PROJECT ONE: MILESTONE 4 – COVER PAGE

Team Number: Tues-26

Please list full names and MacID's of all *present* Team Members

Full Name:	MacID:
Jackson Lippert	lippertj
Sana Khan	khans288
Sophia Workun	workus1
Emilia Pisic	pisice
Ehsaan Khan	khane16

MILESTONE 4 (STAGE 1) – FINALIZED DESIGN: ESTIMATE THICKNESS REQUIREMENT

Document the results of your materials selection and ranking on the following page.

→ Each team member is required to complete this on the *INDIVIDUAL* worksheet document, and then copy-and-paste to this document

We are asking that you submit your work on both worksheets**.** It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their estimation of deflection with the **Milestone Four Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into the **Milestone Four Team Worksheets** document allows you to readily access your team member's work
    - This will be especially helpful when completing ***Stage 2*** of the milestone

Team Number: Tues-26

Copy-and-paste from the INDIVIDUAL worksheet

Full Name:	MacID:
Sana Khan	khans288

1. The title of the scenario

Engineers Without Borders

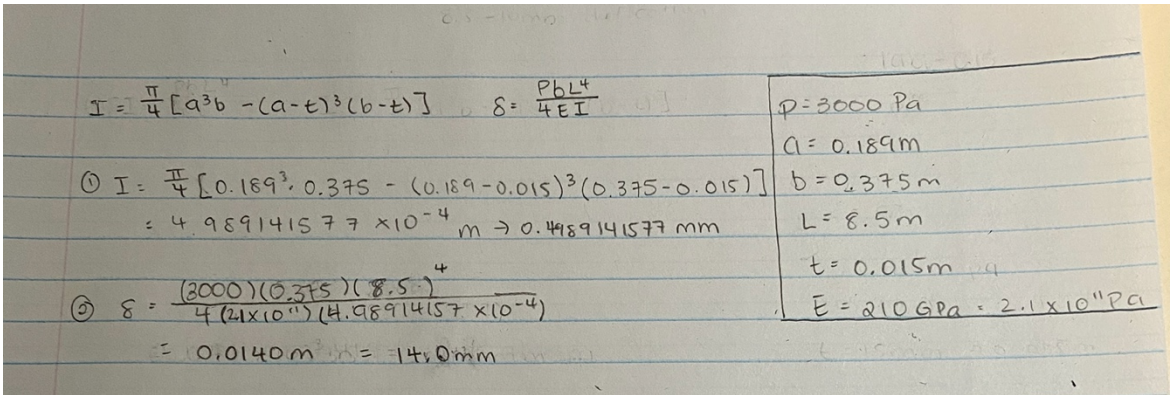
2. Chosen Material

	Material Name	Young's Modulus (GPa)	Yield Strength (MPa)
Chosen Material	High Carbon Steel	210	678.5

3. Estimate of Deflection - Analytical Model

Assigned thickness, *t* from Table 1 (mm)	**15-mm**
Estimated deflection δ (mm)	14.0mm

Insert calculation or photo of hand calculation.



Team Number: Tues-26

Copy-and-paste from the INDIVIDUAL worksheet

Full Name:	MacID:
Sophia Workun	workus1

1. The title of the scenario

Engineers without borders

2. Chosen Material

	Material Name	Young's Modulus (GPa)	Yield Strength (MPa)
Chosen Material	High Carbon Steel	210	678.5

3. Estimate of Deflection - Analytical Model

Assigned thickness, *t* from Table 1 (mm)	**30-mm**
Estimated deflection δ (mm)	7.74mm
Insert calculation or photo of hand calculation.	

$P = 0.003\,MPa = 3000\,Pa$

$a = 0.189m$

$b = 0.375m$

$L = 8.5m$

$t = 0.03m$

$I = ?$

$E = 210\,GPa = 2.1 \times 10^{11}\,Pa$

$\delta = ?$

$$I = \frac{\pi}{4}\left[a^3 b - (a-t)^3(b-t)\right]$$

$$= \frac{\pi}{4}\left[(0.189)^3(0.375) - (0.189-0.03)^3(0.375-0.03)\right]$$

$$= 8.99 \times 10^{-4}\,m^4$$

$$\delta = \frac{pbL^4}{4EI}$$

$$= \frac{3000(0.375)(8.5)^4}{4(2.11\times10^{11})(8.99\times10^{-4})}$$

$$= 7.74 \times 10^{-3}\,m \quad \text{OR} \quad 7.74mm$$

Team Number: Tues-26

Copy-and-paste from the INDIVIDUAL worksheet

Full Name:	MacID:
Emilia Pisic	pisice

1. The title of the scenario

Engineers Without Borders

2. Chosen Material

	Material Name	Young's Modulus (GPa)	Yield Strength (MPa)
Chosen Material	High Carbon Steel	210	678.5

