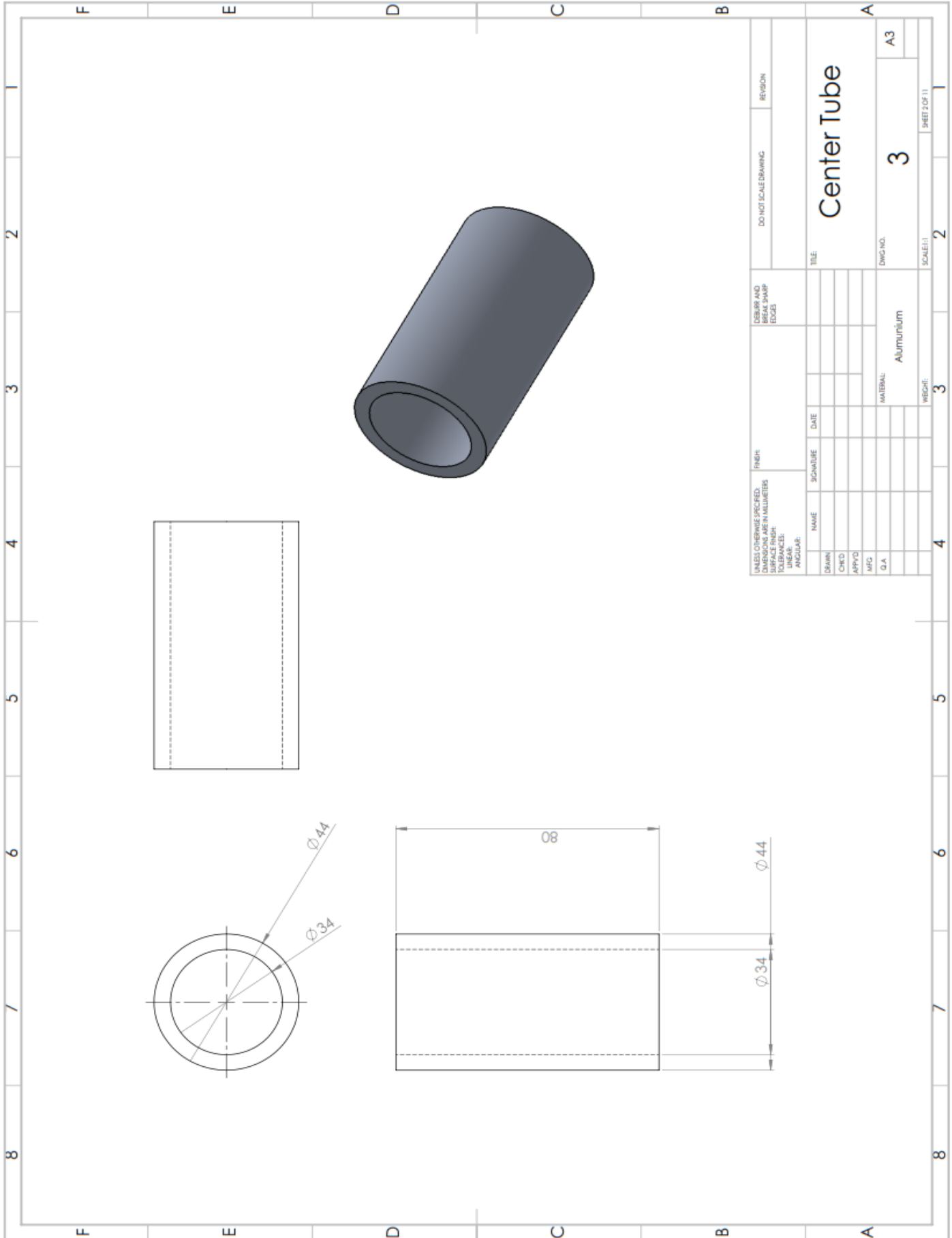
Gambar 2 Dimensi Rangka Sepeda



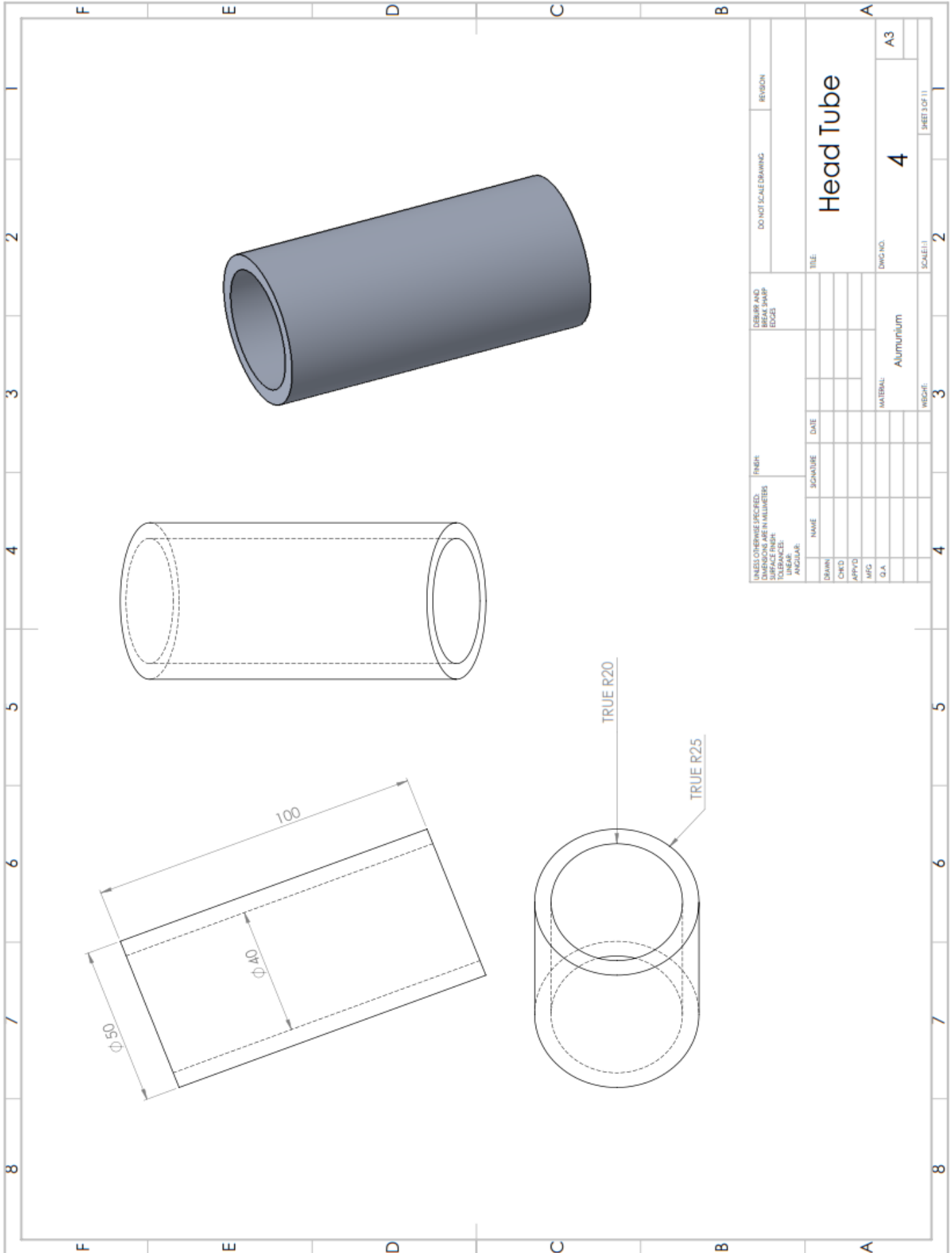
DIMENSIONS UNLESS SPECIFIED: SURFACE FINISH: DIMENSIONS ARE IN MILLIMETERS TOLERANCES: ANGULAR:		FINISH: DEBUR AND BREAK SHARP EDGES	DO NOT SCALE DRAWING	REVISION
DRAWN: CHKD: APPVD: MFG: Q.A.	NAME: All Firdaus Firdaus Firdaus Firdaus Firdaus	SIGNATURE: DATE:	TITLE: <h2 style="text-align: center;">Rangka Sepeda Bambu</h2> DWG NO.: <h1 style="text-align: center;">1</h1> A3	
MATERIAL: Bamboo, Aluminium, dan Epoxy		HSCAL:	SCALE:	SHEET OF 11



