

7/5/20 @ 13:00 CAE & Stress Analysis (MSX02064)

2a)
Cont.

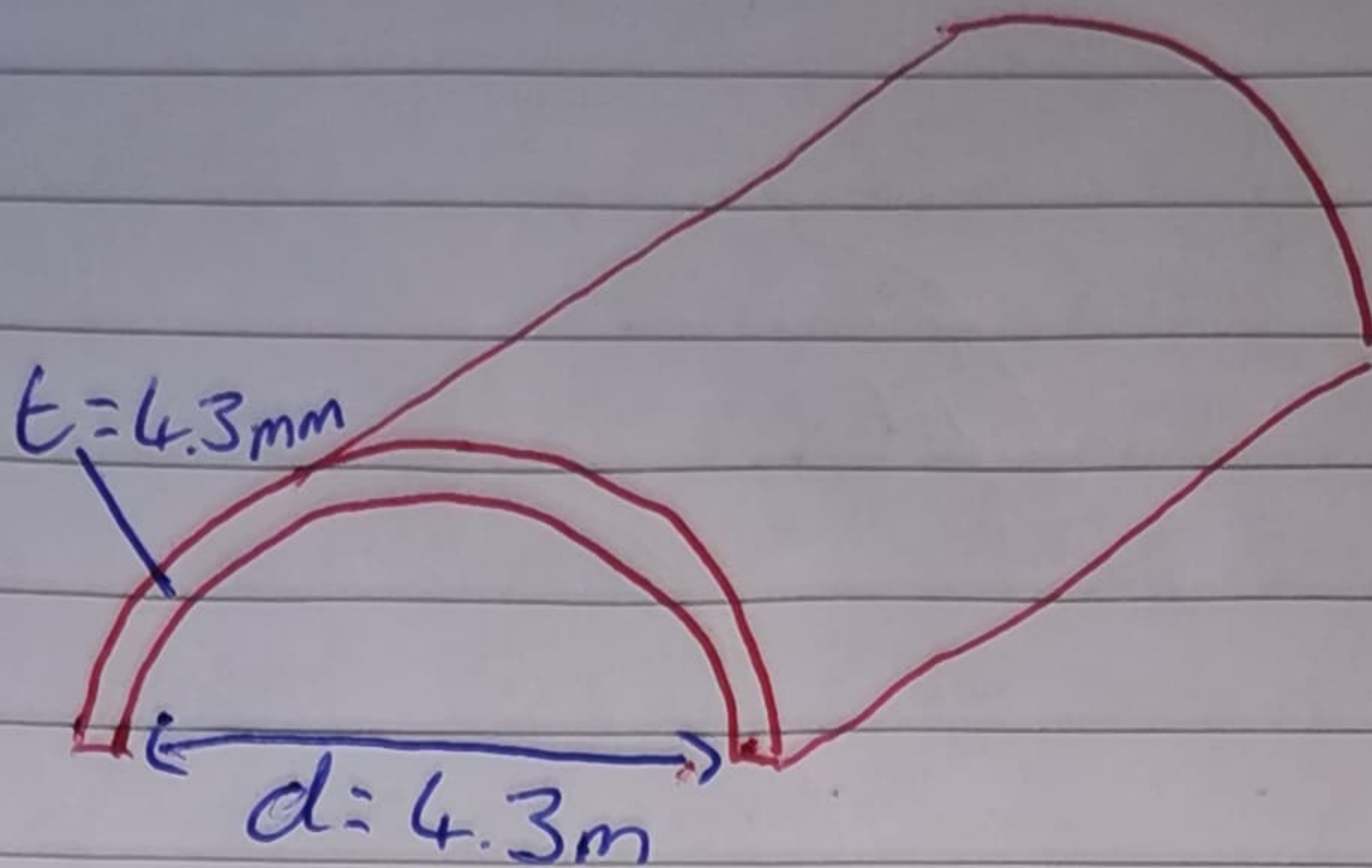
5. Testing and implementing. This step involves making prototypes of the chosen solution as well as working models. Documentation is important throughout as people in the team may have different specialities and ~~any~~ the process needs to be completely understood by all, normally via a technical report. Finally applying for patents which will give the manufacturer rights.

