

Sea Level Enclosure: Background

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Project Description

- Client - NAU Swim Coach Andy Johns
- Air tight enclosure
- Sea level conditions from 3rd party company
- 2 lanes of pool for training purposes
- Quick assembly/disassembly
- Compact to store



Background - Live High, Train Low

- Recovery time
- Higher performance
- Increased oxygen levels
- Higher red blood cell count



Hyperbaric chamber for athletes

Benchmarking

- Fabrico Sun Domes
 - \$6,500 in ground pool 24x58 ft.
 - 12 mil clear vinyl
 - 1 in. aluminum tubing
 - Heat and helps keep pool clean.

- Yolloy
 - 36m x 18m Outdoor airtight tent
 - 0.6 mm PVC tarp or 0.45mm
 - 2 year warranty
 - \$5,000





Design/Customer Needs

- Quick assembly/disassembly
- Altitude at sea-level (0-meters)
- Clear-see through design
- Longevity
- Space for coaches inside the environment to communicate with swimmers
- Compactable
- Light weight



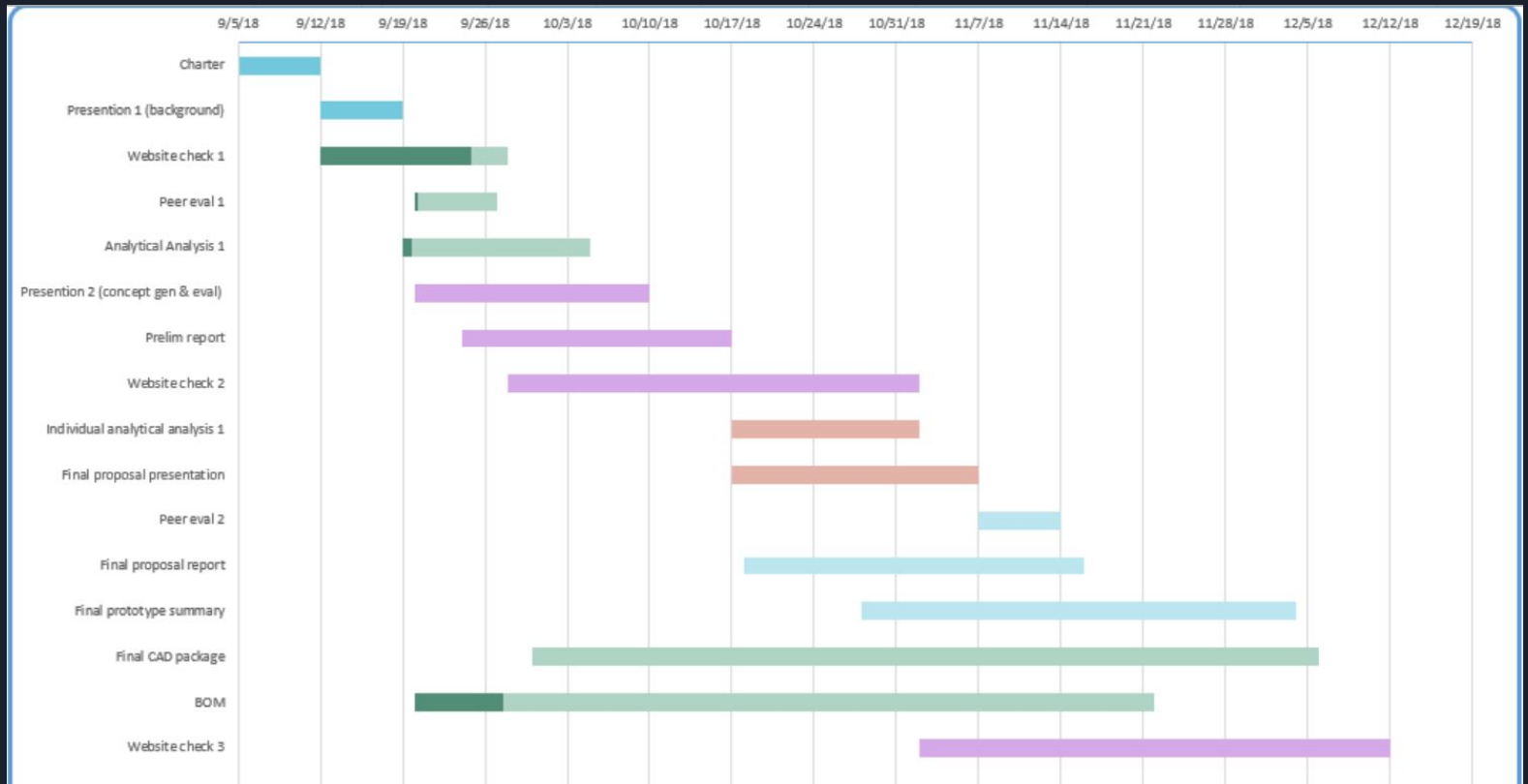
Engineering Requirements

- 30 minutes or less
- 78.2 kPa (for Flagstaff)
- Transparent materials (transmittance > 80%)
- 60 - 80 times per year, 2 -3 years lifespan
- Roughly 280 m² (pool and coaches)
- 28 m³ to store
- Less than 136 kg

QFD

System QFD		Project: Sea level enclosure												
		Date: 9/19/2018												
Setup/breakdown time														
Pressure		-												
Transmittance														
Cycles			+											
Area		-	-											A Fabrico Sun Domes
Collasped volume		-			+	+								B Yolloy
Weight		-		-	+	+	+							
		Technical Requirements						Customer Opinion Survey						
Customer Needs	Customer Weights	Setup/breakdown time	Pressure	Transmittance	Cycles	Area	Collasped volume	Weight	Poor		Acceptable		Excellent	