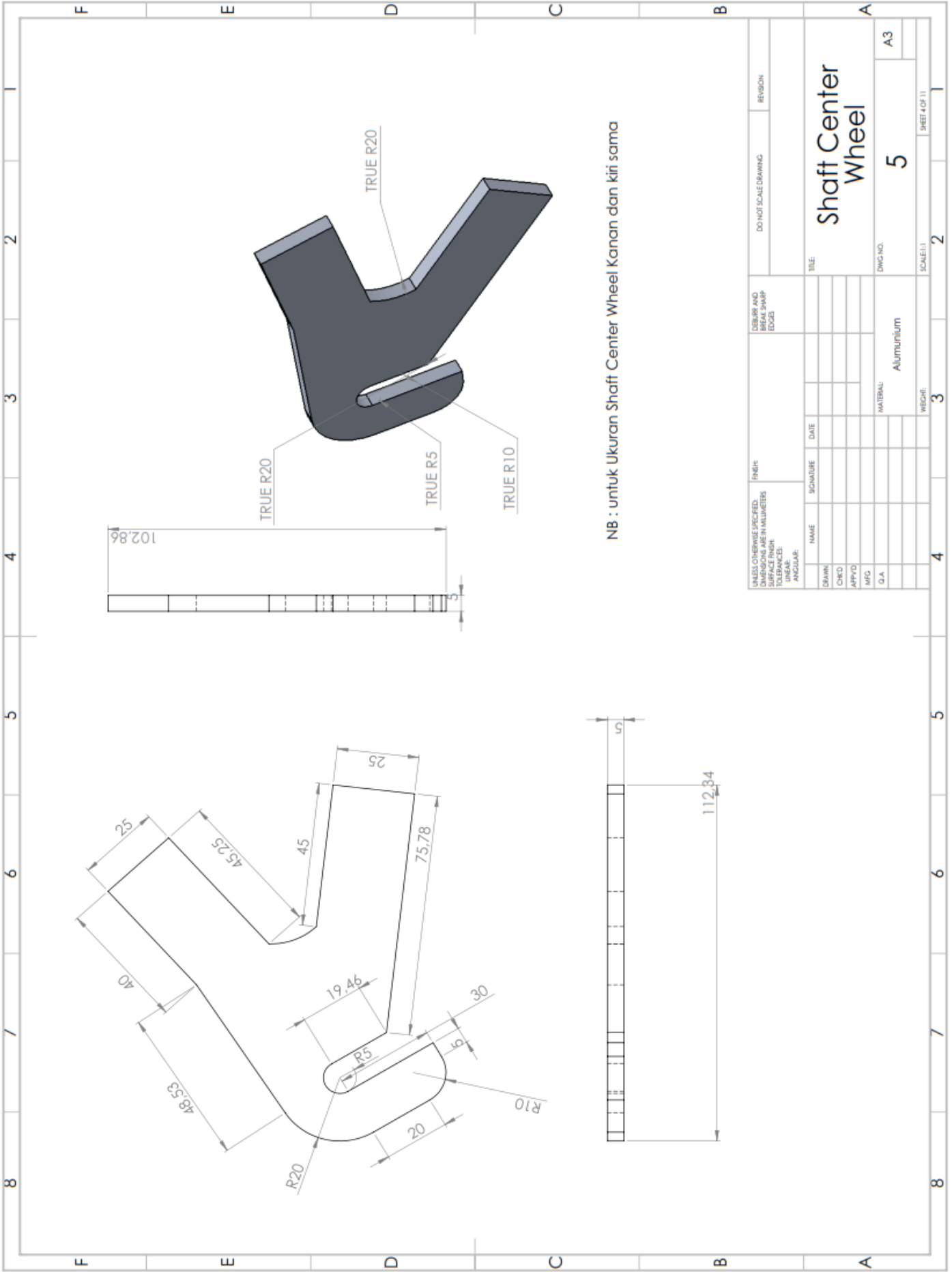
Geometri Sepeda



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS		FINISH		DO NOT SCALE DRAWING		REVISION	
DIMENSIONS UNLESS OTHERWISE SPECIFIED		SURFACE		DEBURR AND BREAK SHARP EDGES		DATE	
TOLERANCES:		NAME		SIGNATURE		DATE	
LINEAR		DATE		DATE		DATE	
ANGULAR		DATE		DATE		DATE	
TITLE		DATE		DATE		DATE	
Center Tube		DATE		DATE		DATE	
DWG NO.		DATE		DATE		DATE	
3		DATE		DATE		DATE	
A3		DATE		DATE		DATE	
MATERIAL		DATE		DATE		DATE	
Aluminium		DATE		DATE		DATE	
SCALE		DATE		DATE		DATE	