2b)

early in the design process FEA can be used to help develop and test possible solutions to the problem so that time is not wasted down the line. by ~~implement~~ implementing FEA during the design phase during parts 3 and 4 CAD models can be developed more efficiently and at a lower cost.

7/5/20 @ 1300 cae & Stress Analysis (MSX02064)

1d)

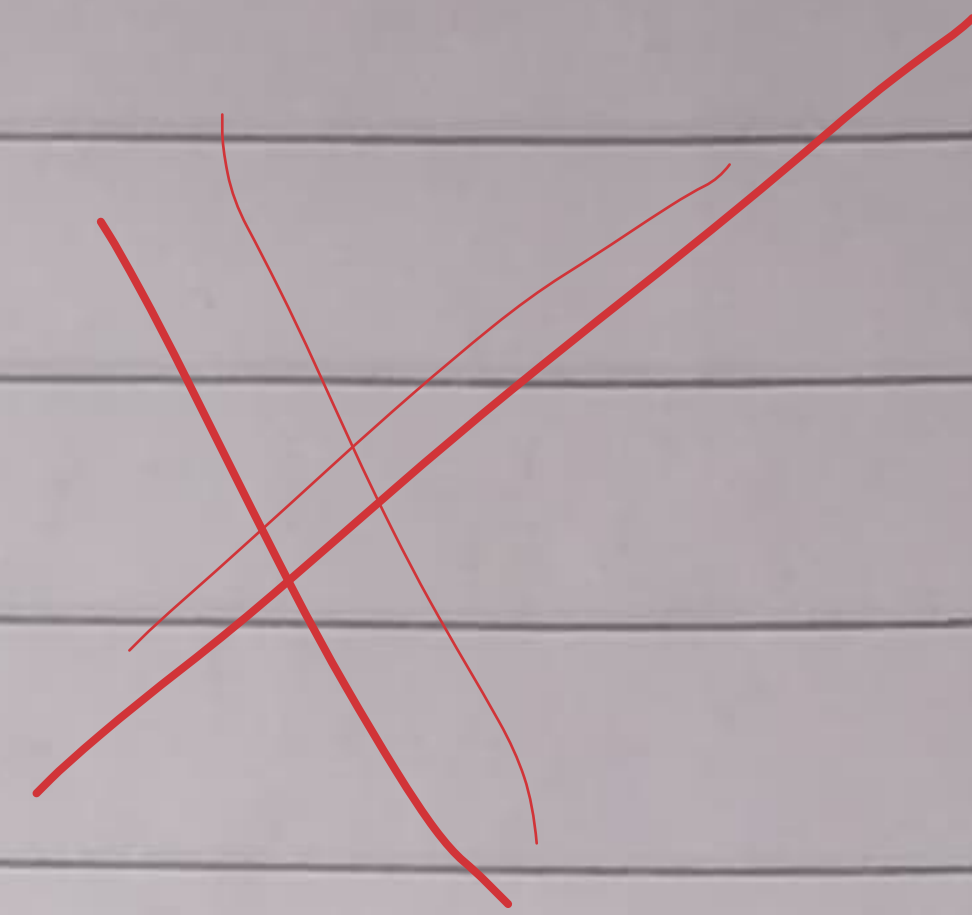


Yield stress 200 Mpa

$$d = 4.3m$$

$$t = 0.0043m$$

$$\sigma_H = 200 \text{ Mpa} = 2 \times 10^8$$



7/5/20 @ 13:00 CAE & Stress Analysis (MSX02064)

- 2a 1. Define Problem. Identify and establish a need for the product and develop a problem statement where criteria are established that the product must meet these can include but are not limited to: safety around children; disposable; low cost of material, manufacture or final product; be ergonomic; and be aesthetically pleasing.
2. gather information. find out what products are already available for the problem, find out what they do well and where they can be improved. Research with the potential buyers to see what they think and ~~there~~ how much they are likely to pay for the product. What companies you would be in competition with and what governing bodies control specifications.
3. generate multiple solutions. This step is crucial in the design process as many options should be considered as they will all meet the design criteria in different ways with emphasis on different aspects. The designs can always be improved where they are weaker
4. Analyse and select. In this step the designs can be graded by how well they meet the design criteria and other aspects such as: functional analysis; industrial and ergonomics; strength; manufacturability; safety and regulations.