		1	2	3	4	5								
Quick assembly/disassembly	4	9			3		3	6	A	B				
Sea level altitude	5		9		6				A			B		
Clear design	3			9							B		A	
Longevity	4		6		9						AB			
Compact space	3	6				9	9	6		B	A			
Weight	4	6				6	6	9	B		A			
Technical Requirement Units		min.	kPa	%	#	m ²	m ³	kg						
Technical Requirement Targets		30	78	80	240	280	28	136						
Absolute Technical Importance		78	69	27	78	51	63	78						
Relative Technical Importance		17.6%	15.5%	6.1%	17.6%	11.5%	14.2%	17.6%						


Schedule





Budget

- 12 mil double polished clear vinyl (3000 sq ft, around 184 lbs)
 - TBD, approximately \$3,000 without shipping
- 304 Stainless Steel Pipe 1 inch x 12" (6 - 10 pieces)
 - \$13.79 each
- Aluminum square tubing 2 x 2 x .12(11-GA) x 24" (1 piece)
 - \$11.80 each
- Anchors: 2.5lbs rubber coated plate (5 pairs)
 - \$33.99 each pair



Estimated
Material Cost:
\$3319.65



Conclusion

- Beneficial to NAU swim team and international swim athletes.
- Helps reduce their recovery times
- Looking for quick assembly and disassembly
- Budget - \$3400 (Not including air pumped in, labor, and shipping)

Questions?



References

- University of Texas - Southwest medical center
 - <https://utswmed.org/why-utsw/>
- Kevin Otto (QFD template)
 - [http://www.kevinotto.com/RSS/templates/QFD Template.xls](http://www.kevinotto.com/RSS/templates/QFD%20Template.xls)
- Pool store (benchmarking)
 - <http://www.poolstore.com/fabrico-sun-dome-pool-enclosure-inground-swimming-pool-dome>
- YolloY (benchmarking)
 - http://www.yolloy.com/html_products/white-large-outdoor-portable-air-tight-inflatable-tennis-enclosure-860.html