

U.S. DEPARTMENT OF ENERGY (DOE) COLLEGIATE WIND COMPETITION

UNIVERSITY OF MASSACHUSETTS LOWELL



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Executive Summary

GoJuice targets a new, highly profitable industry opportunity that links wind energy to portable electronic device charging. The company offers a network of free, ad-for-service, green energy mobile phone charging kiosks distributed throughout high-traffic urban areas. The purchase of a slim protective phone case with an integrated but swappable auxiliary battery admits the customer to the GoJuice kiosk network. The customer experience is streamlined: the old battery is removed from the GoJuice case, a 30-45 second advertisement is served on the kiosk display and a fully charged battery is dispensed. Once in the case, the new battery charges the mobile phone to significantly extend device usage. Revenues are derived from both the kiosk advertisements and device case sales. Both Android and iOS apps are included to further enhance the user experience.

Environmental responsibility and sustainability are the cornerstones of the GoJuice business. The battery swapping kiosks source the majority of their energy from renewable sources of energy such as wind and solar. By providing customers a practical, efficient and high quality alternative energy experience, GoJuice demonstrates that renewable energy can be efficient, effective and trendy.

The GoJuice team at the University of Massachusetts Lowell comprises an inter-disciplinary team of approximately twenty senior-level engineering students and seven faculty advisors.

Business Overview

GoJuice's mission is to provide a *worry-free, wait-free* solution to mobile smartphone charging. GoJuice supports consumers with an on-the-go and around the clock modern life through a unique and interactive one-minute phone charging experience. An auxiliary battery is used to transfer energy from the GoJuice charging kiosk to the user's phone via a custom-designed battery-holding case. By adopting the efficient, stylistic and renewables-based GoJuice charging system, users will save time, alleviate their battery range anxiety and reduce their environmental footprint.

Mobile phone cases containing removable battery compatible with the market's major smartphone models will be sold and serviced. Consumers will enjoy their personalized, stylish case, which functions both as a fashion statement supporting renewables and as an energy reserve. In the transition between work and social activities, the user will make a quick stop at one of GoJuice's many kiosks (JuiceBoxes) to perform a rapid energy exchange. With battery capacity comparable to that of their phones, the user will be instantly satisfied with the increased longevity of their device.

Market Opportunity

Overall Market Opportunity and the GoJuice Target Market

GoJuice's battery exchange service targets the urban business and college demographics that have long on-the-go days, and rely heavily on their power-hungry smart phones for communication and data transfer. These user groups typically experience consumer nomophobia^[1] or the fear of being out of mobile phone contact, as the day progresses and their batteries drain. GoJuice ultimately addresses the consumer's psychological need for always-on communication and desire to be environmentally friendly.

Triple Bottom Line

The three core pillars of GoJuice are sustaining profit, people and environment:

- **Profit:** The GoJuice system has been carefully designed and analyzed to capitalize on a market opportunity that promises to yield high profits in a short period of time. GoJuice investors will benefit from high profit margins.
- **People:** GoJuice is designed to improve customer's lives and day-to-day experiences. The system reduces the time taken to recharge phones and provides a low-anxiety interaction with mobile devices late in the day. GoJuice offers their employees competitive salaries and work environment.
- **Environment:** In addition to the highly visible use of renewable energy to operate kiosks and charge batteries, GoJuice also is deeply rooted in environmentally friendly business practices such as:

replacing paper with electronic ink options, using hybrid corporate vehicles for travel, minimizing energy and carbon footprint, and wind-powered corporate buildings and offices. GoJuice promotes employee commitment to renewable energy via monthly recognition of energy savvy employees.

Market Gap Analysis

The GoJuice case is targeted to create a “mid-tier” mobile phone case market juxtaposed with premium and bottom-tier brands. GoJuice’s mobile phone case will be perceived as a unique, high quality product that supports extended productivity on a renewable energy foundation. Table 1 highlights the main market competition in the phone case with external batteries market space.

Table 1 Current market competitors for phone cases with extra battery life.

Market	Brand	Product	Description	Price
Premium (high quality, high cost)	Mophie ^[2]	Space Pack	“World’s 1 st ” extra storage iPhone 5 case 1700 mAh (+120% life): 32 GB Storage	\$179.95
	Mophie	Space Pack	“World’s 1 st ” extra storage iPhone 5 case 1700 mAh (+120% life): 16 GB Storage	\$149.95
	Lenmar ^[3]	Meridian	2-piece design; charging case only 2300 mAh (+160% life)	\$89.99
Mid-tier (high quality, low cost)	GoJuice	Swappable Battery Case	Removable batter exchange service 1200 mAh (+80% life)	\$29.99
Bottom-tier (low quality, low cost)	Aria Accessories ^[4]	Battery Case	Generic Design 2200 mAh (+150% life)	\$14.99

These competitors in the mobile phone charging accessories product space are bifurcated into premium brands (Mophie, Lenmar) that incur premium pricing and bottom-tier products (Aria Accessories) that are simple, low-quality plastic battery phone cases. GoJuice, by contrast, offers a premium product at a bottom-tier price, establishing new “mid-tier” market. For a price of \$29.99, GoJuice customers purchase not only a case, but also free access to network of charging stations.

GoJuice’s ecosystem approach offers competitive advantage based on the proverb “Time is Money.” Consumers typically place significant value on the time they spend interacting with a product or service. Our value proposition maximizes the consumer value versus time and monetary cost ratio. The phone case purchase cost is amortized over years of free battery exchange service and which

requires less than 6 seconds per interaction. Additional perceived value comes from GoJuice’s phone app service that locates nearby kiosks and GoJuice business advertisers that offer coupons and discounts.

Pricing Strategy and Customer Value Analysis

Revenue is earned by selling cases and serving advertisements at the GoJuice kiosks. In order to garner increased advertising cost per engagement (CPE) [5][6][7][8] a large and diverse user base must be rapidly built in cities served by GoJuice. The price of the case directly relates to the consumer adoption of the GoJuice case. A focus group of 140 college students was surveyed to examine their value assessment of the GoJuice product. Figure 1 shows the resulting sensitivity of the revenue streams to changes in the selling price of the phone case calculated using the focus group data. In order to simultaneously maximize the user-base and overall case and advertising revenues, phone case price point is \$29.99 is selected.

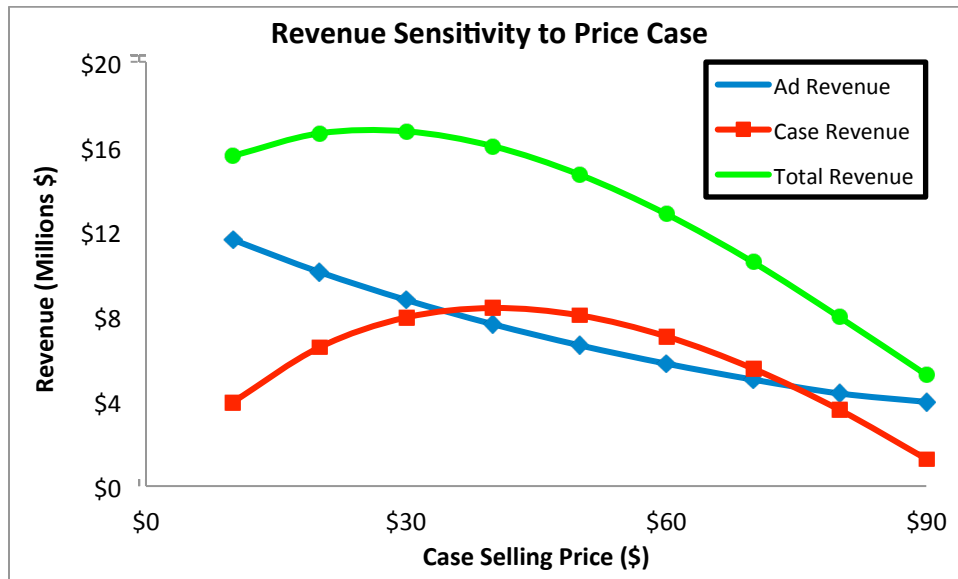


Figure 1 Total GoJuice revenue responding to phone case selling price

Based on the survey, the GoJuice adoption rate among college students is 50% at selling price of \$29.99. At present, 20% of the world population owns smartphone (60% of the U.S. population)^[9], indicating a maximum potential market around 5% of the world population after accounting for

demographics. A conservative target of 0.30% adoption in target markets was chosen to estimate revenues and expenses. Appendix provides further financial analysis for years 2015-2018.

The estimated manufacturing cost per case is \$8.14, resulting in gross unit margin of roughly \$2 (i.e., 67%) for the \$29.99 case price. Table 2 itemizes the GoJuice phone case manufacturing costs.

Table 2 Estimated manufacturing costs per GoJuice phone case

Item #	Part	Qty.	Unit Price	Cost
1	iPhone 5 case (custom)	1	\$ 2.00	\$ 2.00
2	3.7 V, 1200 mAh battery	1	\$ 1.25	\$ 1.25
3	Electronic components	1	\$ 1.02	\$ 1.02
4	Lightning connector	1	\$ 0.37	\$ 0.37
5	Minor components & assembly	N/A	N/A	\$ 3.50
Total				\$ 8.14

To encourage mass distribution in the early stages of the product cycle, an introductory “early-adopter” case price of \$9.99 will be instated. This lower price will promote rapid initial growth and word-of-mouth advertising for the GoJuice service. As the membership grows, the business will be primarily sustained by advertising sales during the kiosk battery exchange service.

Government incentive programs can affect the product pricing by subsidizing the cost of kiosk manufacturing or installation because of GoJuice’s positive stance on utilizing green energy sources through its wind turbine and solar panels. The Renewable Electricity Production Tax Credit (PTC) is a federal corporate tax credit program. This incentive credits 2.3¢/kWh for wind power and 1.1 ¢/kWh for solar.^[10] Each state varies with its own incentives that will be taken advantage of as well. Providing awareness and encouraging the use of the kiosk, which is powered by green energy sources, will create opportunities to partner with agencies advocating carbon-neutral energy.

Aesthetics and Consumer Appeal

The entire GoJuice system is based on the idea of “juice” as popular term for battery power, inviting users into a fun, interactive, and modern green energy solution to charge smart phones. The phone cases are referred to as “JuicePacks,” while the kiosks are “JuiceBoxes.” Figure shows the kiosk and phone case designs. Appendix contains GoJuice’s corporate branding information guide.

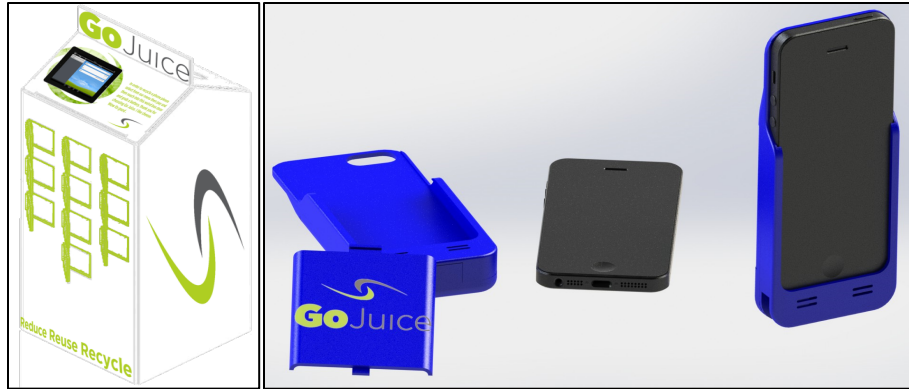


Figure 2 Kiosk “JuiceBox” and Phone Case “JuicePack” Renderings with Integrated Branding

Management Team

The executive management team will comprise a CEO, CFO, and Directors of Engineering IT, Business Relations, Marketing, and Operations & Maintenance. GoJuice Headquarters will reside in the United States and will oversee all company operations, including accounting and R&D.

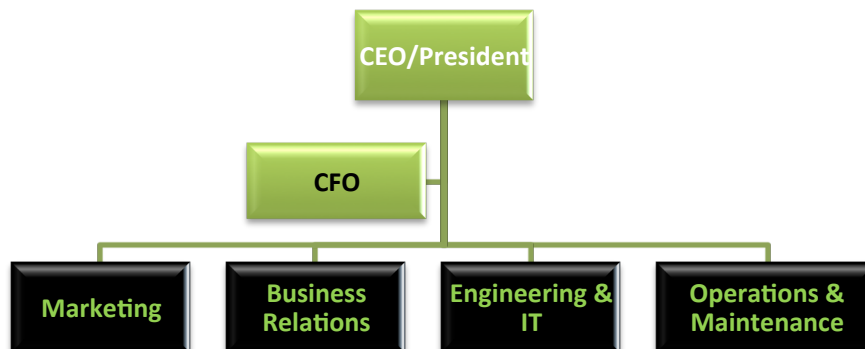


Figure 3 Executive company structure

GoJuice will ultimately be deployed in seven regional markets, including: Northeast United States and Eastern Canada, Southeast United States, Northwest United States and Western Canada, Southwest United States, Asia, Europe, and the Middle East. Each region will have a regional manager and small operations team to maintain the local GoJuice energy generation and charging station network. The regional managers will oversee: regional operations (i.e., kiosk installations and maintenance), cultural sensitivities, and marketing. The regional managers’ teams will consist of marketers and several service technicians. Each marketing team is essential to specifically promote

GoJuice’s services and products in their respective region, and to adapt to the local culture, societal and economic trends, and demographics. Managers and employees will be evaluated based on ambitious target metrics for customer base expansion and advertising revenue growth.

Product Development and Corporate Operations

Deployment Activity and Growth

Several major cities in the northeast region of the United States are targets the initial GoJuice deployment. Candidate cities are scored by their overall population, population density, and annual visitors; specific installation locations are determined by analyzing citizen traffic patterns (e.g., metro stations, sporting venues, shopping malls) and by using publicly available metrics (e.g., their “walk score”). Table 3 displays the target cities in order of deployment schedule for the first two years. Rapid adoption of GoJuice will derive from these metro areas; GoJuice kiosks will also be installed in nearby popular tourist and recreational areas, such as beaches, piers, parks and ski-slopes.

Table 3 Target major cities for GoJuice’s 2 year deployment plan^{[11][12][13][14]}

Year	City	Stations	Min. Cases	Int./Station	Pop.	Pop. Den. [per mi ²]
1	Boston	20	1591	80	636479	12793
	Chicago	85	6787	80	2714856	11842
	New York City	208	20842	100	8336697	27012
	D.C.	23	1581	70	632323	9856
	Philadelphia	48	3869	80	1547607	11397
2	Seattle	23	1586	70	634265	7251
	Vancouver	19	1509	80	603502	13590
	San Francisco	23	2065	90	825863	17179
	Las Vegas	25	1491	60	596424	4298
	Dallas	52	3103	60	1241162	3518
	San Diego	56	3346	60	1338348	4020
	San Antonio	58	3457	60	1382951	2880
	Phoenix	62	3722	60	1488750	2798
	Houston	90	5402	60	2160821	3501
Los Angeles	138	9644	70	3857799	8092	

Kiosks will be powered by a variety of renewable energy sources dependent on their location.

Kiosks in off-grid areas, such as parks and beaches, will rely exclusively on wind and/or solar sources.

Urban kiosks, by contrast, will draw renewables-generated power from the grid and, where possible, be

paired with solar panels, which pose minimal risks in an urban environment. Regardless of kiosk location, the energy will be 100% renewably sourced to meet a “green power” guarantee for the customer.