3. Estimate of Deflection - Analytical Model

Assigned thickness, *t* from Table 1 (mm)	**50-mm**
Estimated deflection δ (mm)	5.37mm
Insert calculation or photo of hand calculation.	

Team Number: Tues-26

Copy-and-paste from the INDIVIDUAL worksheet

Full Name:	MacID:
Ehsaan Khan	khane16

1. The title of the scenario

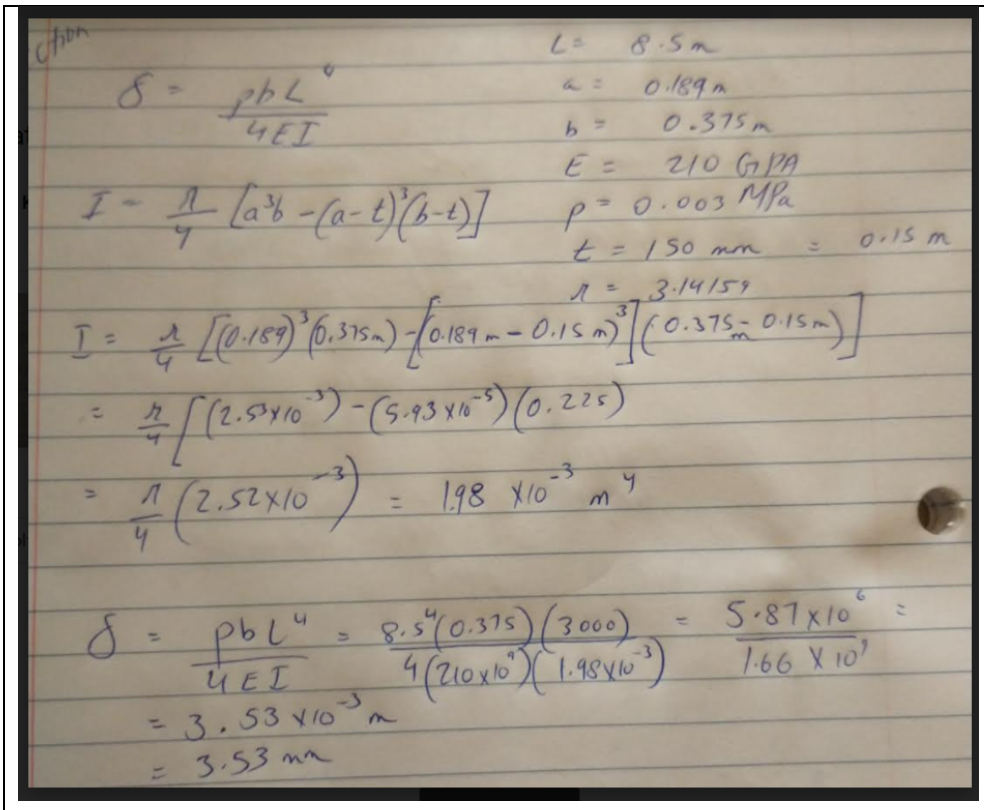
Engineers Without Borders

2. Chosen Material

	Material Name	Young's Modulus (GPa)	Yield Strength (MPa)
Chosen Material	High Carbon Steel	210	678.5

3. Estimate of Deflection - Analytical Model

Assigned thickness, *t* from Table 1 (mm)	**150-mm**
Estimated deflection δ (mm)	3.53 mm
Insert calculation or photo of hand calculation.	