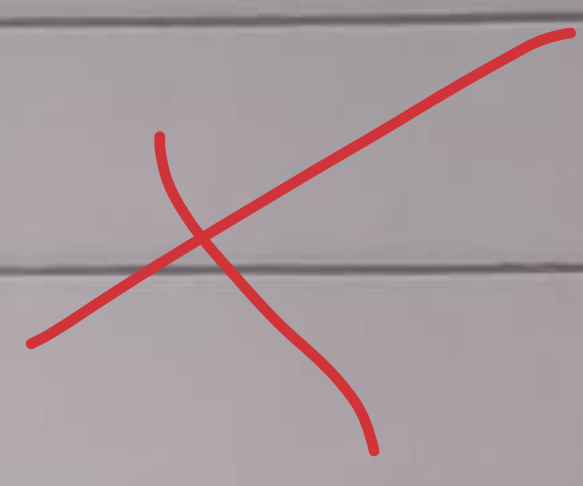
7/5/20 @ 13:00 CAE & stress Analysis (MSK02064)

4b)

$$\sigma_{\theta} = \tau_{xy} \sin 2\theta$$

$$= 77 \sin(2 \times 52)$$

$$\sigma_{\theta} = 74.71 \text{ Mpa}$$

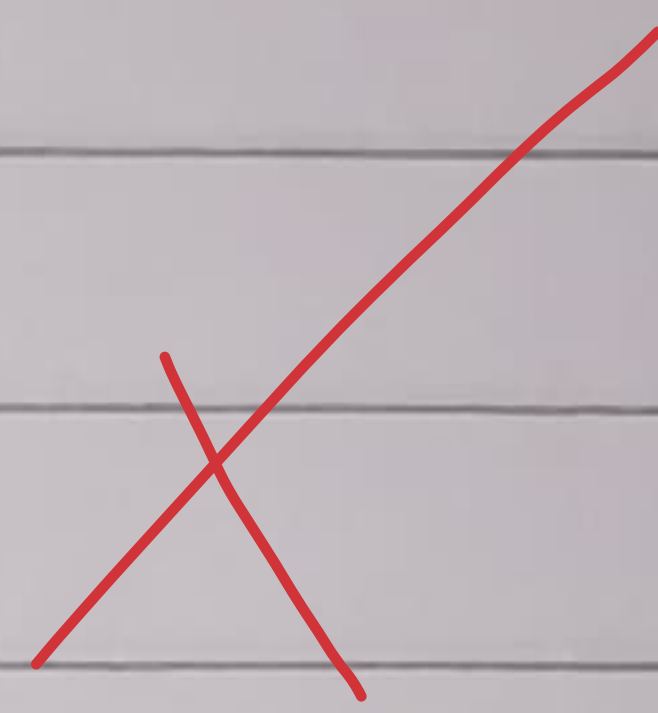


4c)