Following initial successes in densely populated U.S. metropolitan centers, GoJuice will quickly expand to the rest of the country. After six years, GoJuice ecosystems will be installed in 20 major U.S. and Canadian cities. In year seven, GoJuice will be deployed to the Asia-Pacific, with large target cities: Singapore, Tokyo, and Seoul, followed by deployment in Hong Kong, Shanghai, and Mumbai. During years nine through fourteen, GoJuice will expand globally across nine major cities in Europe, and in year fifteen two major cities in the Middle East will have a GoJuice network. The deployment plan is in Appendix B.

Marketing Efforts

Market research in each regional business areas is a major component in the operations process. Macro-environmental factors such as demographics, social, technology, economy, and culture will impact GoJuice’s business. Young business-persons and college students concentrate within large urban areas, which are local trade hubs and offer a population base with higher average incomes. Social trends, such as online media and smartphone apps, increase the demand for mobile device usage. Technology trends including self-driving cars and “Bucking the Price Norm” may affect consumer purchase and product usage behavior in the coming years. Financial resources are usually available through the city’s local government and/or other local organizations. The different cultures and nuances between each region can affect the business of GoJuice. Some areas may be heavily involved in sports, social entertainment, and events, while other areas are more focused on tourism, technology hubs, or agricultural business.

Research and Development

All kiosk, phone, and marketing research and development work will remain in-house to maintain competency and ability to iterate on rapidly developing trends in phone case designs for the

mobile industry, in which the typical smartphone product lifecycle is a mere months. The R&D team will work toward improved kiosk energy efficiency to increase the daily battery unit charges using the existing installed capacity. Promising technologies, such as rapid-charge super-capacitors, will be closely watched to assess adoption potential for the GoJuice ecosystem.

Manufacturing

GoJuice will pursue cost competitive kiosk assembly and manufacture, phone case molding, and wind turbine and solar system components. The GoJuice team will design the components – where they add value to the process – and outsource the manufacturing process to specialized companies via an open source bidding process that accounts for ethical labor and environmental practices.

Product Distribution

Distribution of the kiosks and phone cases will be handled via Ryder or other professional transportation services. Kiosks will be installed by regional GoJuice employees. Phone cases will be sold via the kiosk itself, like other electronic device vending machines, and by distribution in select retail outlets including online retailers (Amazon.com, NewEgg.com). Monetary procurement can be sourced externally if possible because of the potential large distances between kiosks.

Financial Analysis

The GoJuice revenue sources are phone cases and advertisements. During the start-up phase of the company, the initial capital is the most important element in the financial statement. GoJuice aims to raise initial venture capital of \$3.2 million to fund the estimated first year roll-out. Investors will be offered a stake in the private company, with a 10% stake in exchange for the \$3.2 million capital. Based on the estimated revenue of \$4.6 million in year one, and a typical P/E ratio of 20, the GoJuice company will be valued at \$92.5 million. Hence, the \$3.2 million investment will offer investors a (go-) juicy annualized return of 189%. This initial investment will cover costs to produce the phone cases, shipping and installing the kiosks, and employee wages. This venture capital will be utilized to keep

manufacturing, packaging, and assembly costs low while maintaining quality for our customers, through outsourcing and bulk manufacturing.

Within the first few years, GoJuice has the potential to make profits in the millions of dollars. Appendices A and B contains the details of this analysis. From the market analysis, GoJuice will still be profitable. With a conservative target of only 0.30% of the population, the result is roughly \$4.6 million in revenue, or \$1.4 million in profit, in the first year alone. This revenue prediction assumes a conservative 50% user interaction rate of 75 customers per station per day. Cities with higher than average population density will see higher interaction rates. For example, popular GoJuice sites in New York City are estimated to serve 100-125 interactions per station per day, while cities like Las Vegas or Orlando are estimated at a minimum 75 interactions per station per day. The eight-year profit is estimated at \$26.5 million (Appendix B, Tables B5-B7).

Although start-up companies are considered risk-prone, a risk-adverse strategy must be in place when considering the manufacture of the product. International distribution services exist to connect parties whom are interested in foreign manufacturers to take advantage of the relatively low-costs in labor and high-quality products resulting from state-of-the-art manufacturing equipment. However, risks through the supply chain result from the increasing number of participants in the chain. These risks can be mitigated by finding a supplier that is capable of all operations in the manufacturing process. Other risks include but are not limited to: export/import regulations such as tariffs, subcontracting risks, and versatility/flexibility in the manufacturing process for changes in the product design. Frequent scheduled communication between GoJuice and its manufacturing supplier is imperative to reduce these risks as much as possible.

The potential of GoJuice is conceived through the strength of its free battery exchange charging service. Standalone components, base phone cases, and even fully assembled battery cases of generic design can be purchased from a foreign manufacturer. Table 2 lists the cost of the major components

that are required to produce one GoJuice phone case. A conservative estimate of manufacturing cost is \$10.00 per case. Competitively positioning GoJuice in the market results in a case selling price of \$29.99, an approximately \$21.00 gross margin. Appendix shows the cost analysis.

In a similar manner for the GoJuice kiosk, the cost of manufacture is estimated by comparing between several possible models including a wind powered, solar powered, green energy hybrid, or “plug-in.” The scale of both the wind turbine and the solar panels will vary based on installation location. A cost analysis will be performed for each region to determine the scale based on the site-specific wind and sunlight resource. Table B2 lists the estimated costs for each model to determine the weighted average cost for a typical kiosk to be manufactured and installed.

Advertising revenue is the primary and lucrative revenue source for GoJuice. The customer will return to the kiosk to exchange for a fully-charged battery almost every day, approximating a subscription-based business model of repeat views of advertisements. Moreover, ads will be sold on high CPE yield from localization of nearby businesses or driven by RFID technology. The GoJuice system, through an RFID system, will collect and request for more information from each user to better serve relevant ads through surveys or user accounts by utilizing a service such as Google Analytics. Video advertisements pay more per exchange based on the consumer engagement. The exchange process can be artificially lengthened to simulate a processing time to create a larger window of advertisement time through the display screen. Keeping users informed of the benefits of using GoJuice’s services and their impact on the environment by using green energy will create opportunities for extended interactivity with the consumer. Based on revenue data collected from Facebook and Google, which pursue similar business activities for ad placement, a weighted average of \$0.26 per impression is expected.

Local advertisements can possibly pay even more than through digital media means. Partnerships can be considered by allowing discount offers for users of GoJuice to bring in unique customers for nearby local businesses. Another possible option is to allow the GoJuice user to decide

themselves which discount to receive, therefore increasing the amount of interactivity and ad influence on the customer. Repeat customer at each kiosk every day creates an enormous number of unique impressions per day in these high-traffic areas, particularly if bystanders and other viewers are interested. Considering initial deployment cities of Boston, Chicago, New York, Washington D.C., and Philadelphia, the weighted average of ad revenue collected from concurrent users generates a daily revenue of \$11,000 or approximately \$4.0 million per year is expected. Due to the extremely lucrative margins, the downside risk of an optimistic overestimation still leaves sufficient margin for an immediate profit.

Supply chain distribution, installation services, and operation costs are paid from the phone case and advertisement gross margins. The salary structure for GoJuice is kept reasonably low: starting salaries and raises are kept at minimum. Table 4 shows the starting salary structure and the maximum annual raise percentage for each position. Operations and maintenance salaries vary by location based on the average salary for similar positions. Insurance costs are estimated to be between \$2000 and \$300 per city depending on how many stations and batteries are in the GoJuice network for the area.

Table 4 Starting salary breakdown by position

Position	Starting Salary	Max. Annual Raise
CEO/President	\$ 70,000	7%
CFO	\$ 60,000	7%
Directors	\$ 52,500	7%
Regional Managers	\$ 47,500	5%
Office Employees	\$ 47,500	3%
Ops and Main (US)	\$ 40,000	1%
Ops and Main. (Asia)	\$ 22,500	1%
Ops and Main (Europe)	\$ 47,500	1%
Ops and Main (Middle East)	\$ 27,500	1%

Appendix A: Pro-Forma Financial Statements

Table A1. GoJuice Income Statement
For 201 through 2018
(all numbers in \$000)

REVENUE	2015	2016	2017	2018
Gross Ad Revenue	\$ 3,948	\$ 7,971	\$ 9,500	\$ 16,578
Gross Case Revenue	\$ 623	\$ 1,258	\$ 1,499	\$ 2,616
Net Sales	\$ 4,571	\$ 9,229	\$ 11,000	\$ 19,194
OPERATING EXPENSES				
Salaries and Wages (inc. benefits)	\$ 2,180	\$ 4,780	\$ 6,091	\$ 7,434
Payroll Taxes (about 7.65%)	\$ 167	\$ 366	\$ 466	\$ 569
Insurance	\$ 3	\$ 3	\$ 3	\$ 3
Rent and Utilities	\$ 90	\$ 270	\$ 360	\$ 450
Total Expenses	\$ 2,440	\$ 5,418	\$ 6,920	\$ 8,456
Net Income Before Taxes	\$ 2,132	\$ 3,811	\$ 4,079	\$ 10,738
Taxes on Income (30%)	\$ 1,371	\$ 2,769	\$ 3,300	\$ 5,758
Net Income After Taxes	\$ 760	\$ 1,042	\$ 779	\$ 4,980

Table A2. GoJuice Cashflow
For 201 through 2018
(all numbers in \$000)

	2015	2016	2017	2018
Cash Received				
Cash from Operations				
Ad Sales	\$3,948	\$7,971	\$9,500	\$16,578
Case Sales	\$623	\$1,258	\$1,499	\$2,616
Subtotal Cash from Operations	\$4,571	\$9,229	\$11,000	\$19,194
Additional Cash Received				
Sales Tax	\$0	\$0	\$0	\$0
New Current Borrowing	\$0	\$0	\$0	\$0
New Long-Term Liabilities	\$0	\$0	\$0	\$0
Sales of Other Current Assets	\$0	\$0	\$0	\$0
Sales of Long-Term Assets	\$0	\$0	\$0	\$0
New Investment Received	\$0	\$0	\$0	\$0
Subtotal Cash Received	\$4,571	\$9,229	\$11,000	\$19,194
Expenditures				
Expenditures from Operations				
Case Manufacturing	\$832	\$1,680	\$2,002	\$3,494
Kiosk Manufacturing	\$124	\$301	\$358	\$521
Operations/Maintenance Equipment	\$2	\$5	\$6	\$8
Subtotal Spent on Operations	\$959	\$1,986	\$2,366	\$4,023
Additional Cash Spent				
Salaries	\$1,970	\$4,150	\$5,251	\$6,432
Principal Repayment of Current Borrowing	\$0	\$0	\$0	\$0
Other Liabilities of Principal Repayment	\$0	\$0	\$0	\$0
Long-Term Liabilities Principal Repayment	\$0	\$0	\$0	\$0
Purchase of Other Current Assets	\$210	\$630	\$840	\$1,002
Subtotal Cash Spent	\$3,139	\$6,765	\$8,457	\$11,457
Net Cash Flow	\$1,433	\$2,464	\$2,542	\$7,737
Cash Balance	\$1,433	\$3,897	\$6,439	\$14,176

Table A3. GoJuice Balance Sheet
For 201 through 2018
(all numbers in \$000)

ASSETS	2015	2016	2017	2018
Current Assets				
Accounts Receivable	\$3,948	\$7,971	\$9,500	\$16,578
Inventory	\$335	\$728	\$867	\$1,407
Total Current Assets	\$4,284	\$8,699	\$10,367	\$17,984
TOTAL ASSETS	\$4,284	\$8,699	\$10,367	\$17,984
TOTAL STOCKHOLDER'S EQUITY				
	\$2,104	\$3,919	\$4,276	\$10,550
LIABILITIES				
Current Liabilities				
Accounts Payable	\$1,970	\$4,150	\$5,251	\$6,432
Total Current Liabilities	\$1,970	\$4,150	\$5,251	\$6,432
Long-Term Liabilities				
Mortgage/Rent	\$90	\$270	\$360	\$450
Other long-term liabilities	\$120	\$360	\$480	\$552
Total Long-Term Liabilities	\$210	\$630	\$840	\$1,002
TOTAL LIABILITIES	\$2,180	\$4,780	\$6,091	\$7,434
TOTAL LIABILITY & STOCKHOLDER'S EQUITY				
	\$4,284	\$8,699	\$10,367	\$17,984

Appendix B: Further Financial Analysis and Location Breakdown

Table B1. Location and Expansion 8-Year Plan

City	Stations	Min. Cases	Int./ Station	Pop.	Pop. Den. [per mi ²]	Region	Year to Expand
Boston	24	1909	80	636479	12793	US/Canada	1
Chicago	102	8145	80	2714856	11842	US/Canada	1
New York City	250	25010	100	8336697	27012	US/Canada	1
D.C.	27	1897	70	632323	9856	US/Canada	1
Philadelphia	58	4643	80	1547607	11397	US/Canada	1
Seattle	27	1903	70	634265	7251	US/Canada	2
Vancouver	23	1811	80	603502	13590	US/Canada	2
San Francisco	28	2478	90	825863	17179	US/Canada	2
Las Vegas	30	1789	60	596424	4298	US/Canada	2
Dallas	62	3723	60	1241162	3518	US/Canada	2
San Diego	67	4015	60	1338348	4020	US/Canada	2
San Antonio	69	4149	60	1382951	2880	US/Canada	2
Phoenix	74	4466	60	1488750	2798	US/Canada	2
Houston	108	6482	60	2160821	3501	US/Canada	2
Los Angeles	165	11573	70	3857799	8092	US/Canada	2
Orlando	12	749	60	249562	2327	US/Canada	3
Atlanta	22	1331	60	443775	3154	US/Canada	3
Miami	16	1242	80	413892	11539	US/Canada	3
Montreal	62	4949	80	1649519	11701	US/Canada	3
Toronto	98	7845	80	2615060	10750	US/Canada	3
Singapore	180	16198	90	5399200	19630	Asia	4
Tokyo	218	27215	125	9071577	37715	Asia	4
Seoul	208	31164	150	10388055	44455	Asia	4
Hong Kong	241	21659	90	7219700	16931	Asia	5
Shanghai	595	53508	90	17836133	17728	Asia	5
Mumbai	250	37435	150	12478447	53561	Asia	5
London	312	24925	80	8308369	13688	Europe	6
Moscow	454	36334	80	12111194	12497	Europe	6
Berlin	146	10203	70	3401147	9900	Europe	6
Madrid	121	9647	80	3215633	14000	Europe	7
Barcelona	32	4865	150	1621537	41420	Europe	7
Milan	43	3898	90	1299439	19520	Europe	7
Paris	45	6731	150	2243833	55000	Europe	7
Rome	109	7662	70	2553873	5300	Europe	7
Vienna	60	4796	80	1598626	10366	Europe	7
Riyadh	213	17030	80	5676621	11914	Middle East	8
Istanbul	464	41721	90	13907015	16449	Middle East	8

Table B2 Estimated kiosk manufacturing costs^{[15][16]}

Station Type	Cost	Weight	Weighted Cost
Wind Station	\$ 5,700.00	5%	\$ 285.00
Solar Station	\$ 3,700.00	10%	\$ 370.00
Grid Station	\$ 1,700.00	65%	\$ 1,105.00
Hybrid	\$ 4,700.00	20%	\$ 940.00
Total			\$ 2,700.00

Table B3 Estimated ad revenue^[17]

Ad Type	Cost/ad	Weight	Weighted Cost
Normal Cost	\$ 0.05	50%	\$ 0.03
Local ads	\$ 0.25	30%	\$ 0.08
RFID	\$ 0.80	20%	\$ 0.16
Total			\$ 0.26

Table B4 Example locations for Boston, MA and New York, New York:

Boston Locations	Manhattan Locations	
1. Paul Revere Mall (North End)	1. Columbia University	21. Macy's (Southwest corner)
2. North Station/Garden	2. Line at 110 th Street	22. Empire State Building
3. Science Park	3. 4-5-6 Line at 110 th Street	23. Madison Square Garden (Southwest corner)
4. Hatch Shell	4. 1-2-3 Line at 96 th Street	24. Chelsea Piers
5. Public Garden/ Newbury/ Boylston	5. Mt. Sinai Hospital	25. Chelsea Park/Highline
6. China Town Gate	6. Carl Schurz Park	26. FIT
7. Park Street/ Downtown Crossing/ Suffolk	7. Metropolitan Museum of Art / 4-5-6 Line at 86 th Street	27. Madison Square Park
8. Government Center/ Faneuil Hall	8. Roosevelt Park South at 85 th Street	28. Bellevue Hospital Center
9. Faneuil Hall/ Aquarium/ India Wharf	9. American Museum of Natural History	29. Jackson Square (Meatpacking District)
10. South Station	10. Hunter College / 4-5-6 Line at 68 th Street	30. NYU/Washington Square Park
11. Boston Convention Center	11. Rockefeller University	31. NYU (Northwest corner)
12. World Trade Center/Seaport	12. Central Park Zoo	32. Tompkins Square Park
13. Mass General	13. Lincoln Center for the Performing Arts	33. 1-2-3 Line at Canal Street
14. Bunker Hill Community College (Charlestown)	14. Ritz Carlton / Central Park	34. Borough of Manhattan Community College / Washington Market Park (Tribeca)
15. Boston Common/Public Garden /Beacon/ Charles	15. Rockefeller Center	35. World Trade Center
16. Boston Public Library/Trinity Church	16. Times Square North	36. Wall Street/NYSE
17. Kenmore/Fenway/BU	17. Times Square South	37. City Hall/Brooklyn Bridge
18. Prudential/Hynes/Northeastern	18. Grand Central Station	38. Battery Park
19. Prudential/BU	19. United Nations Headquarters	39. NYU Hospital
20. Logan Airport	20. Jacob K. Javis Convention Center	40. F-M-J-Z Lines at Delancy Street and Essex Street

Table B5. Eight-year cost and revenue projection, based on urban kiosk deployment

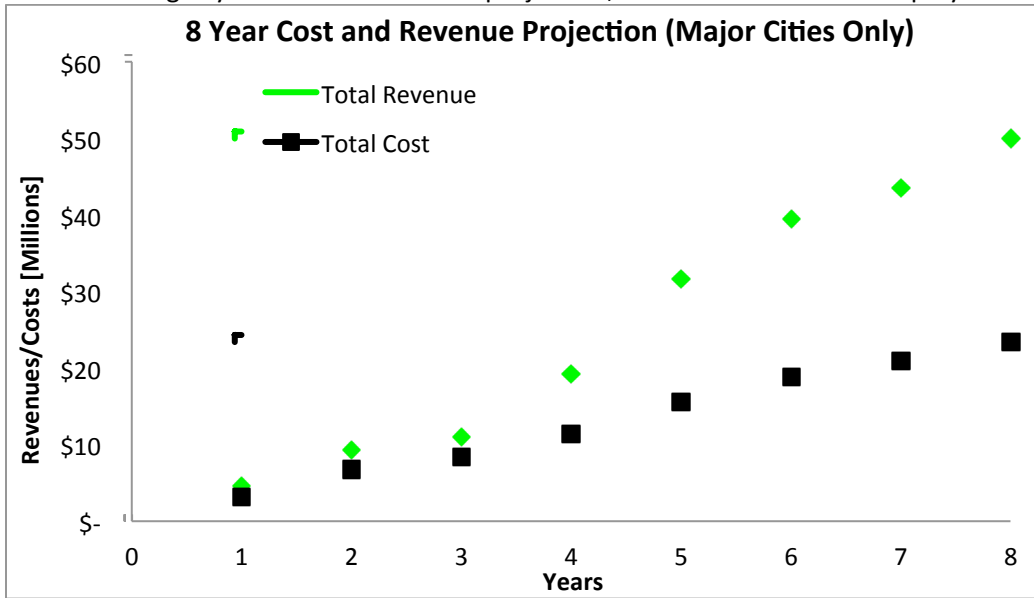


Table B6. Eight-year cost and revenue projection, based on urban kiosk deployment

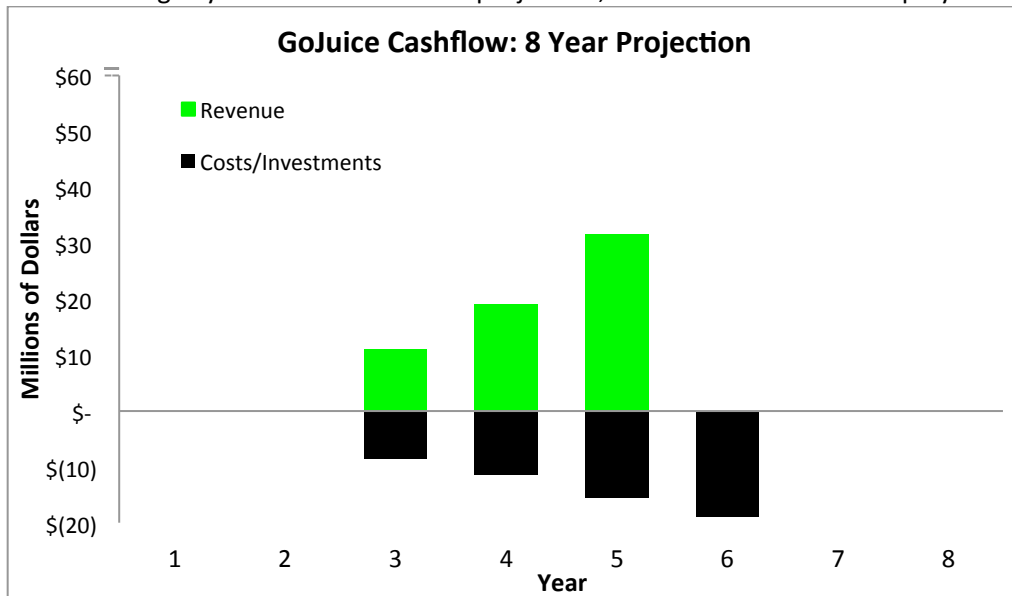
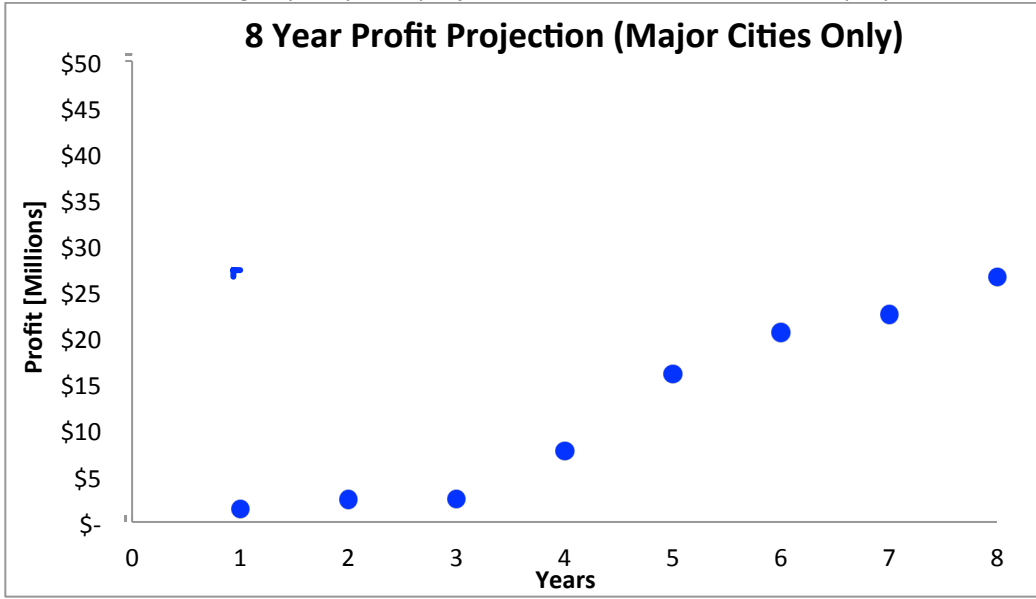


Table B7. Eight-year profit projection, based on urban kiosk deployment



Appendix C: References

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Appendix D: Branding Guide

Attached is an extensive branding guide created for GoJuice.



GoJuice

Identity & Branding Guide

U.S. DEPARTMENT OF ENERGY **(DOE)**
Collegiate Wind Competition

UNIVERSITY OF MASSACHUSETTS LOWELL TEAM





GoJuice

Business Overview

GoJuice's mission is to provide a worry-free wait-free solution to mobile phone charging. GoJuice supports the fast paced rhythm and efficiency of the modern work environment through a unique and interactive phone charging experience that lasts less than one minute. Users will exchange an auxiliary battery from their custom designed GoJuice case with a fully charged battery that will charge the phone on the-go. By adopting the efficient, stylistic and renewables based GoJuice charging system, users will be able to reduce their environmental footprint without making any compromises on quality and their time.

Cellular phone cases containing a removable battery compatible with the market's major smart phone models will be sold and serviced. Consumers will enjoy their personalized, stylish case also functioning as an energy reserve, but with the added capability of instantaneously recharging their phone. Before or after the day's

work, the user will make a quick stop at one of GoJuice's many JuiceBoxes located in their area to exchange their drained case battery for a fully charged one. With a battery capacity equivalent or higher than that of their phones, the user will be satisfied with the increased longevity of their device instantaneously.

Providing a durable and highly functional phone case is one of the many GoJuice goals. The kiosks passively recharge deposited batteries from the user through renewable energy sources. Advocating renewable energy, GoJuice's kiosks harness both wind and solar power. GoJuice benefits in three major ways: financially through the sales of phone cases and strategic media revenue; socially through the improvement of consumers lives by giving them extra phone power for free; and environmentally through the use of green energy for recharging mobile phones and recyclable materials for phone cases.





GoJuice

Logo-Development

“Logo must convey movement”

“GoJuice needs to be a bold color different than any other mobile phone or renewable energy company”

“Logo and Brand need to capture user”

“Target audience is young adult (college)”

“Logo or sign should relate to wind turbine”

“3 blades does not look better than 2 blades”

“Can we animate the logo to actually show movement”

“relation to human, humanity, green effort”

“renewable energy”

“focus on GO not the juice”

How we got here?





Go Juice
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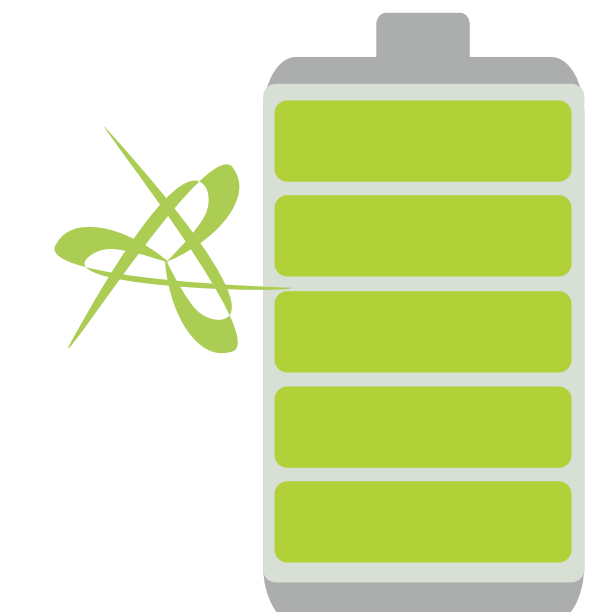
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Primary Logo



GoJuice

Primary Logo with type

“Logo must convey movement”

“GoJuice needs to be a bold color different than any other mobile phone or renewable energy company”

“Logo and Brand need to capture user”

“Target audience is young adult (college)”

“Logo should relate to wind turbine”

“3 blades does not look better than 2 blades”

“Can we animate the logo to actually show movement”

“relation to human, humanity, green effort”

“renewable energy”

“focus on GO not the juice”



GoJuice

Logo Use & Rules



Primary Colors

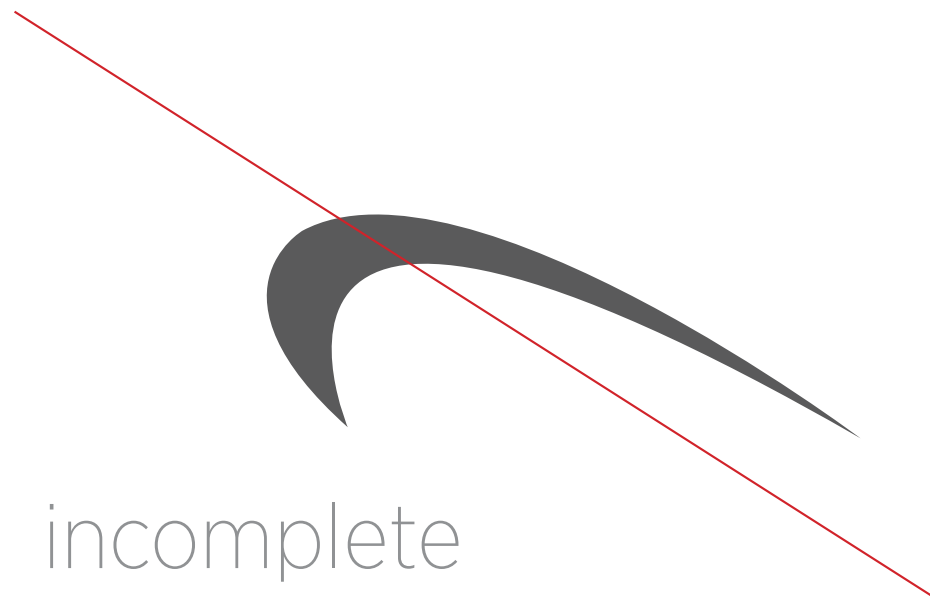


Secondary Colors- On Grey, Green, or other color



Safe Area & Isolation Area

Unacceptable Use of logo & brand





GoJuice

Brand in context





GoJuice

User Interface & App Overview

Kiosk users are first identified by the user interface as they approach the station using the RFID tag embedded in the GoJuice phone case. The auxiliary battery exchange is performed efficiently (< 1 minute) with minimal user interaction. During the battery exchange, the customer views a targeted interactive advertisement streaming on the kiosk's low-power touchscreen.

A detailed user experience flowchart is provided in Figure 6. The user experience is augmented by downloading the optional GoJuice phone application, which provides:

(1) a synopsis of the environmental impact of phone charging behavior; (2) the locations of nearby GoJuice stations; and (3) storage of electronic coupons served by GoJuice. Other potential involvement with the customer is to allow them to choose which ad is appealing to them.

This can lead to exclusive offers such as discounts or promotions to establishments or other products that the consumer would like to receive, further enhancing the experience of good service.

To provide user-interactivity, a touchscreen display, such as an iPad, will be used to handle all transactions. Internal to the kiosk, an automated robotic receiving mechanism will accept the customer's batteries and delivers them to an H-frame charging assembly. Subsequently, a fully charged battery is removed from the charging assembly and placed into a pick-up slot. A wireless access point will also be installed to provide network connectivity to the consumer.







GoJuice

Kiosk Overview

The primary goals of the **GoJuice kiosk** are (1) to provide an effective user experience through a professionally-designed, interactive user interface; (2) to provide a nearly instantaneous auxiliary mobile phone battery exchange; (3) to protect and recharge auxiliary and station batteries both outdoors and indoors; and (4) to provide a fourth generation internet connection between the station and GoJuice's user database/advertisement servers. A team of 3 were tasked for the concept, design, user-interface and interaction, and construction of the GoJuice kiosk.