1:1		DATE		DATE		DATE	
SHEET NO.		DATE		DATE		DATE	
3		DATE		DATE		DATE	
SHEET TOTAL		DATE		DATE		DATE	
2		DATE		DATE		DATE	

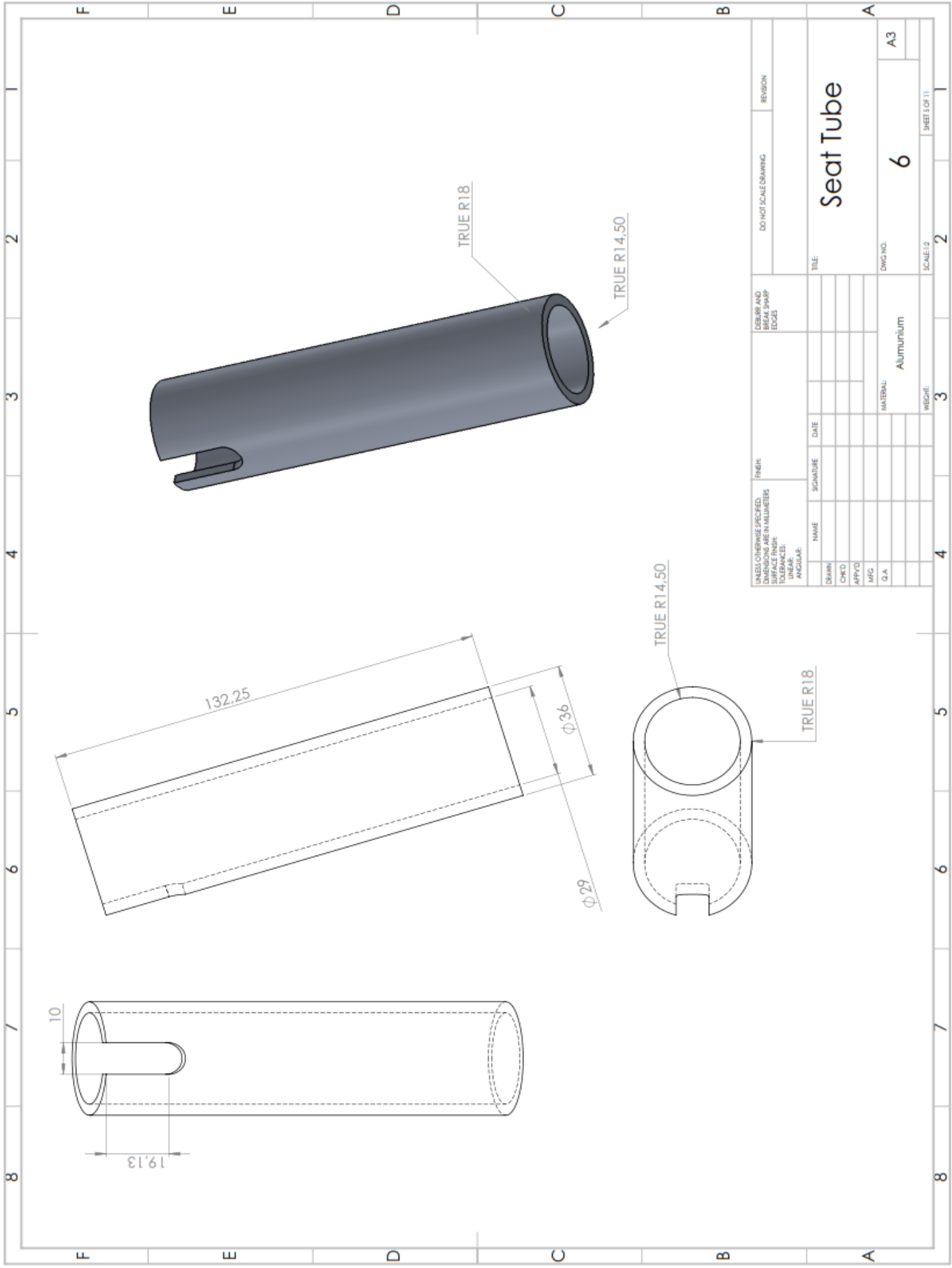


UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: TOLERANCES: LINEAR: ANGULAR:		FINISH:		DEBURR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION	
DRAWN:	NAME	SIGNATURE	DATE	TITLE		Head Tube			
CHKD:									
APPVD:									
MFG:									
C.A.:									
	MATERIAL: Aluminum			DWG NO. 4		A3			
	WEIGHT: 3			SCALE: 1:1		SHEET 3 OF 11			