$$\tau_{\theta} = -\tau_{xy} \cos 2\theta$$

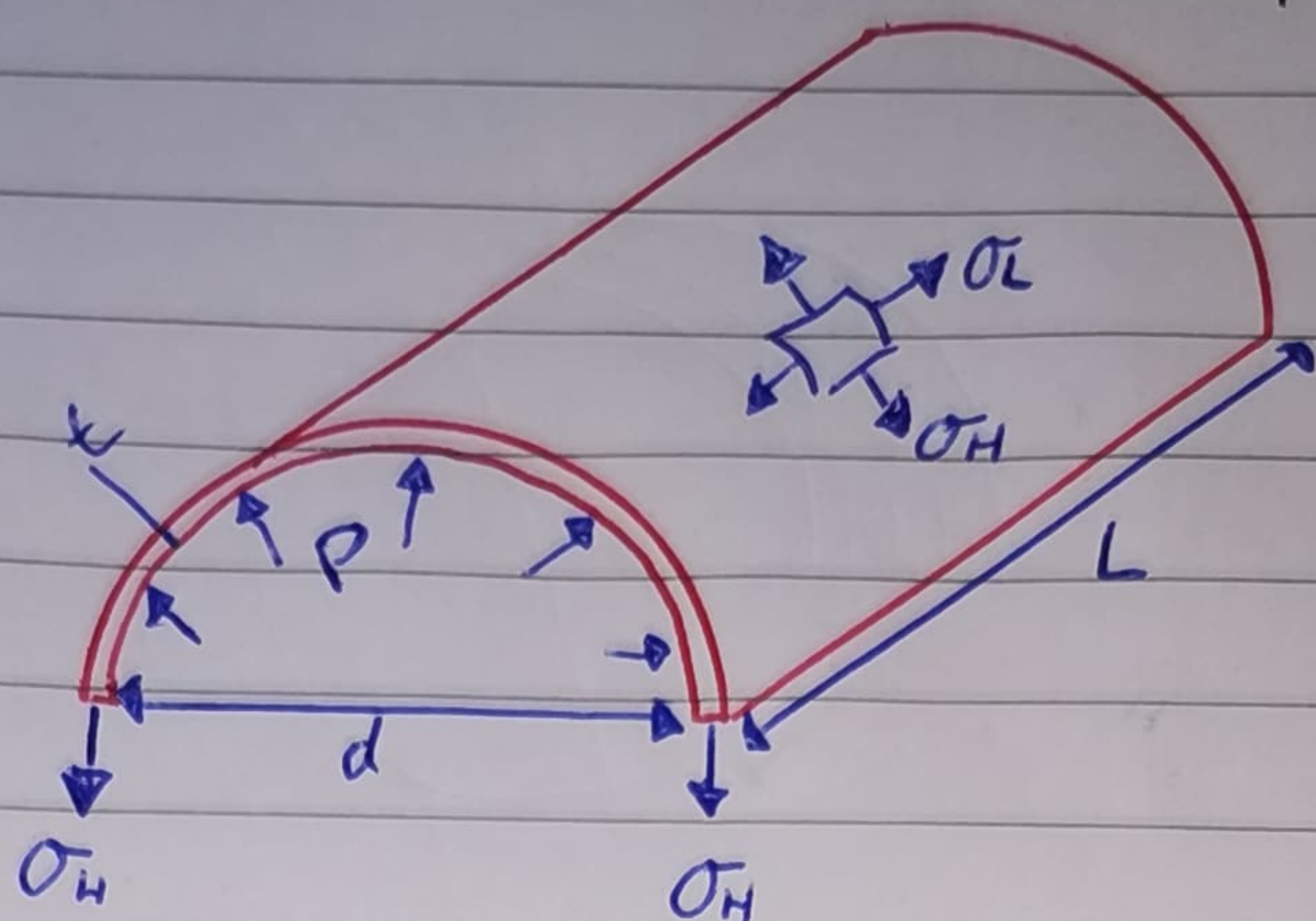
$$= -77 \cos(2 \times 52)$$

$$\tau_{\theta} = 18.63 \text{ Mpa}$$



7/5/20 @ 13:00 CAE & Stress Analysis (MSX02064)

1a)



The total force on half the cylinder due to the internal pressure = $P \times \text{projected area} = PdL$

The resisting force due to hoop stress in the cylinder walls = $2\sigma_H \times Lt$