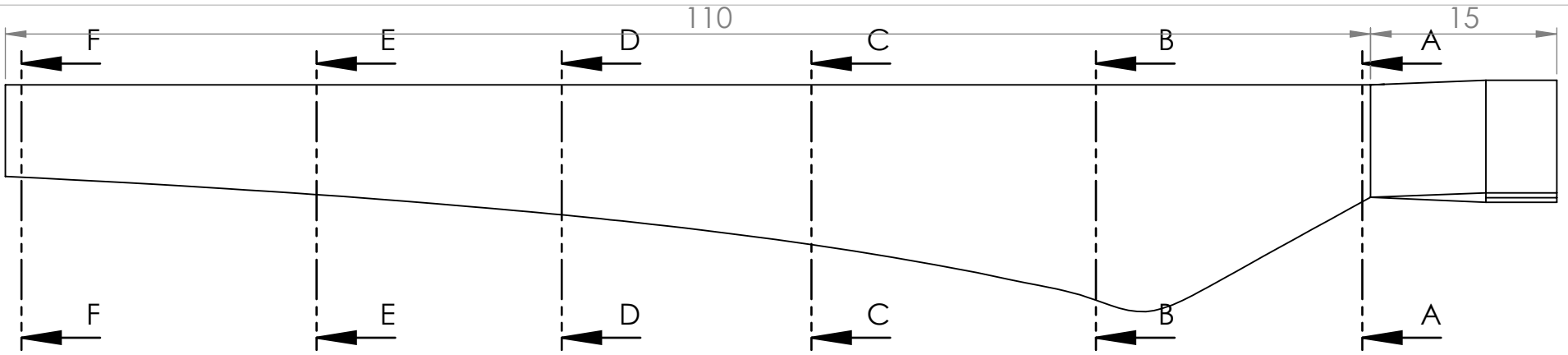


kiosk prototype

Appendix E: Specifications for the Full Scale Turbine

Attached are the Specifications for the Full Scale Turbine.

Large Scale Turbine



SECTION F-F
SCALE 1 : 3



SECTION E-E
SCALE 1 : 3



SECTION D-D
SCALE 1 : 3



SECTION C-C
SCALE 1 : 3

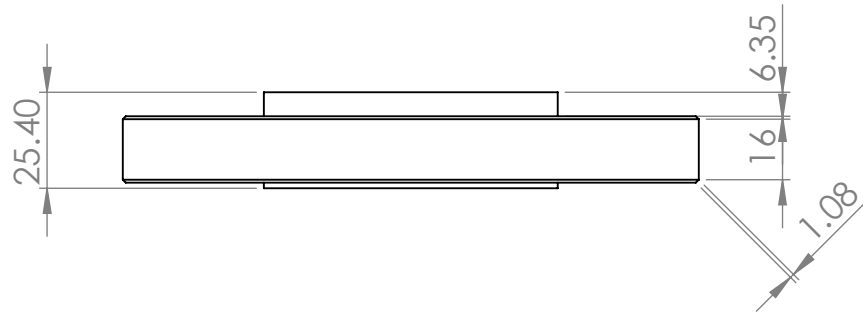
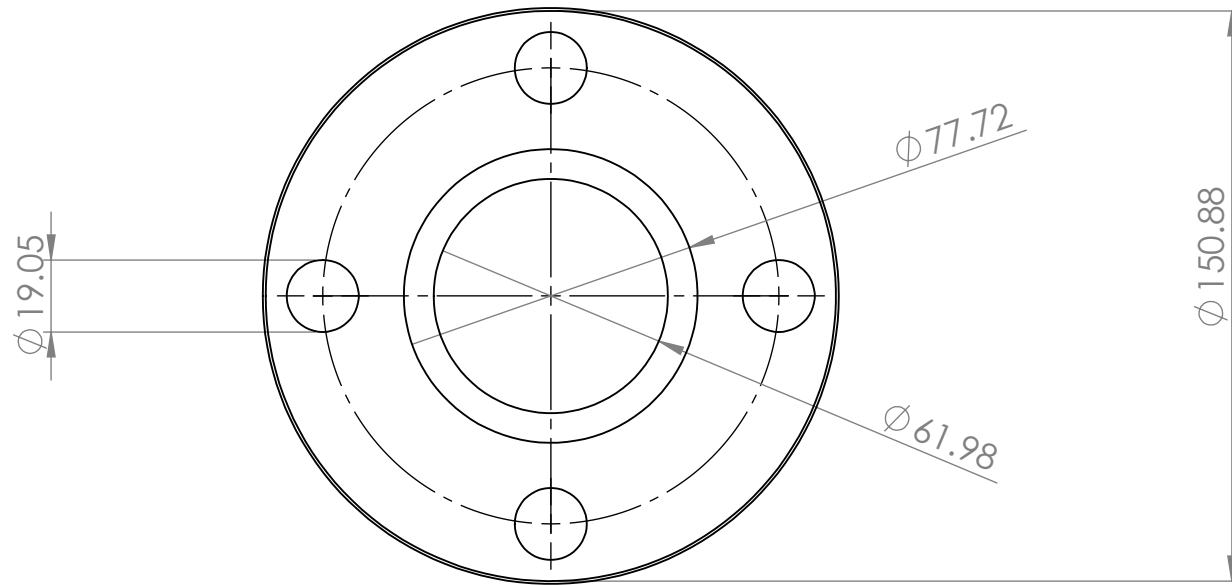


SECTION B-B
SCALE 1 : 3



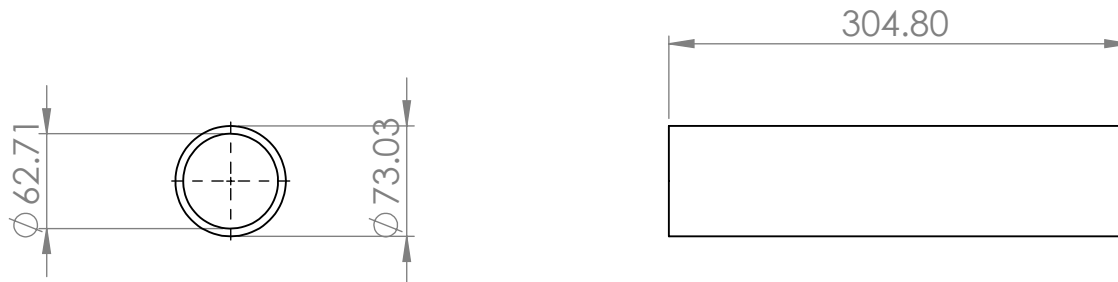
SECTION A-A
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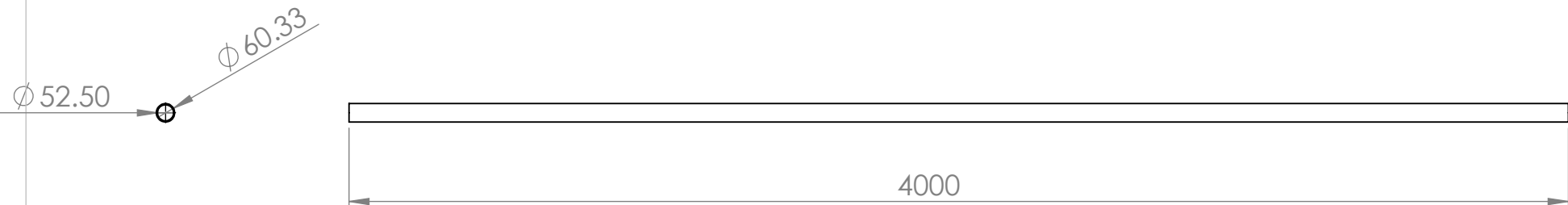
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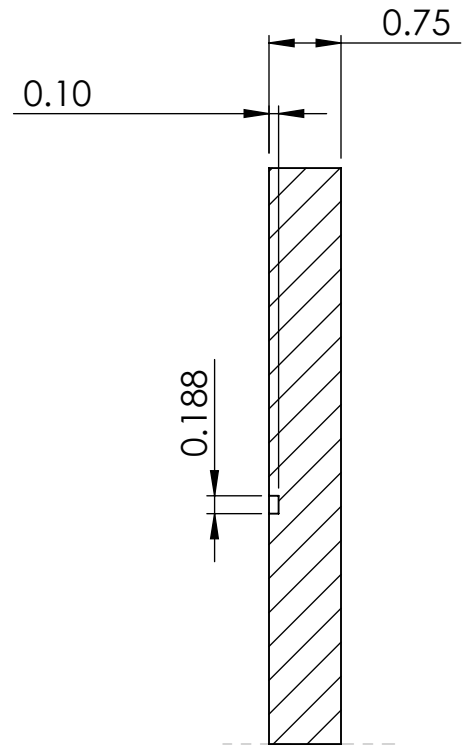
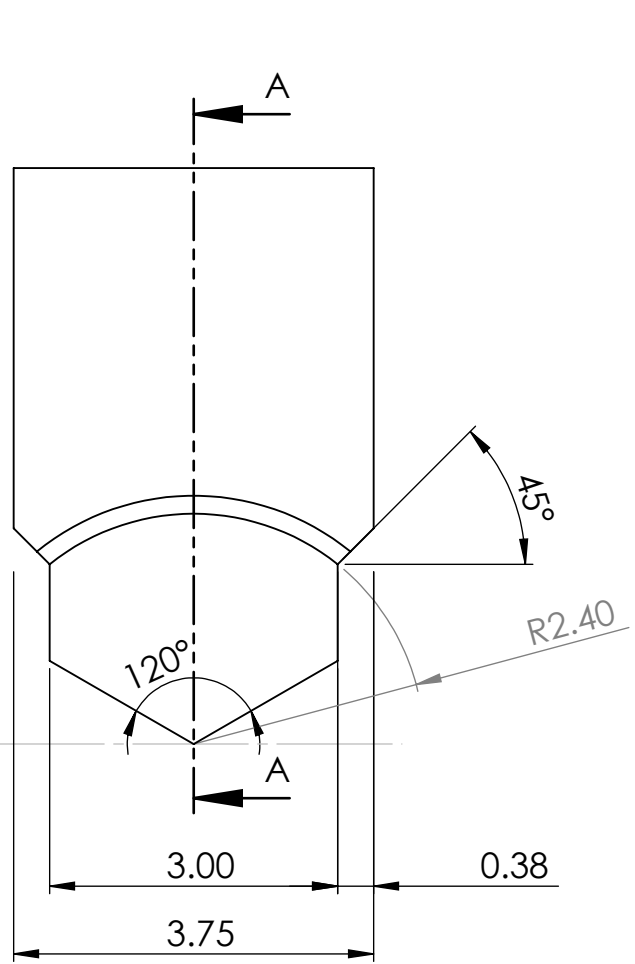
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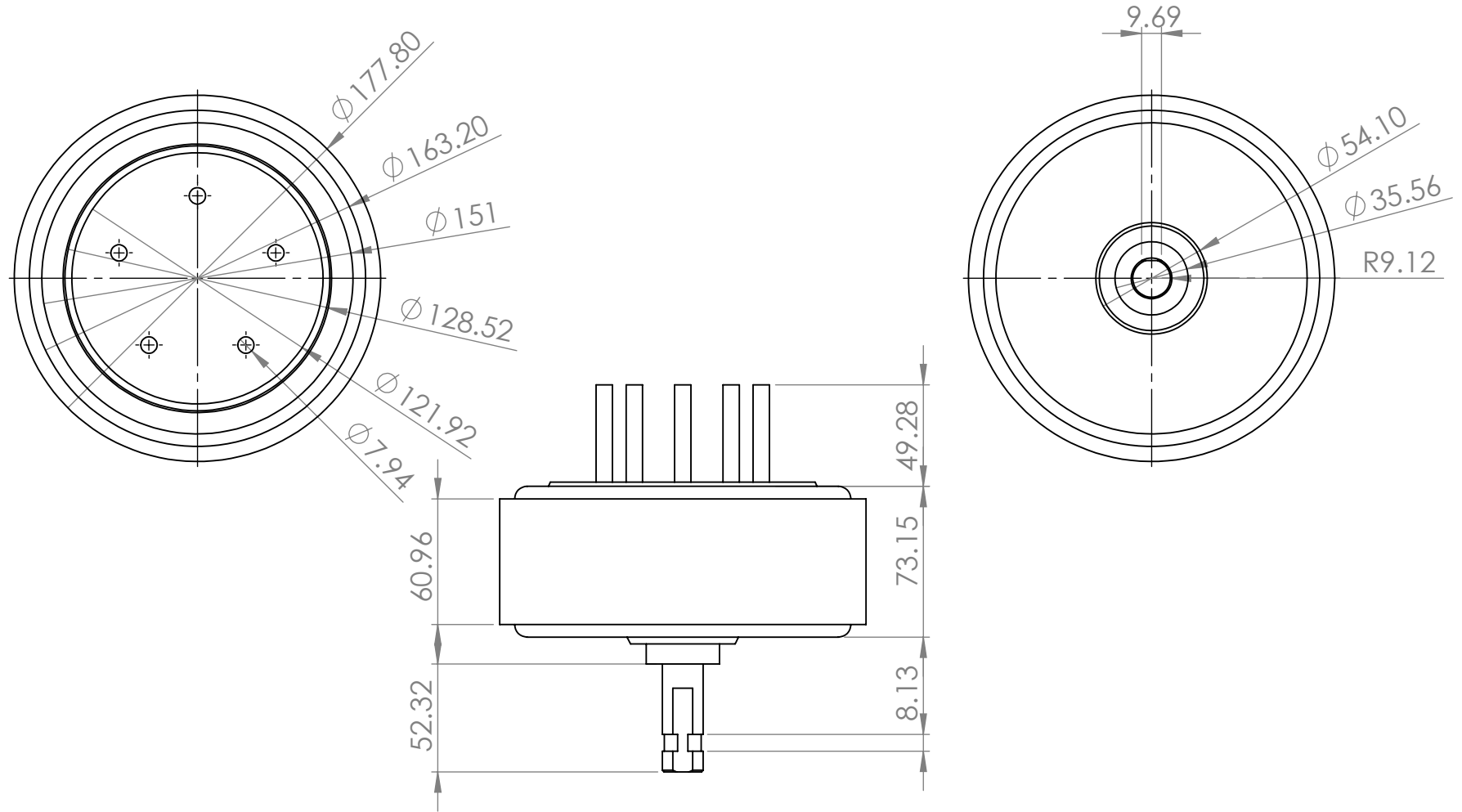