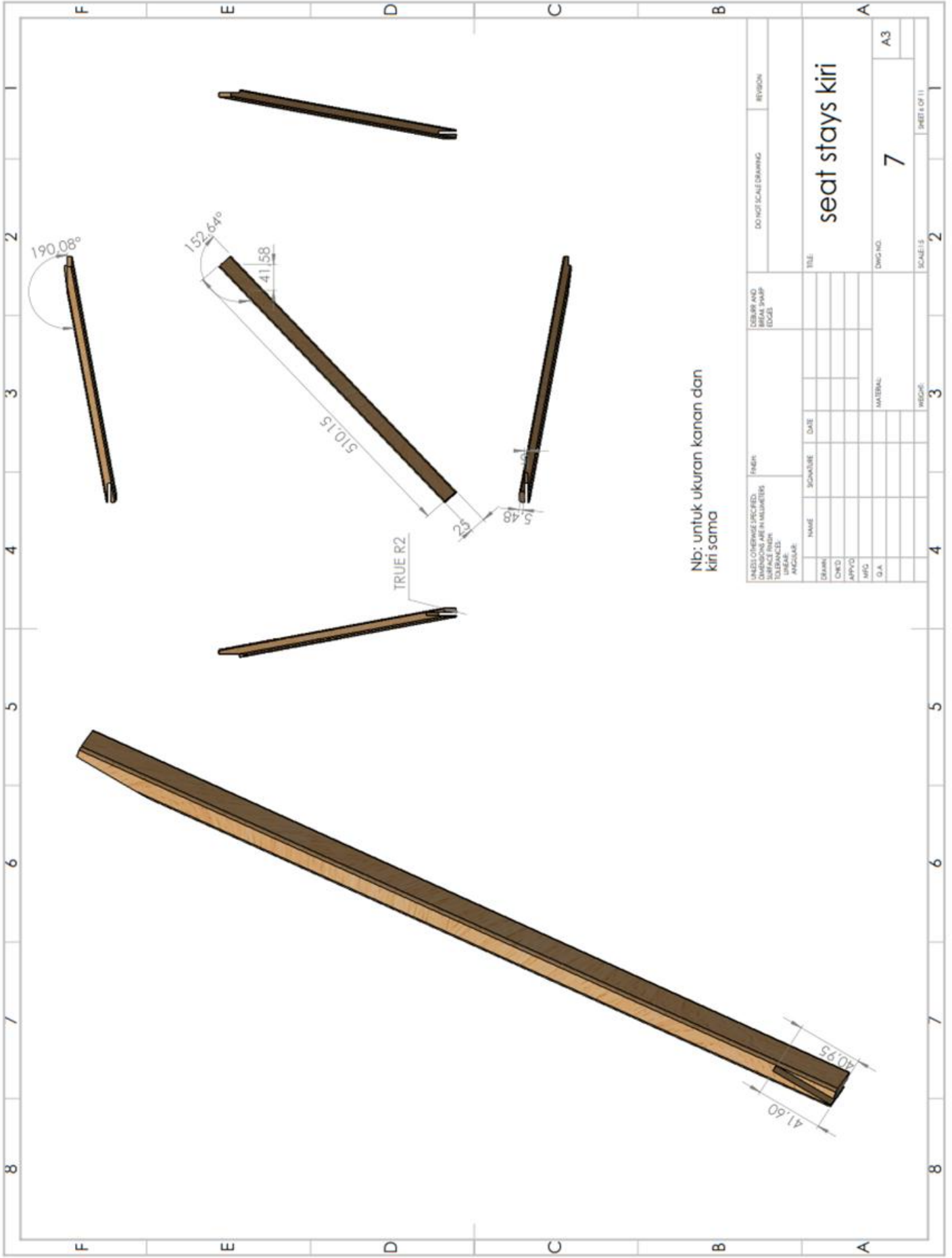


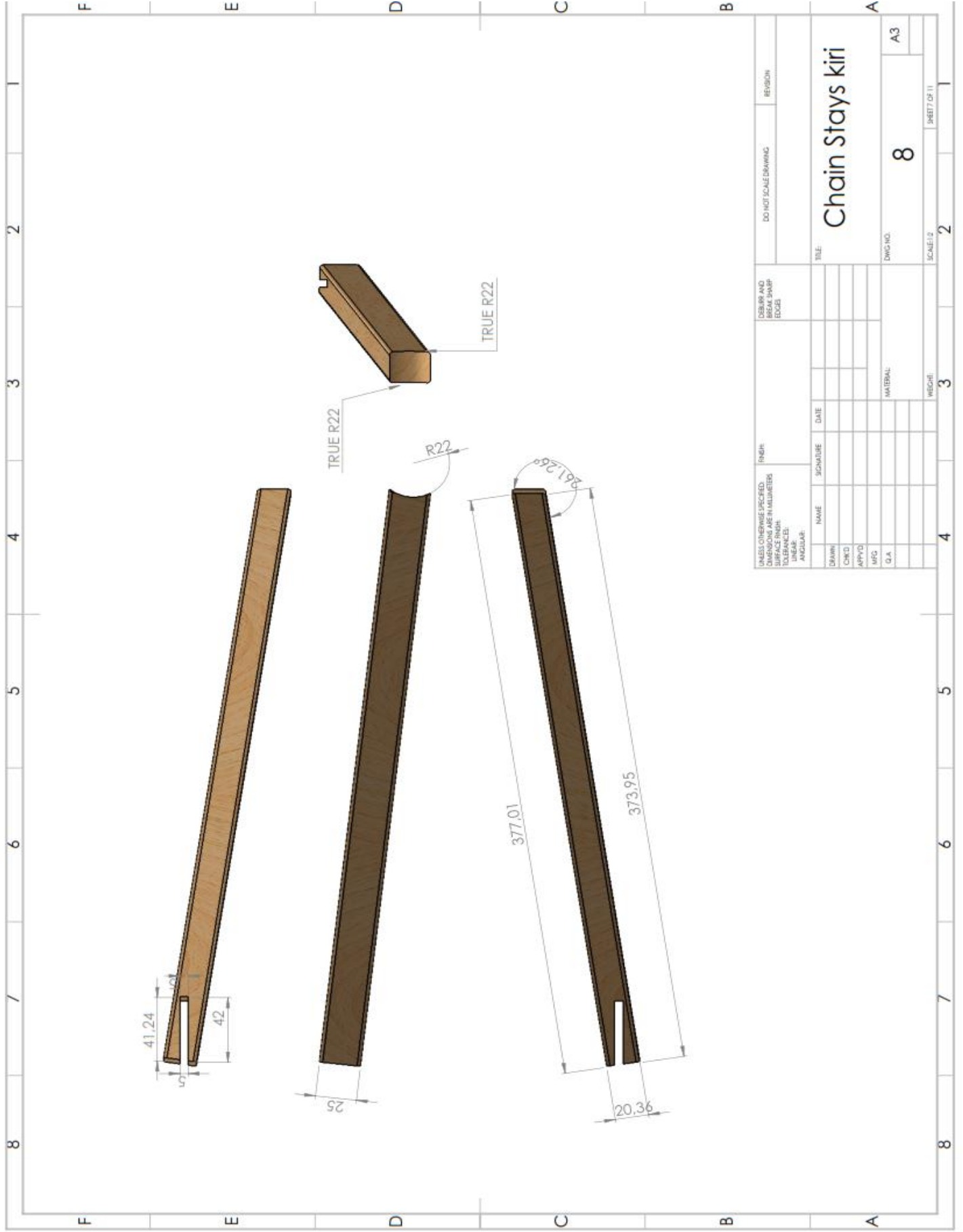
NB : untuk Ukuran Shaft Center Wheel Kanan dan kiri sama