Hence $\sigma_H = \frac{Pd}{2t}$

$\therefore 2\sigma_H Lt$

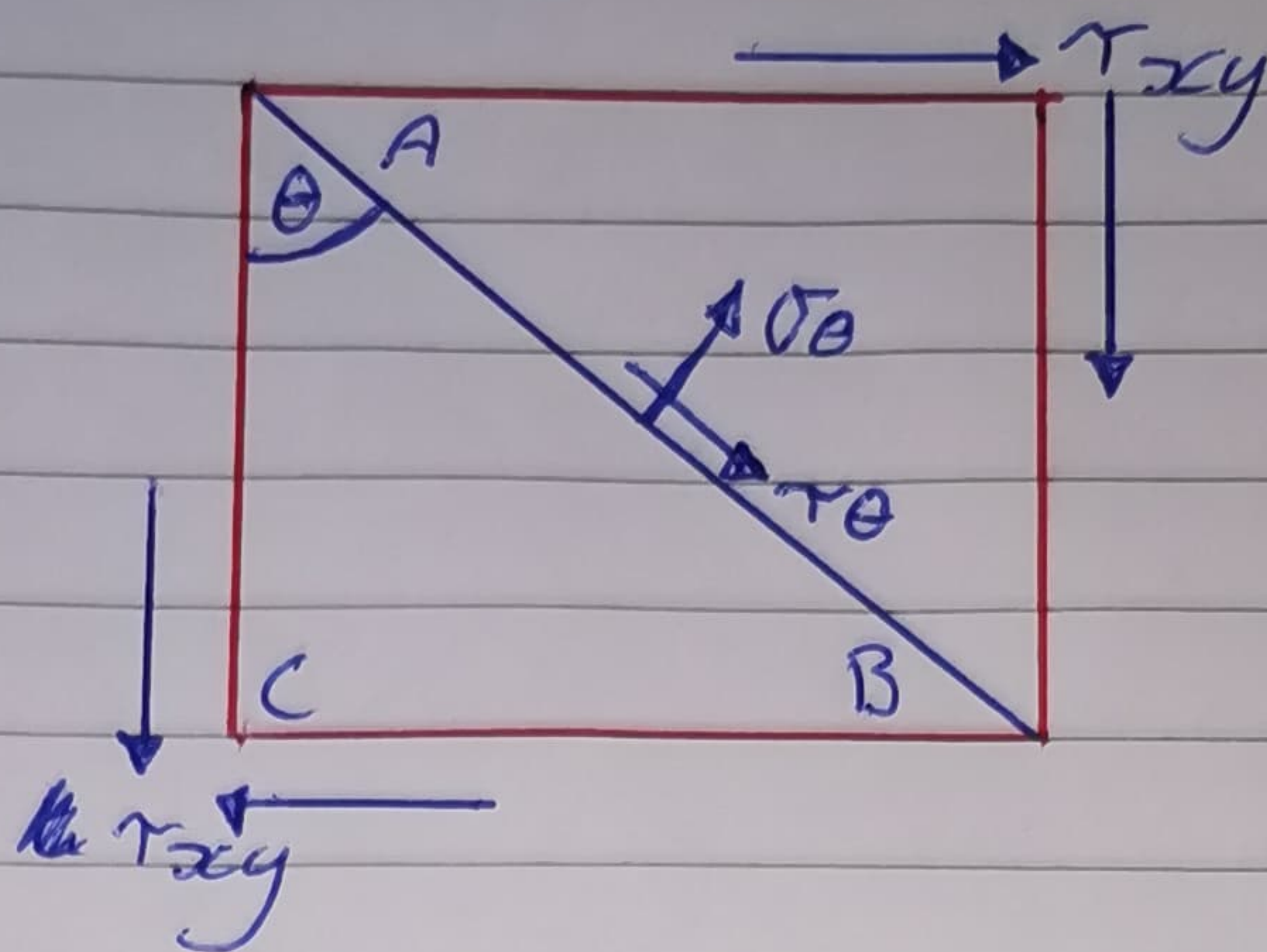
1b) ~~the~~ Hoop stress is ~~a~~ the limiting factor as this is twice that of ~~longitudinal~~ stress therefore cannot be exceeded

1c) by tracing the graph: 1.0260 g/cm^3

$\therefore 0.001 \text{ kg/m}^3$

7/5/20 @ 13:00 CAE & Stress Analysis (MSX02064)

4a)



Sum of the forces perpendicular to AB are zero

$$AB \sigma_{\theta} = AC \tau_{xy} \sin \theta + BC \tau_{xy} \cos \theta$$

$$\therefore \sigma_{\theta} = \frac{AC}{AB} \tau_{xy} \sin \theta + \frac{BC}{AB} \tau_{xy} \cos \theta$$

$$\frac{AC}{AB} = \cos \theta \text{ and } \frac{BC}{AB} = \sin \theta$$

$$\therefore \sigma_{\theta} = \tau_{xy} \sin \theta \cos \theta + \tau_{xy} \sin \theta \cos \theta$$

$$\therefore \sigma_{\theta} = 2 \tau_{xy} \sin \theta \cos \theta$$

$$\sigma_{\theta} = \tau_{xy} \sin 2\theta$$

Since $\sin \theta \cos \theta = \frac{1}{2} \sin 2\theta$