SECTION A-A

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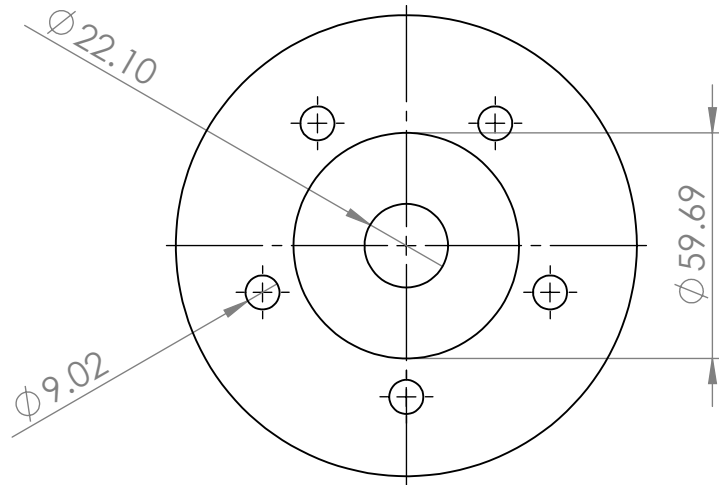
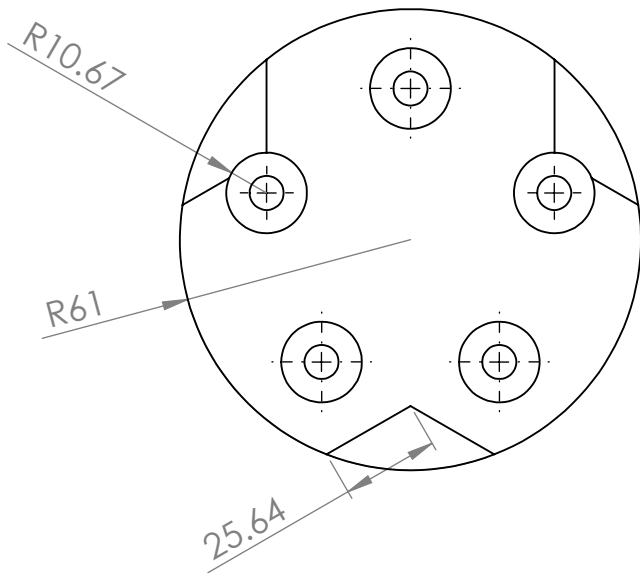
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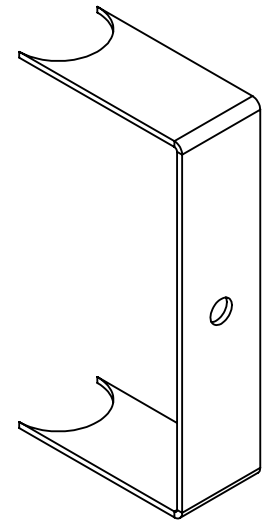
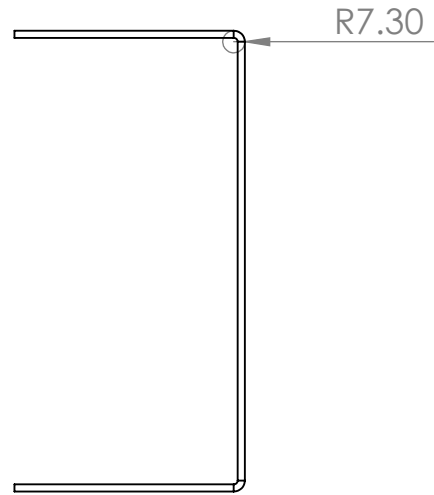
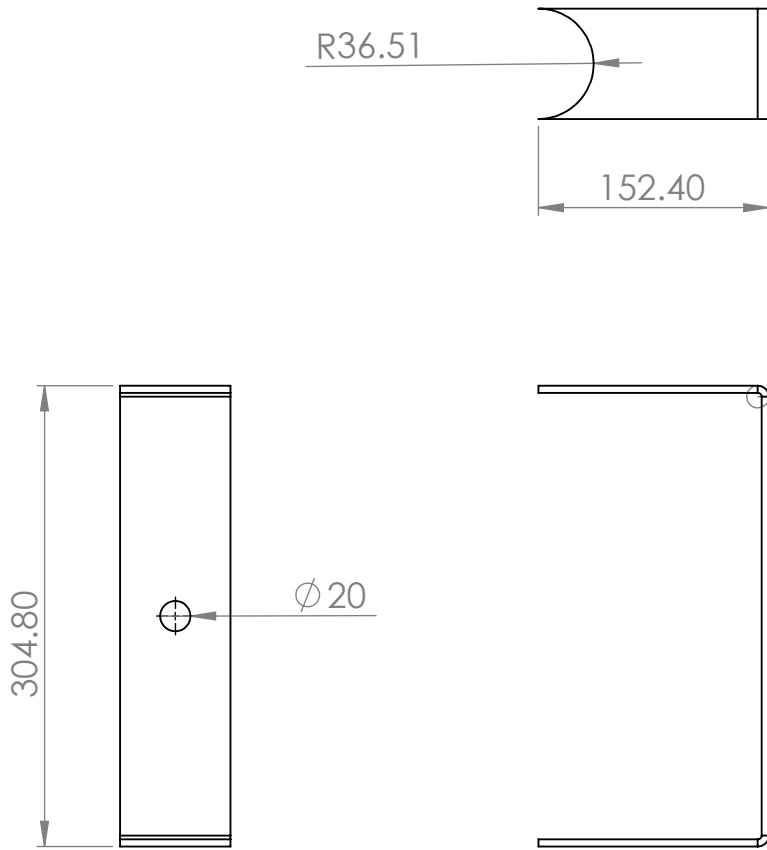
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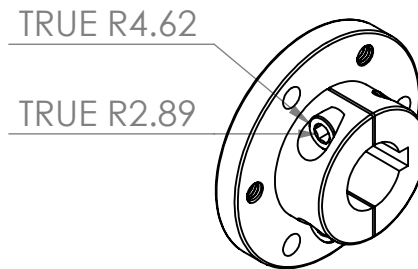
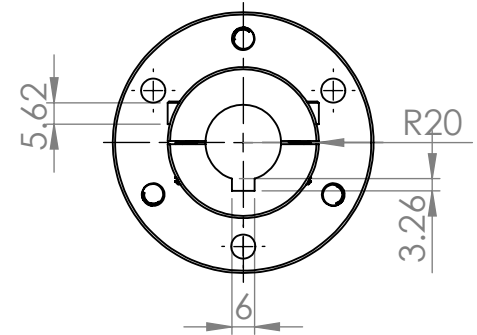
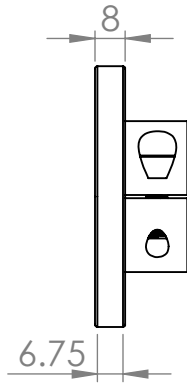
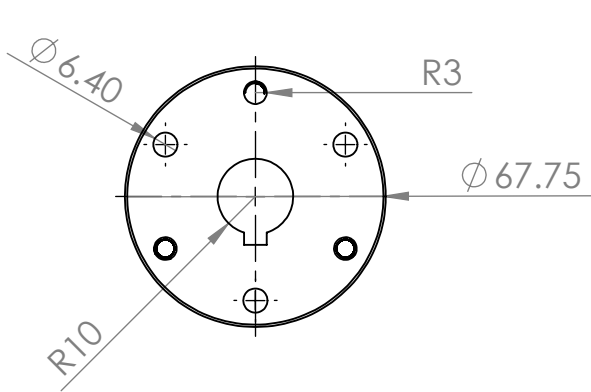


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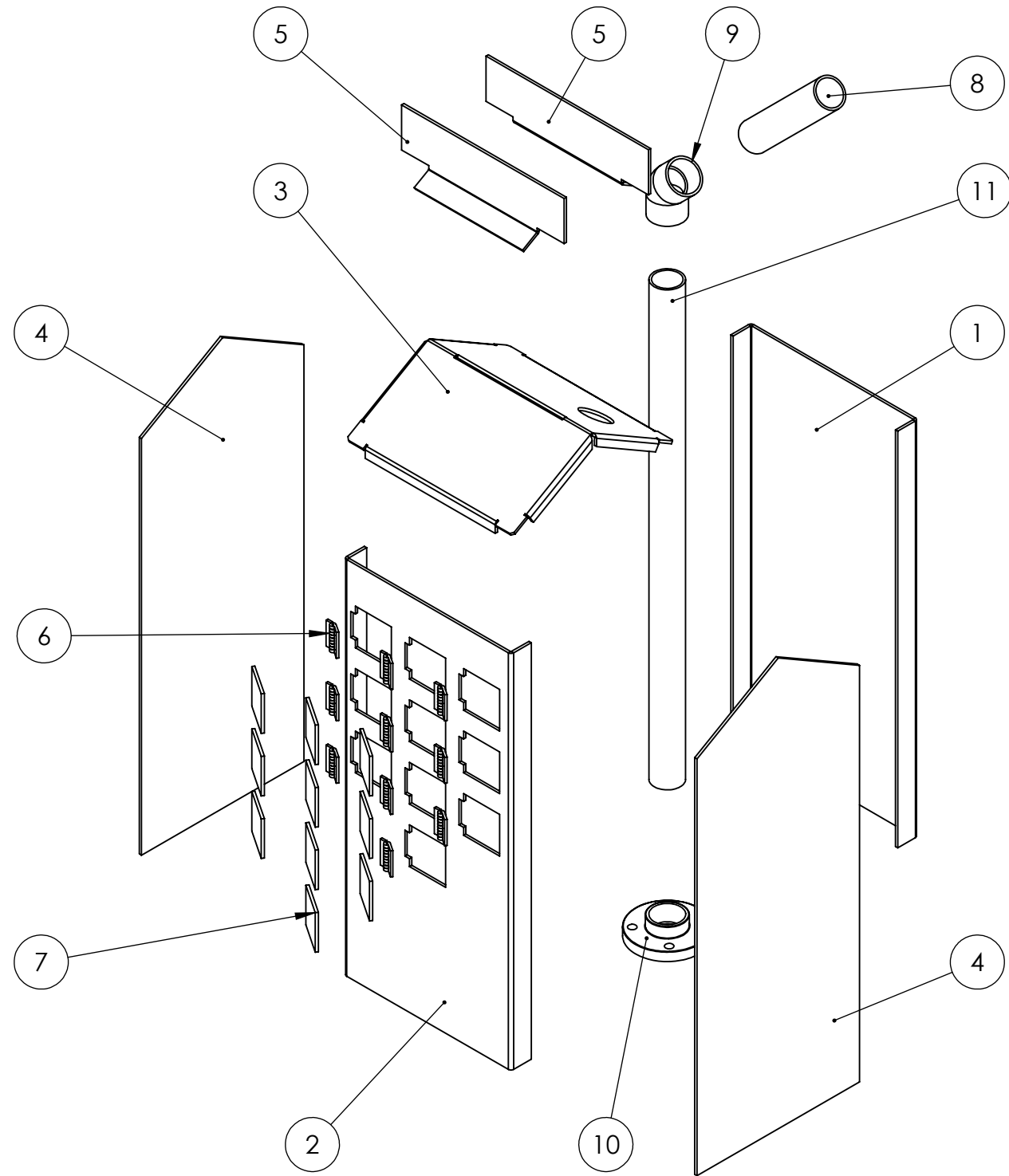
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2	Front Panel	1
3	Roof Panel	1
4	Side Panel	4
5	Top Panel	2
6	Hinge	10
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11	4 Ft. PVC Pipe	1

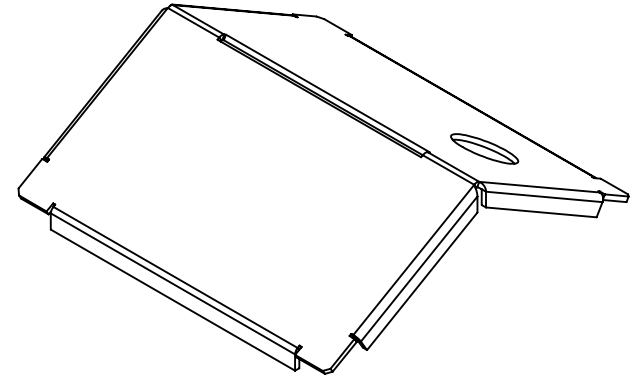
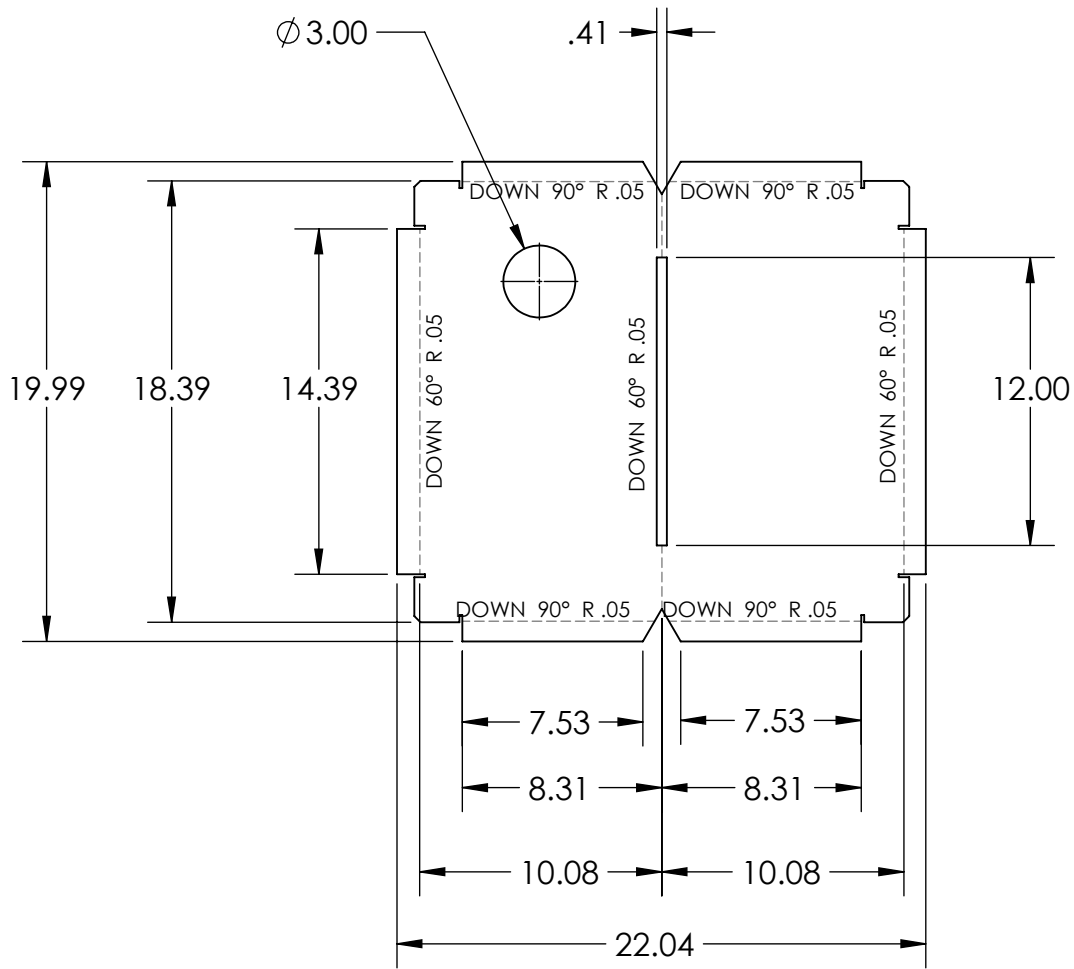


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NEXT ASSY	USED ON			Q.A.		SIZE DWG. NO. REV	
APPLICATION		DO NOT SCALE DRAWING		COMMENTS:		SCALE: 1:12 WEIGHT: SHEET 1 OF 10	

8 7 6 5 4 3 2 1



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INTERPRET GEOMETRIC TOLERANCING PER:

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4.11.14

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MFG APPR.