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS		DESIGN AND CONSTRUCTION REQUIREMENTS: SHARP EDGES		DO NOT SCALE DRAWING		REGION	
SURFACE FINISH:		TITLE:		SHAFT CENTER WHEEL		REV. NO.	
TOLERANCES:		NAME		SIGNATURE		DATE	
LINEAR:		DRAWN		CHKD		APPROV	
ANGULAR:		MFG		G.A.		MATERIAL: Aluminum	
		SCALE: 1:1		SHEET 4 OF 11		2	
		WEIGHT:		3		5	
		DWG. NO.		A3		8	

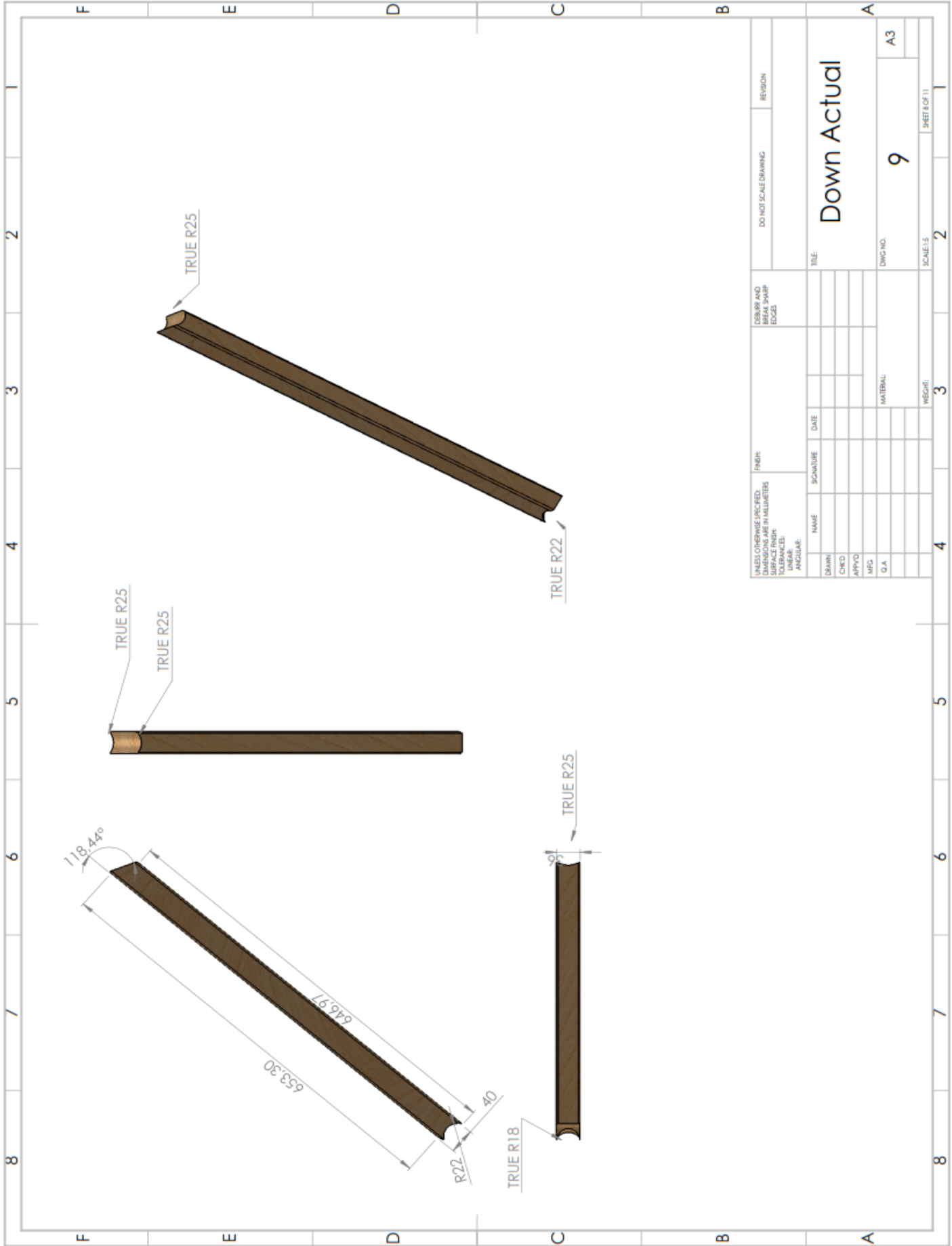


UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS		FINISH		DEBARR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REGION	
TOLERANCES:									
LINEAR:									
ANGULAR:									
DESIGN	NAME	SIGNATURE	DATE	TITLE		SCALE		SHEET NO. OF TOTAL SHEETS	
CHECKED				Seat Tube		2		11	
APPROVED				MATERIAL		6		A3	
MFG				Aluminum					
DRAWN				ENGR. NO.					