*If you are in a team of 5, please copy and paste the above on a new page

Team Number: Tues-26

Copy-and-paste from the INDIVIDUAL worksheet

Full Name:	MacID:
Jackson Lippert	lippertj

4. The title of the scenario

Engineers Without Borders

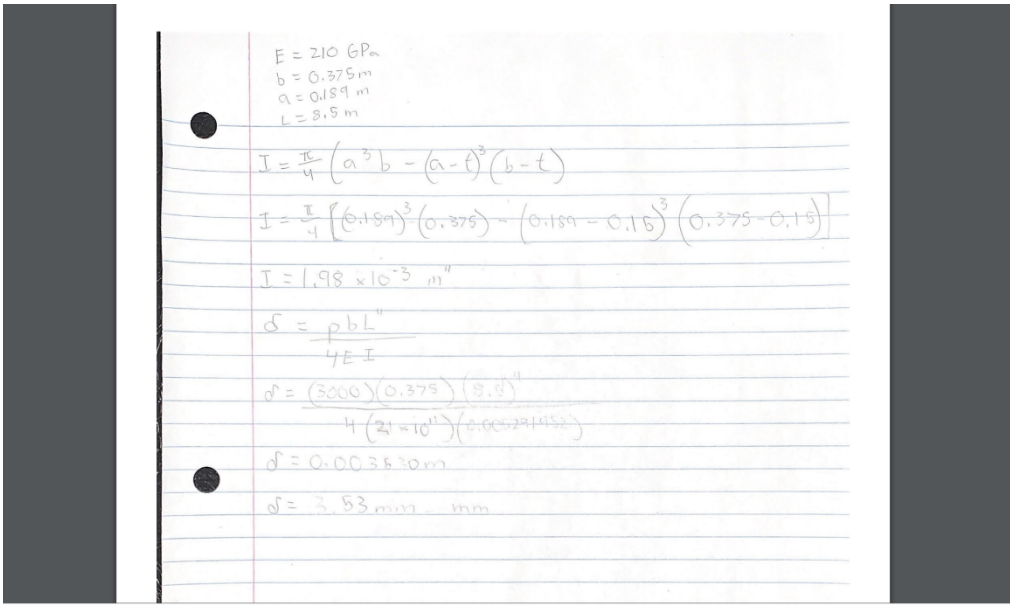
5. Chosen Material

	Material Name	Young's Modulus (GPa)	Yield Strength (MPa)
Chosen Material	High Carbon Steel	210	678.5

6. Estimate of Deflection - Analytical Model

Assigned thickness, *t* from Table 1 (mm)	**150-mm**
Estimated deflection δ (mm)	3.53 mm

Insert calculation or photo of hand calculation.



*If you are in a team of 5, please copy and paste the above on a new page

MILESTONE 4 (STAGE 2) – FINALIZED DESIGN: REFINE THICKNESS REQUIREMENT

Team Number: Tues-26

1. Calculate Thickness Requirement Based on Deflection Simulation

Initial Thickness range, obtained from stage 1 (e.g. 30mm < t < 50 mm):	15mm < t < 30 mm

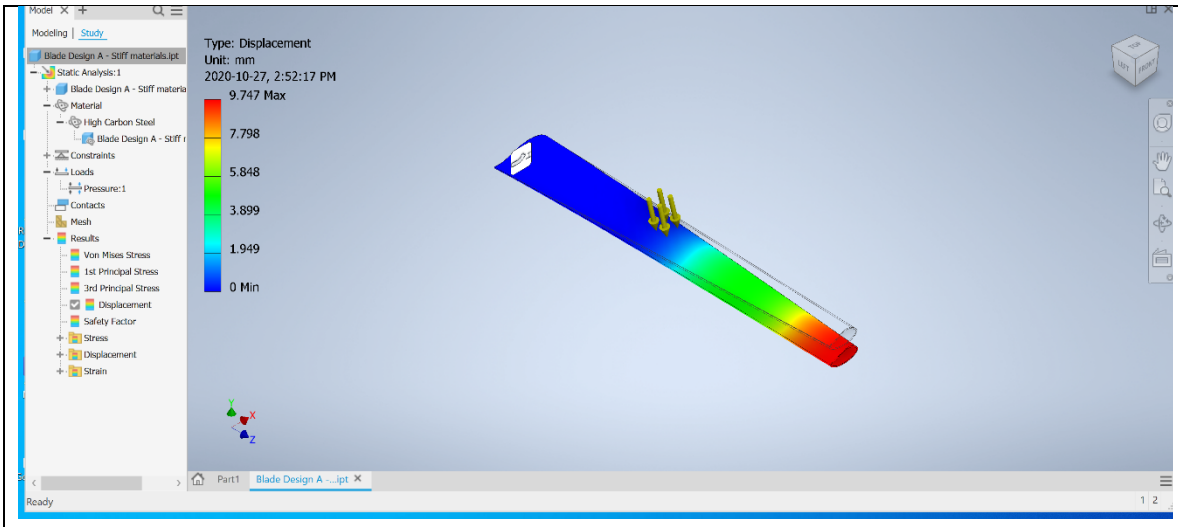
For every iteration, include your thickness and observed deflection in the table below. Only include as many rows as needed until you get a deflection of 10 mm (Do not over-design the turbine blade. i.e., if your deflection is less than 8.5 mm, it is over-designed). Add more rows, if needed:

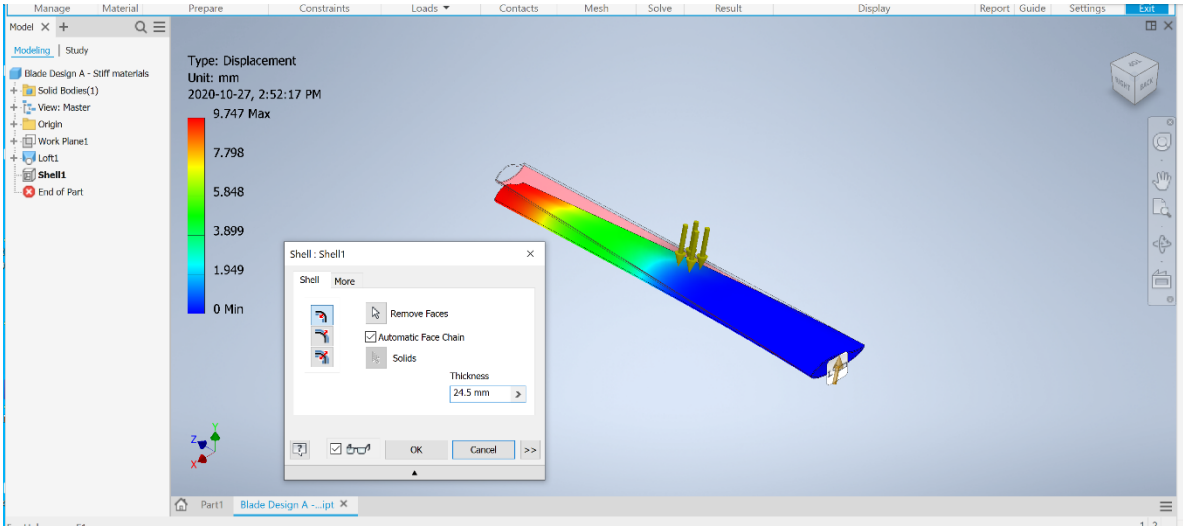
Thickness (mm)	**Observed deflection (mm)**
15	14.58
22	10.48
23	8.644
24	10.3
24.5	**9.747**
24.7	9.383
25	9.435

Final refined turbine blade thickness *t* (mm):	24.5mm

Insert print screens of deflection simulation and provide evidence that the deflection satisfies the design constraint.

Thickness: 24.5mm


Type: Displacement
Unit: mm
2020-10-27, 2:52:17 PM
9.747 Max
7.798
5.848
3.899
1.949
0 Min
Ready


Type: Displacement
Unit: mm
2020-10-27, 2:52:17 PM
9.747 Max
7.798
5.848
3.899
1.949
0 Min
Shell : Shell1
Shell
More
Remove Faces
Automatic Face Chain
Solids
Thickness
24.5 mm
OK
Cancel

MILESTONE 4 (STAGE 3) – PEER INTERVIEW

Team Number: Tues-26

1. Peer Interview Notes

Discuss what you have learned from another group.

Scenario 1
Cost efficient
Large amount of energy
Structurally sound
Bunch of wind turbines that make most amount of energy
Min mas and min cost
Min mass would min inertia and give highest energy
Needed to produce many many turbines

Material

Low alloy steel seemed more well rounded for them
More flexible
Same 15mm-30mm range

Factors in decision matrix: carbon footprint, flexibility, stiffness, lightweight, easy transportability

- Flexibility and stiffness became constraints because they affects the inertia and energy produced the most(group wanted minimum inertia and maximum energy)

Objective: design a turbine to create large amount of energy for and large population.
Turbine must be cost efficient and structurally sound
Carbon footprint was not important for group
Minimize mass and cost
Final material: low alloy steel

Note: Please be mindful that you are expected to write a short reflection on what you have learned from the other team in your final deliverable