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TITLE:

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SIZE

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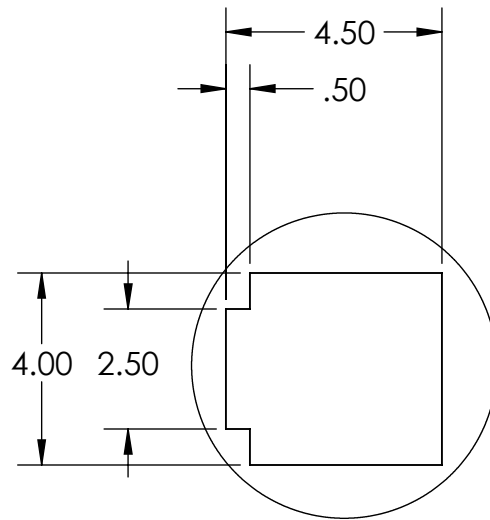
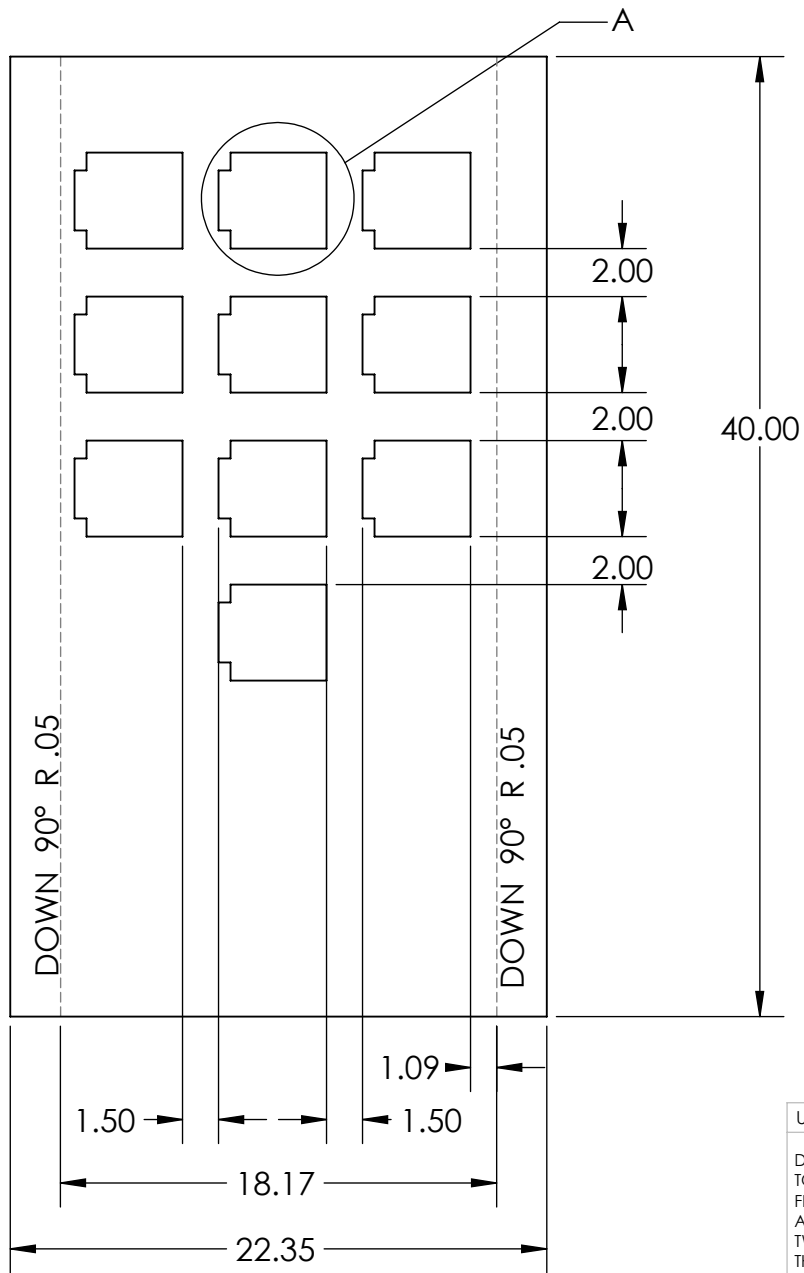
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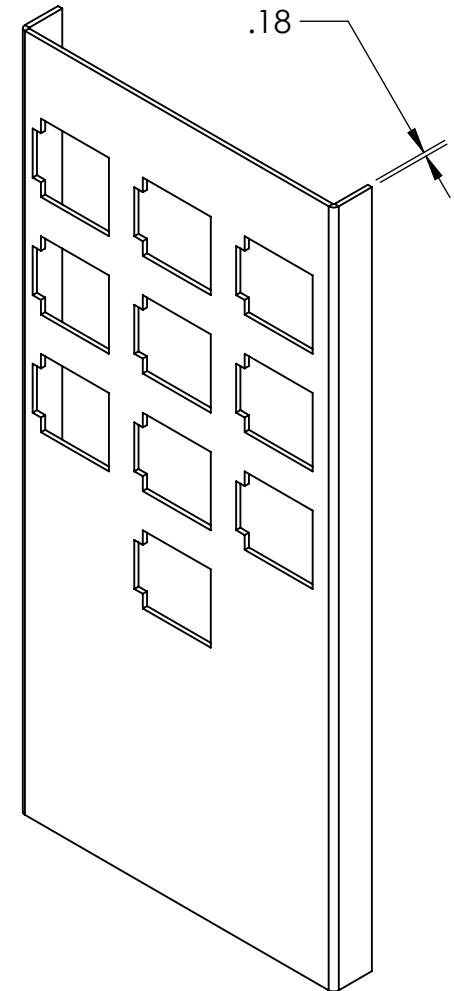
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WEIGHT:

SHEET 2 OF 10



DETAIL A
SCALE 1 : 4



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NAME

DATE

DRAWN

PP

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TITLE:

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SIZE

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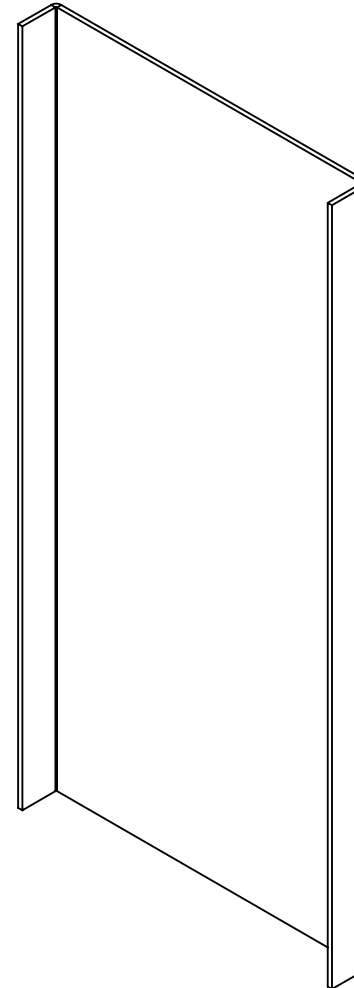
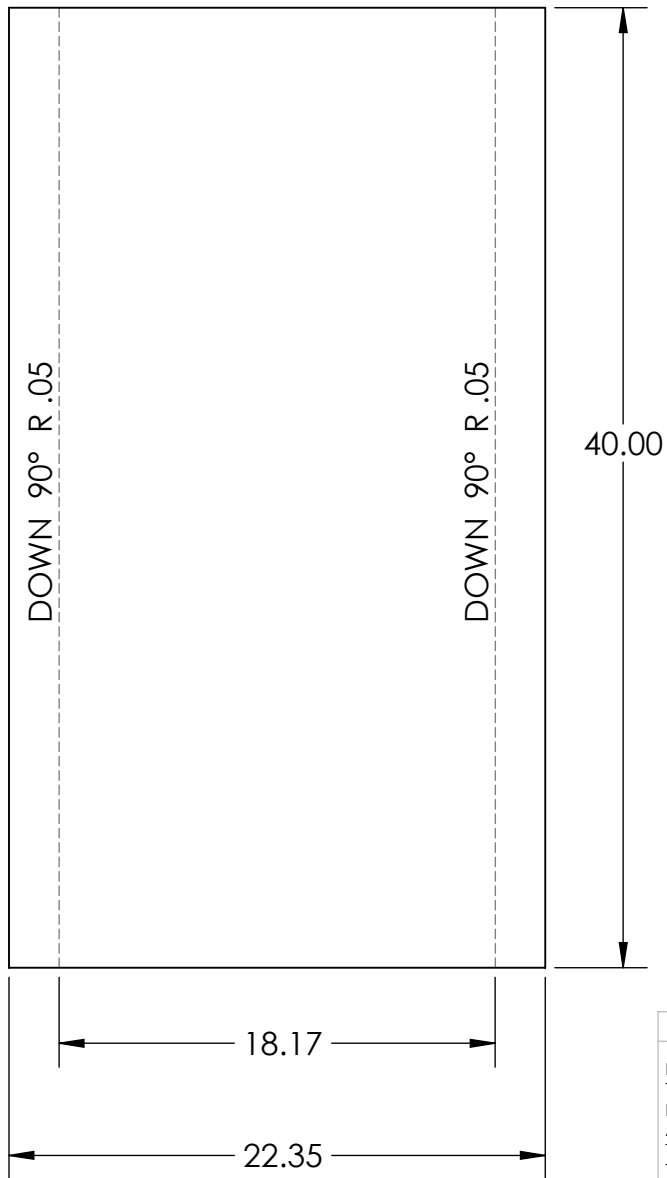
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A

SCALE: 1:8

WEIGHT:

SHEET 3 OF 10



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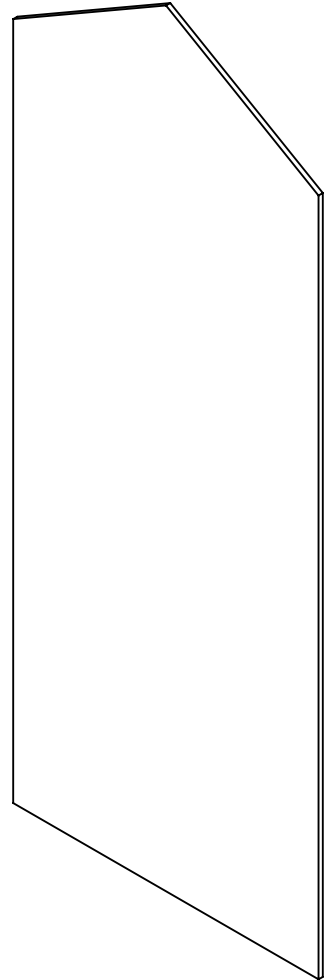
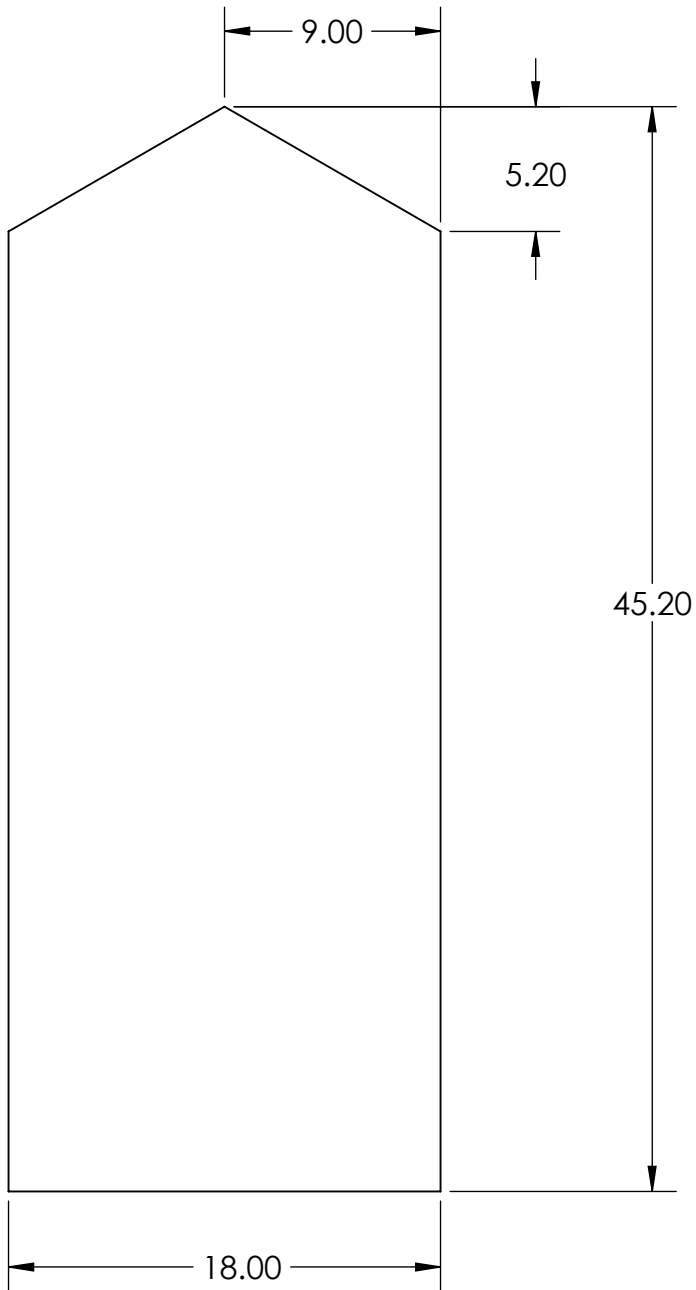
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UML GO JUICE

TITLE:
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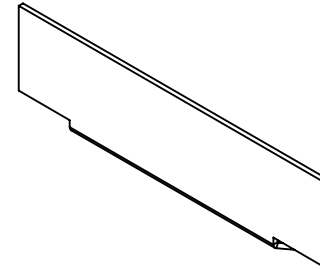
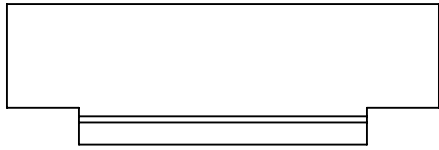
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TITLE:
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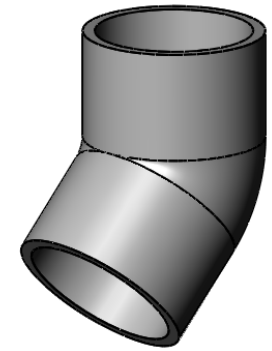
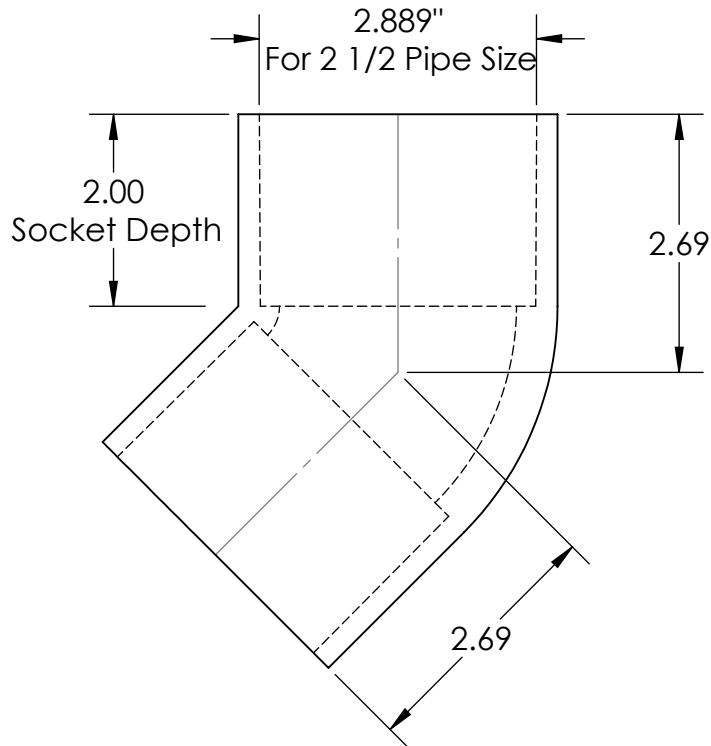
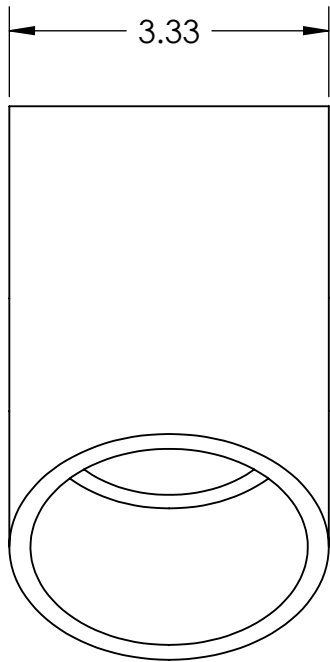
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	CHECKED			
	ENG APPR.			
		MFG APPR.		
		Q.A.		
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	A			
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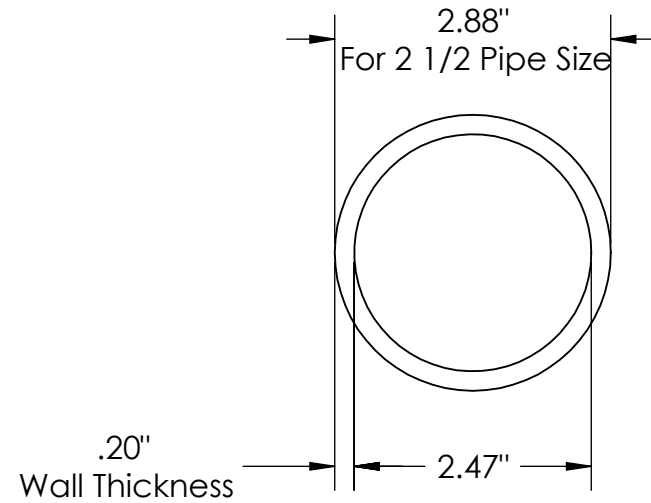
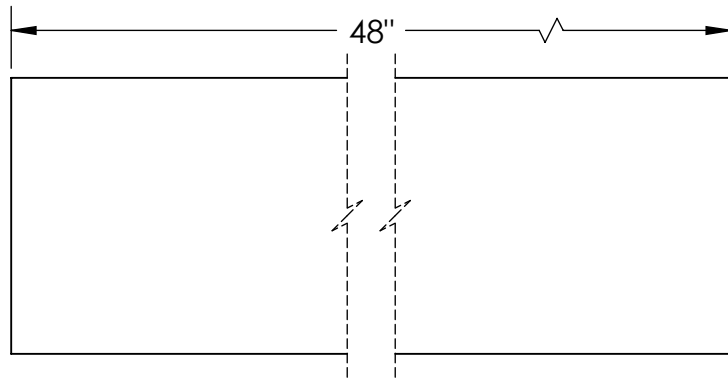
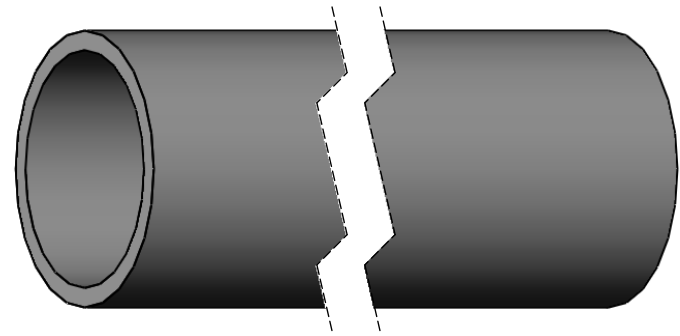
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MATERIAL			
FINISH			
DO NOT SCALE DRAWING			