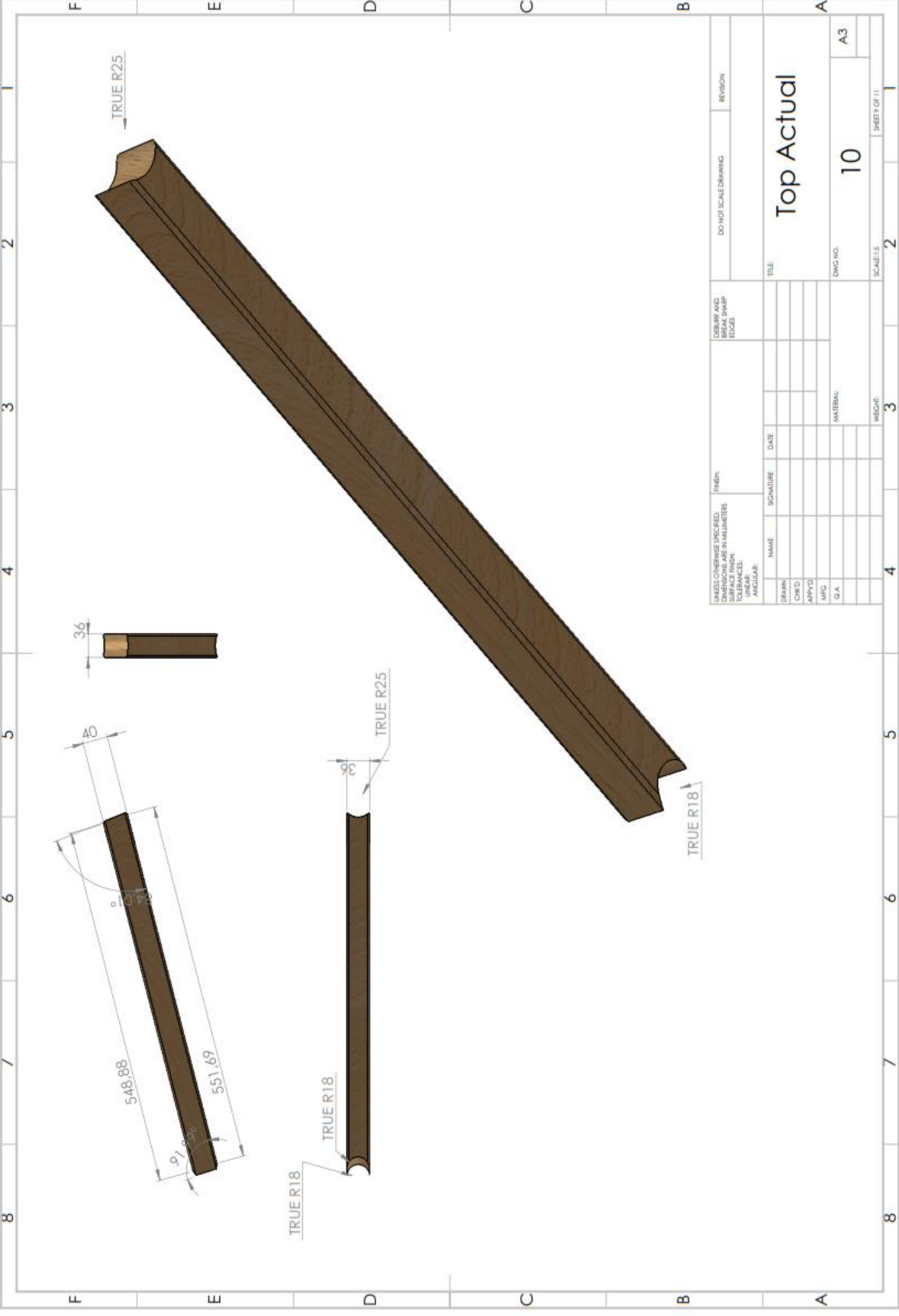




UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS		FINISH:		DO NOT SCALE DRAWING		REGION	
SURFACE FINISH:		R22		DEBURR AND BREAK SHARP EDGES		TITLE	
LINE STYLE:		TRUE R22		CHAIN STAYS kiri		DWG NO. 8	
ANGULAR:		TRUE R22		SCALE: 1:2		SHEET 7 OF 11	
DRAWN	NAME	SIGNATURE	DATE	SCALE: 1:2	2	A3	
CHECKED				WEIGHT	3		
APPROVED							
MFG							
Q.A.							
	MATERIAL:						



UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS		DO NOT SCALE DRAWING		REVISION	
SURFACE FINISH:		CORNER AND BREAK SHARP EDGES		TITLE	
TOLERANCES:				Down Actual	
ANGULAR:				DWG NO. 9	
				A3	
				SHEET # OF 11	
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				100	



UNLESS OTHERWISE SPECIFIED: DIMENSIONS IN MILLIMETERS		FINISH:		DISCARD UNDESIRABLE EDGES		DO NOT SCALE DRAWING		REVISION	
SURFACE FINISH:		SIGNATURE		DATE		TITLE		DWG. NO.	
TOLERANCES:		NAME				Top Actual		10	
ANGLES:		DRAWN				SCALE: 1:5		2	
RADIUS:		CHKD				SHEET 1 OF 1		A3	
		APPLY							
		MFG							
		G.A.							
		MATERIAL:							
		WEIGHT:							
		3							

Lampiran 2

Analisa perhitungan beban maksimal

Dari tabel diatas dapat diketahui nilai beban maksimal dan nilai tegangan maksimal rangka sepeda bambu sebagai berikut :

- a. Rangka sepeda menggunakan bambu raw material.