UML GO JUICE

TITLE:
45 Degree PVC Elbow

SIZE A	DWG. NO.	REV
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SCALE: 1:2	WEIGHT:	SHEET 7 OF 10
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TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±

INTERPRET GEOMETRIC
TOLERANCING PER:

MATERIAL

FINISH

DO NOT SCALE DRAWING

NAME

DATE

DRAWN

PP

4.11.14

CHECKED

ENG APPR.

MFG APPR.

Q.A.

COMMENTS:

UML GO JUICE

TITLE:

4 Foot PVC Pipe

SIZE
A

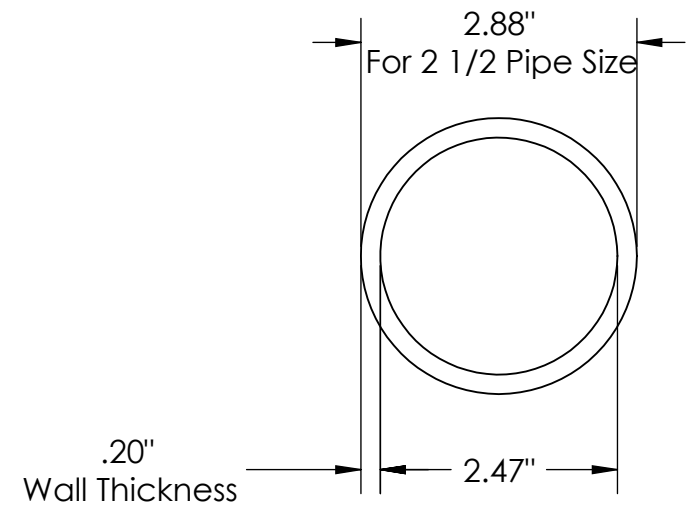
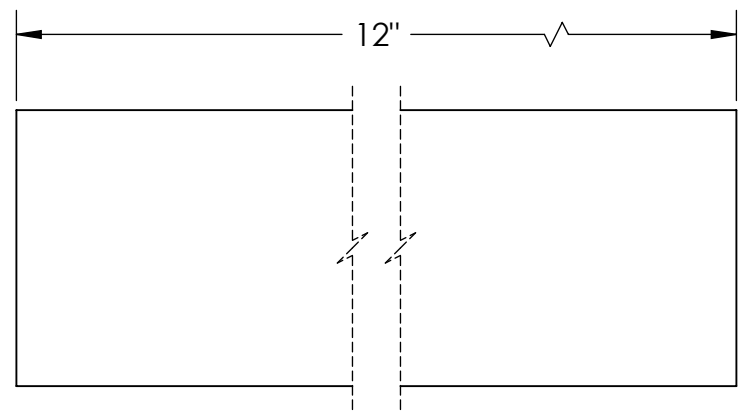
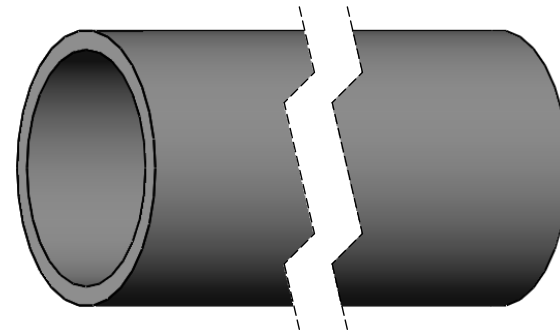
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REV

SCALE: 1:2

WEIGHT:

SHEET 8 OF 10



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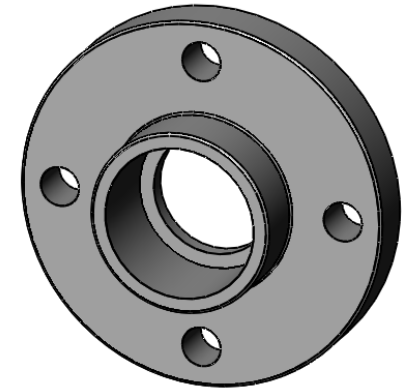
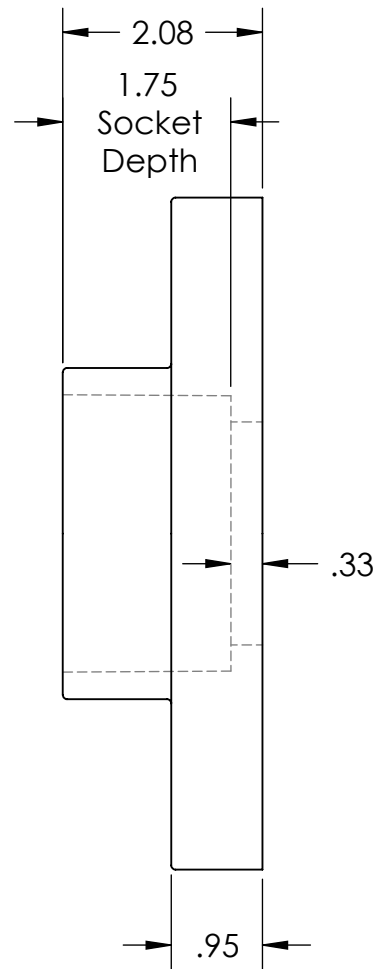
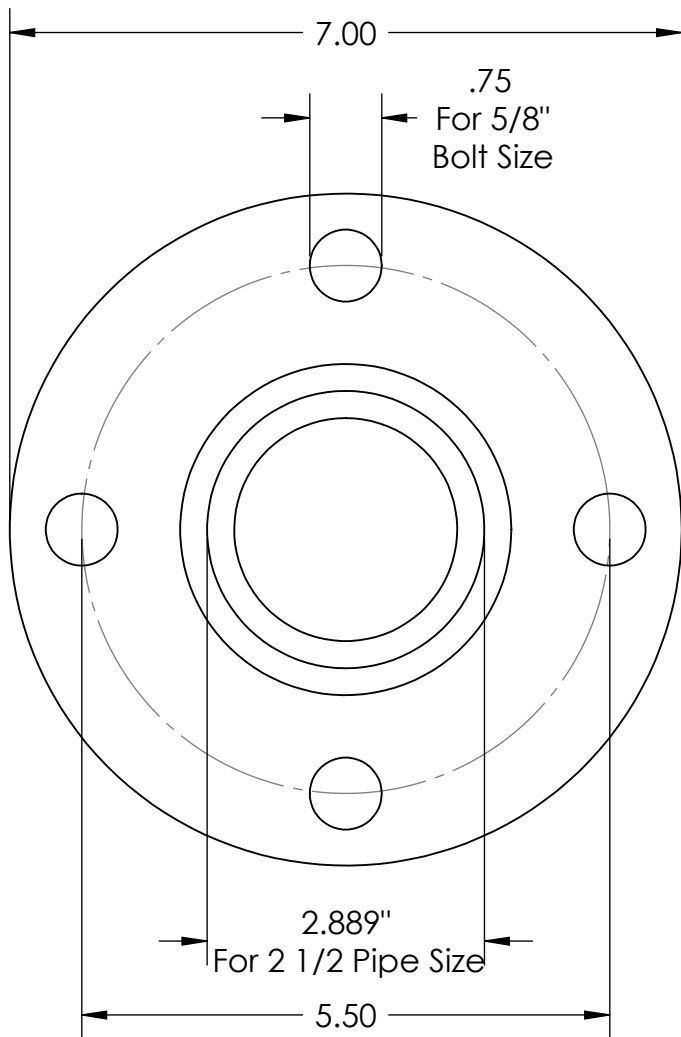
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THREE PLACE DECIMAL ±	COMMENTS:	
INTERPRET GEOMETRIC TOLERANCING PER:		
MATERIAL		
FINISH		
DO NOT SCALE DRAWING		

UML GO JUICE

TITLE:
1 Foot PVC Pipe

SIZE A	DWG. NO.	REV
SCALE: 1:2	WEIGHT:	SHEET 9 OF 10



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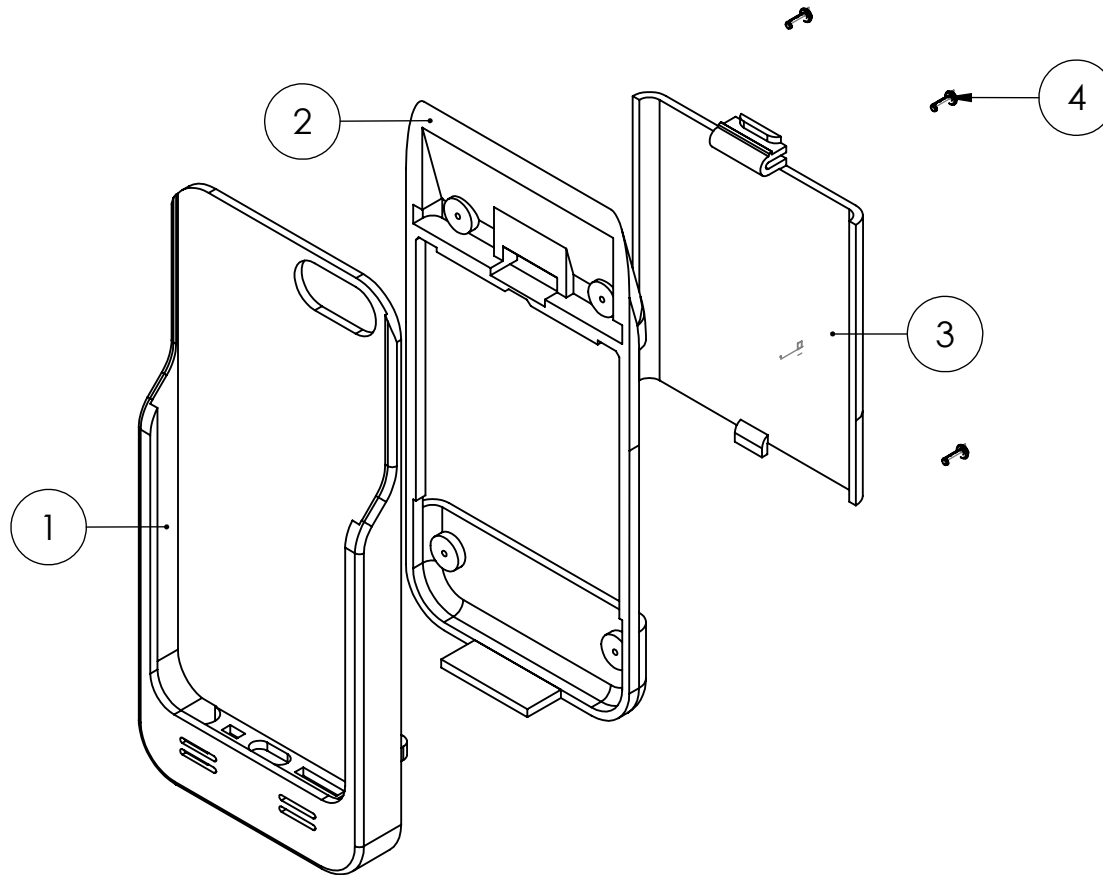
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FINISH			
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UML GO JUICE
TITLE:
PVC Pipe Fitting

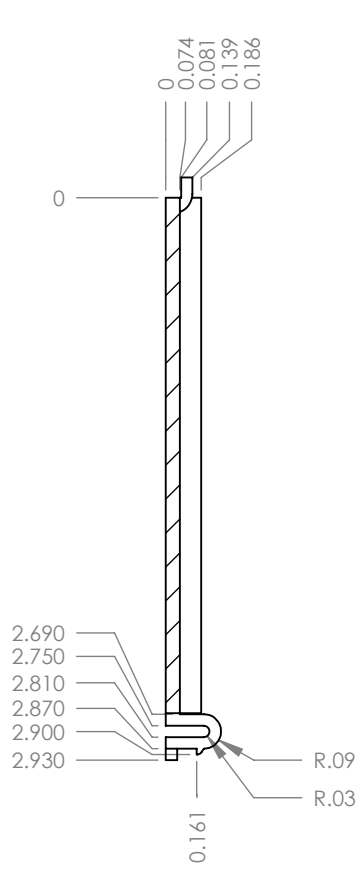
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Phone Case Drawings