Faktor keamanan dirumuskan :

$$\eta = \frac{\text{Kekutan sebenarnya (beban sebenarnya)}}{\text{kekuatan yang dibutuhkan (beban yang dibutuhkan)}}$$

Maka jika ,

1. Diketahui $P_e = 80 \text{ kg}$ nilai factor safety $n = 7$

$$\sigma_e = 13,55 \text{ Mpa} \quad u = 0,03125 \text{ mm}$$

$$\sigma_{yield} = ? \quad P_{max} = ?$$

$$u_{max} = ?$$

Hasil :

$$\text{a) } 7 = \frac{P_{Max}}{80}$$

$$P_{max} = n \times P_e = 7 \times 80 = 560 \text{ kg}$$

$$P_{max} = 560 \text{ kg}$$

$$\text{b) } \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$7 = \frac{\sigma_{yield}}{13,55}$$

$$\sigma_{yield} = \eta \times \sigma_e = 7 \times 13,55 = 94,85 \text{ Mpa}$$

$$\sigma_{yield} = 94,85 \text{ Mpa}$$

$$\text{c) } \eta = \frac{u_{max}}{u}$$

$$7 = \frac{u_{max}}{0,03125}$$

$$u_{max} = \eta \times u = 7 \times 0,03125 = 0,218$$

$$u_{max} = 0,218 \text{ mm}$$

2. Diketahui $P_e = 100 \text{ kg}$ Nilai factor safety $n = 5,6$

$$\sigma_e = 16,95 \text{ Mpa} \quad u = 0,03907 \text{ mm}$$

$$\sigma_{yield} = ? \quad P_{max} = ?$$

$$u_{max} = ?$$

Hasil :

$$a) 5,6 = \frac{P_{max}}{100}$$

$$P_{max} = n \times P_e = 5,6 \times 100 = 560 \text{ kg}$$

$$P_{max} = 560 \text{ kg}$$

$$b) \eta = \frac{\sigma_{max}}{\sigma_e}$$

$$5,6 = \frac{\sigma_{yield}}{16,95}$$

$$\sigma_{yield} = \eta \times \sigma_e = 5,6 \times 16,95 = 94,92 \text{ Mpa}$$

$$\sigma_{yield} = 94,92 \text{ Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$5,6 = \frac{u_{max}}{0,03907}$$

$$u_{max} = \eta \times u = 5,6 \times 0,03907 = 0,218$$

$$u_{max} = 0,218 \text{ mm}$$

3. Diketahui $P_e = 150 \text{ kg}$ Nilai factor safety $n = 3,737$

$$\sigma_e = 25,42 \quad u = 0,0586 \text{ mm}$$

$$\sigma_{yield} = ?$$

$$P_{max} = ?$$

$$u_{max} = ?$$

Hasil :

$$a) 3,7 = \frac{P_{max}}{150}$$

$$P_{max} = n \times P_e = 3,737 \times 150 = 560 \text{ kg}$$

$$P_{max} = 550 \text{ kg}$$

$$b) \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$3,7 = \frac{\sigma_{yield}}{25,42}$$

$$\sigma_{yield} = \eta \times \sigma_e = 3,737 \times 25,42 = 94,99 \text{ Mpa}$$

$$\sigma_{yield} = 94,99 \text{ Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$3,7 = \frac{u_{max}}{0,03907}$$

$$u_{max} = \eta \times u = 3,7 \times 0,0586 = 0,218$$

$$u_{max} = 0,218 \text{ mm}$$

Jadi beban maksimal dari rangka adalah sebesar 560 kg

Jika nilai factor safety 4 maka,

$$4 = \frac{560}{P_e} = x = \frac{560}{4} = 140 \text{ kg}$$

Jadi beban untuk nilai factor safety 4 sebesar 140 kg berat pengendara, sebagai nilai keamanan sepeda untuk dipergunakan.

b. Rangka bambu *Sandwict non treatment*

Faktor keamanan dirumuskan :

$$n = \frac{\text{Kekuatan sebenarnya (beban sebenarnya)}}{\text{kekuatan yang dibutuhkan (beban yang dibutuhkan)}}$$

Maka jika ,

1. Diketahui $P_e = 80$ kg nilai factor safety $\eta = 6,7$

$$\sigma_e = 14,16 \text{ Mpa} \qquad u = 0,037 \text{ mm}$$

$$\sigma_{yield} = ? \qquad P_{max} = ?$$

$$u_{max} = ?$$

Hasil :

$$a) \quad 7 = \frac{P_{max}}{80}$$

$$P_{max} = \eta \times P_e = 6,7 \times 80 = 536 \text{ kg}$$

$$P_{max} = 536 \text{ kg}$$

$$b) \quad \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$7 = \frac{\sigma_{yield}}{14,16}$$

$$\sigma_{yield} = \eta \times \sigma_e = 6,7 \times 14,16 = 94,93 \text{ Mpa}$$

$$\sigma_{yield} = 94,93 \text{ Mpa}$$

$$c) \quad \eta = \frac{u_{max}}{u}$$

$$6,7 = \frac{u_{max}}{0,037}$$

$$u_{max} = \eta \times u = 6,7 \times 0,037 = 0,247$$

$$u_{max} = 0,247 \text{ mm}$$

2. Diketahui $P_e = 100$ kg nilai factor safety $\eta = 5,36$

$$\sigma_e = 17,72 \text{ Mpa} \qquad u = 0,046 \text{ mm}$$

$$\sigma_{yield} = ? \quad u_{max} = ?$$

Hasil :

$$a) 5,36 = \frac{P_{max}}{100}$$

$$P_{max} = \eta \times P_e = 5,36 \times 100 = 536 \text{ kg}$$

$$P_{max} = 536 \text{ kg}$$

$$b) \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$5,36 = \frac{\sigma_{yield}}{17,72}$$

$$\sigma_{yield} = \eta \times \sigma_e = 5,36 \times 17,72 = 94,97 \text{ Mpa}$$

$$\sigma_{yield} = 94,97 \text{ Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$5,36 = \frac{u_{max}}{0,046}$$

$$u_{max} = \eta \times u = 5,36 \times 0,046 = 0,246$$

$$u_{max} = 0,246 \text{ mm}$$

3. Diketahui $P_e = 150 \text{ kg}$ nilai factor safety $\eta = 3,577$

$$\sigma_e = 26,55 \text{ Mpa} \quad P_{max} = ?$$

$$\sigma_{yield} = ? \quad u = 0,036 \text{ mm}$$

$$u_{max} = ?$$

Hasil :

$$a) 3,57 = \frac{P_{max}}{150}$$

$$P_{max} = \eta \times P_e = 3,577 \times 150 = 536,5 \text{ kg}$$

$$P_{max} = 535,5 \text{ kg}$$

$$b) \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$3,57 = \frac{\sigma_{yield}}{26,57}$$

$$\sigma_{yield} = \eta \times \sigma_e = 3,577 \times 26,57 = 94,96 \text{Mpa}$$

$$\sigma_{yield} = 94,96 \text{Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$3,577 = \frac{u_{max}}{0,069}$$

$$u_{max} = \eta \times u = 3,577 \times 0,069 = 0,246$$

$$u_{max} = 0,246 \text{ mm}$$

Jadi beban maksimal dari rangka adalah sebesar 536 kg

Jika nilai factor safety 4 maka,

$$4 = \frac{536}{P_e} \times x = \frac{536}{4} = 134 \text{ kg}$$

Jadi beban untuk nilai *factor safety* 4 sebesar 134 kg berat pengendara, sebagai nilai keamanan sepeda untuk dipergunakan.

c. Bambu *sandwich composite* dengan *treatment*

Faktor keamanan dirumuskan :

$$\eta = \frac{\text{Kekutan sebenarnya (beban sebenarnya)}}{\text{kekuatan yang dibutuhkan (beban yang dibutuhkan)}}$$

Maka jika ,

1. Diketahui $P_e = 80 \text{kg}$ nilai factor safety $\eta = 7,5$

$$\sigma_e = 12,62 \text{ Mpa} \quad P_{max} = ?$$

$$\sigma_{yield} = ? \quad u = 0,021 \text{ mm}$$

$$u_{max} = ?$$

Hasil :

$$a) 7,5 = \frac{P_{max}}{80}$$

$$P_{max} = \eta \times P_e = 7,5 \times 80 = 600 \text{ kg}$$

$$P_{max} = 600 \text{ kg}$$

$$b) \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$7,5 = \frac{\sigma_{max}}{12,62}$$

$$\sigma_{yield} = \eta \times \sigma_e = 7,5 \times 12,62 = 94,65 \text{ Mpa}$$

$$\sigma_{yield} = 94,65 \text{ Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$7,5 = \frac{u_{max}}{0,021}$$

$$u_{max} = \eta \times u = 7,5 \times 0,021 = 0,157$$

$$u_{max} = 0,157 \text{ mm}$$

2. Diketahui $P_e = 100 \text{ kg}$ nilai factor safety $\eta = 6$

$$\sigma_{max} = 15,78 \text{ Mpa} \quad P_{max} = ?$$

$$\sigma_{max} = ? \quad u = 0,026$$

Hasil :

$$a) 6 = \frac{P_{max}}{100}$$

$$P_{max} = \eta \times P_e = 6 \times 100 = 600 \text{ kg}$$

$$P_{max} = 600 \text{ kg}$$

$$b) \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$6 = \frac{\sigma_{max}}{15,78}$$

$$\sigma_{yield} = \eta \times \sigma_e = 6 \times 15,78 = 94,68 \text{ Mpa}$$

$$\sigma_{yield} = 94,68 \text{ Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$6 = \frac{u_{max}}{0,026}$$

$$u_{max} = \eta \times u = 6 \times 0,026 = 0,156$$

$$u_{max} = 0,156 \text{ mm}$$

3. Diketahui $P_e = 150 \text{ kg}$ nilai factor safety $\eta = 4$

$$\sigma_e = 23,76 \text{ Mpa} \quad P_{max} = ?$$

$$\sigma_{yield} = ? \quad u = 0,039$$

$$u_{max} = ?$$

Hasil :

$$a) 4 = \frac{P_{max}}{150}$$

$$P_{max} = \eta \times P_e = 4 \times 150 = 600 \text{ kg}$$

$$P_{max} = 600 \text{ kg}$$

$$b) \eta = \frac{\sigma_{yield}}{\sigma_e}$$

$$4 = \frac{\sigma_{max}}{23,76}$$

$$\sigma_{yield} = \eta \times \sigma_e = 4 \times 23,76 = 95,04 \text{ Mpa}$$

$$\sigma_{yield} = 95,04 \text{ Mpa}$$

$$c) \eta = \frac{u_{max}}{u}$$

$$4 = \frac{u_{max}}{0,039}$$

$$u_{max} = \eta \times u = 4 \times 0,039 = 0,156$$

$$u_{max} = 0,156 \text{ mm}$$

Jadi beban maksimal dari rangka adalah sebesar 600 kg jika menggunakan bambu *sandwict non treatment* sebagai material dan tegangan maksimum dari sepeda tersebut adalah

Jika nilai factor safety 4 maka,

$$4 = \frac{600}{P_e} = x = \frac{600}{4} = 150 \text{ kg}$$

Jadi beban untuk nilai *factor safety* 4 sebesar 150 kg berat pengendara, sebagai nilai keamanan sepeda untuk dipergunaka