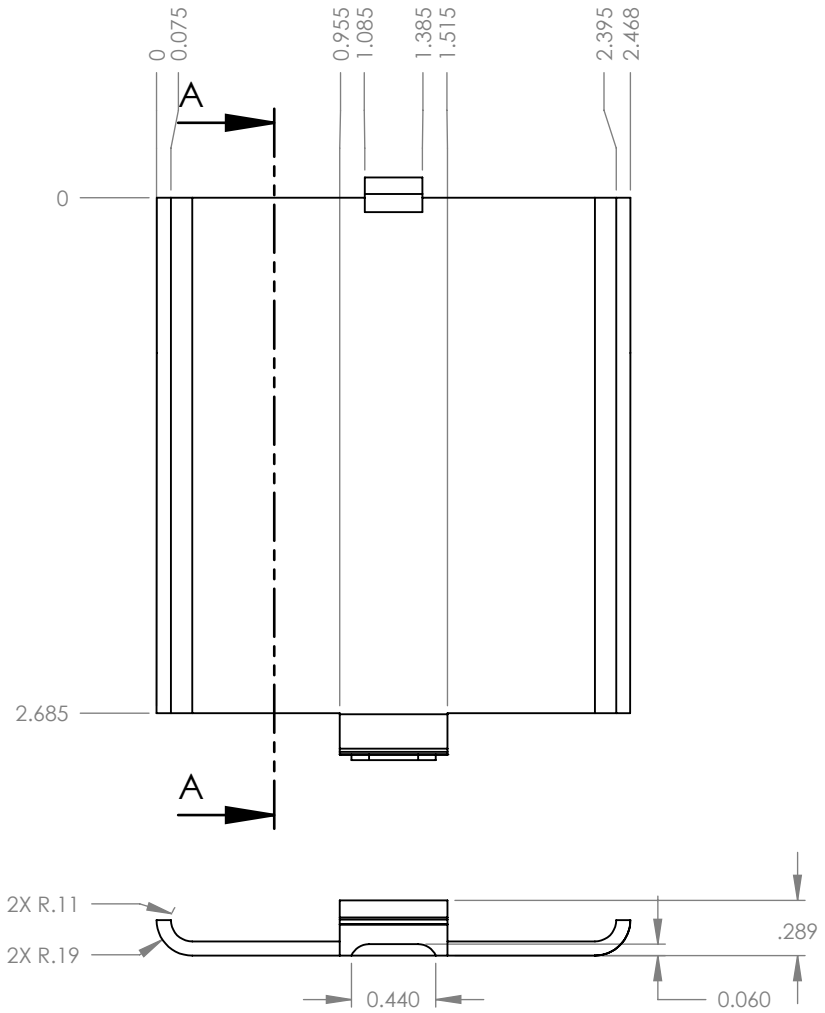
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2	IPHONE CASE BOTTOM	1
3	BATTERY COVER	1
4	#0-80 x 3/16" screw	4



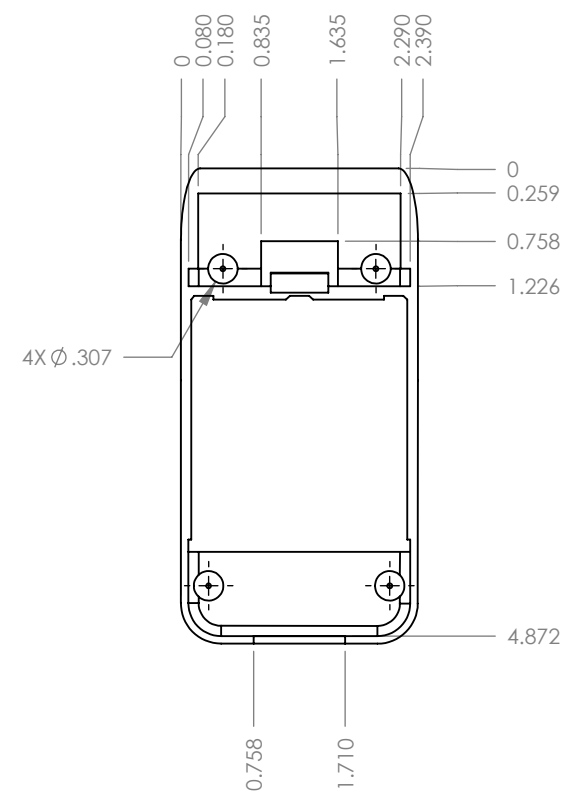
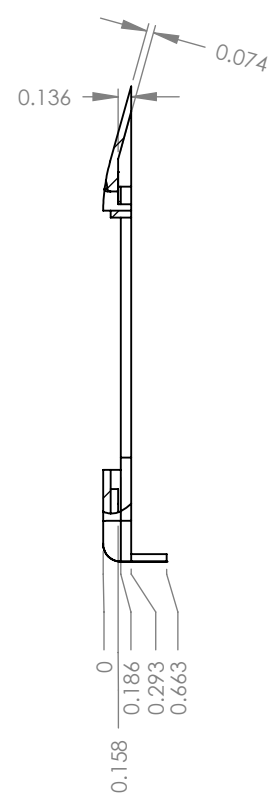
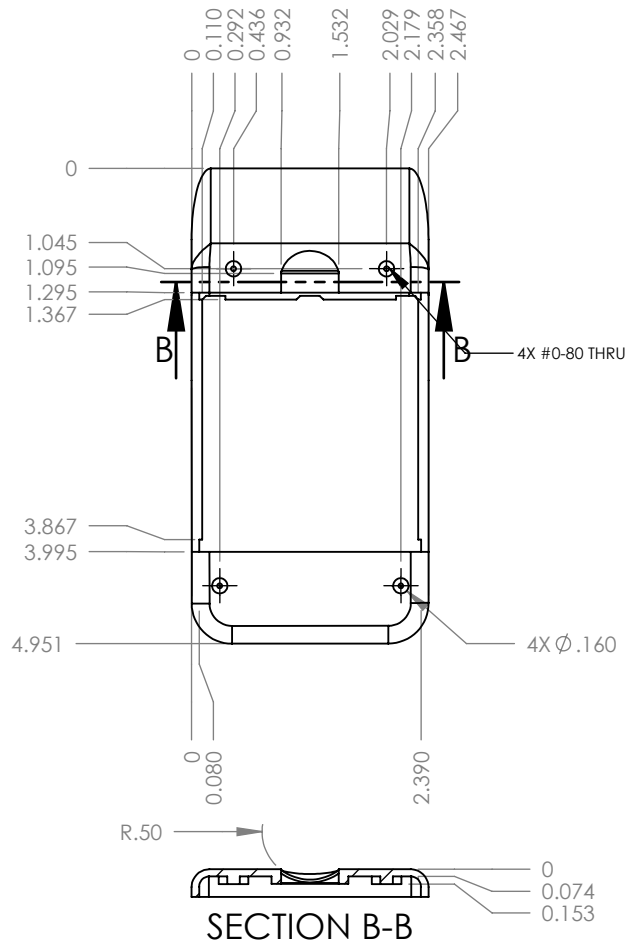
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THREE PLACE DECIMAL ±		COMMENTS:		A		
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MATERIAL						
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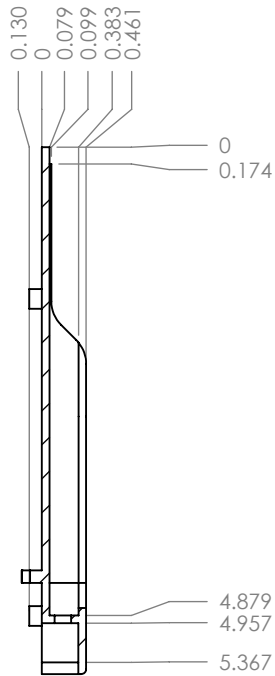
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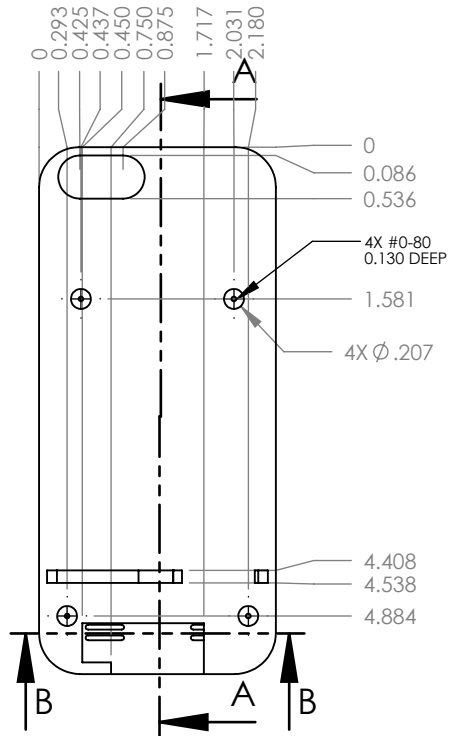
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ANGULAR: MACH ± BEND ±		MFG APPR.			
TWO PLACE DECIMAL ±0.01		Q.A.			SIZE DWG. NO. REV
THREE PLACE DECIMAL ±0.005		COMMENTS:			A
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FINISH					
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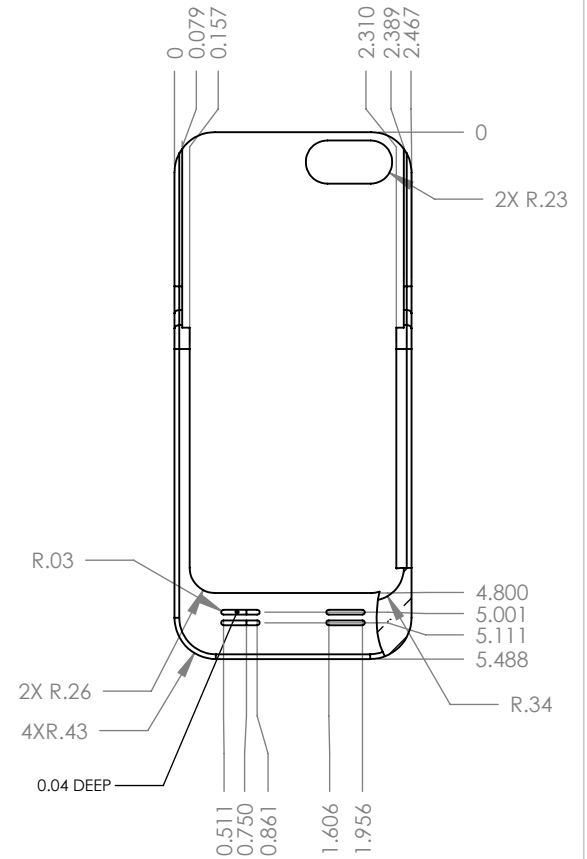
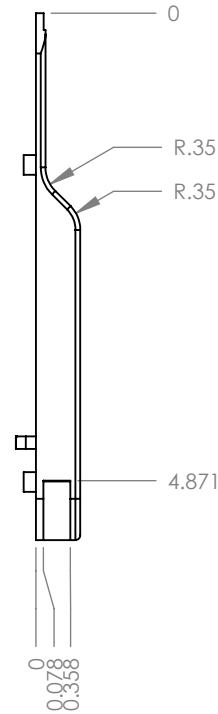
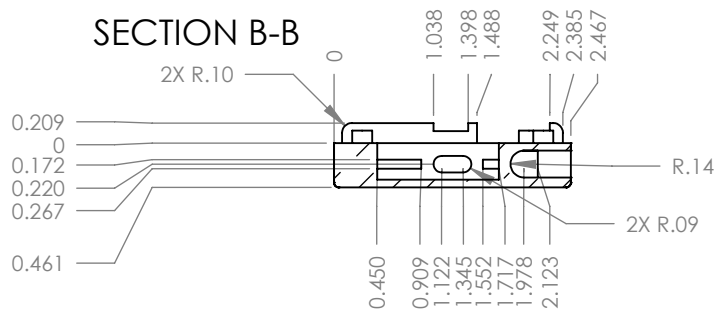
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	MFG APPR.			A		
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COMMENTS:						



SECTION A-A



SECTION B-B



UNLESS OTHERWISE SPECIFIED:		NAME	DATE
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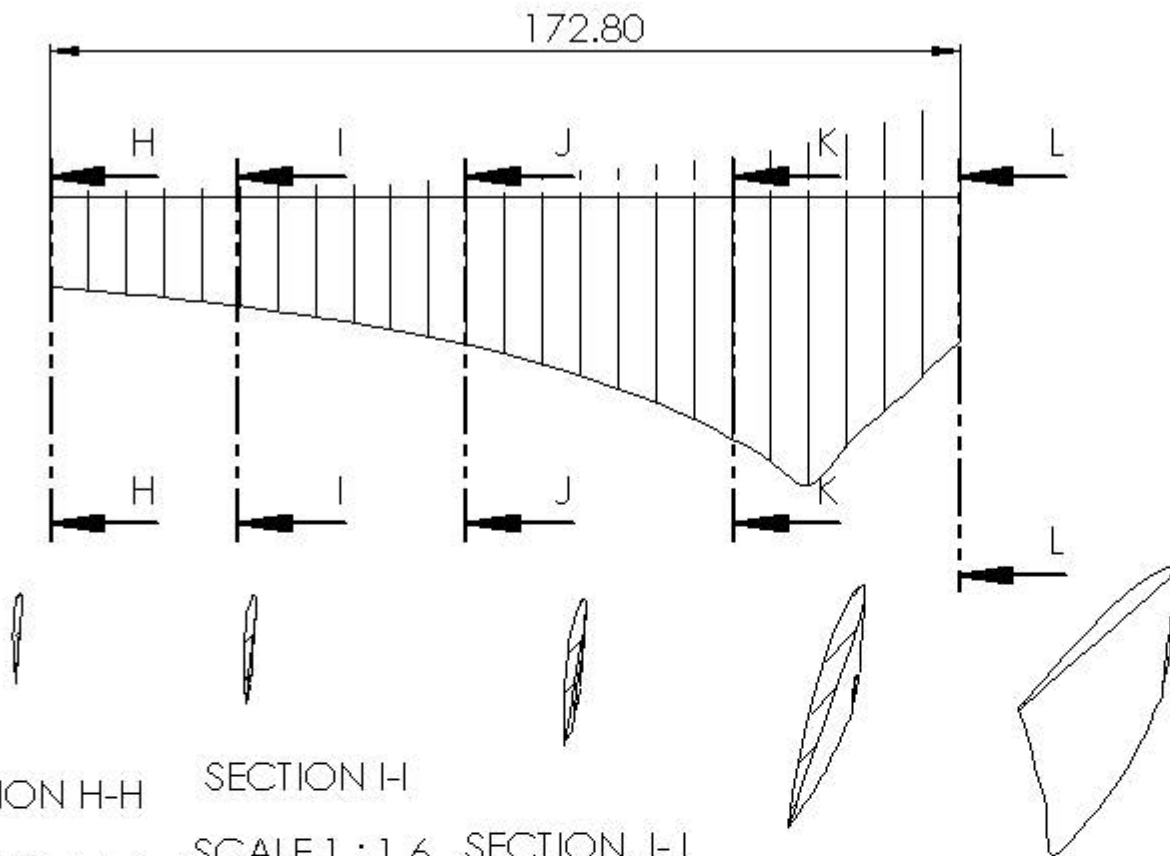
GO JUICE

TITLE:
iphone case top

SIZE	DWG. NO.	REV
A		
SCALE: 1:2	WEIGHT:	SHEET 1 OF 1

Appendix F: Specifications for the Wind Tunnel Test Turbine

Attached are the Specifications for the Wind Tunnel Test Turbine.



SECTION H-H SCALE 1 : 1.6
 SECTION I-I SCALE 1 : 1.6
 SECTION J-J SCALE 1 : 1.6
 SECTION K-K SCALE 1 : 1.6
 SECTION L-L SCALE 1 : 1.6

	Gamma	Cord Length
1 (L)	42.63	4.00
2	51.35	4.36
3	58.00	4.79
4	63.09	5.30
5	67.07	5.92
6	70.22	5.30
7 (K)	72.79	4.79
8	74.89	4.36
9	76.65	4.00
10	78.14	3.69
11	79.41	3.43
12	80.51	3.19
13	81.47	2.99
14 (J)	82.32	2.81
15	83.07	2.65
16	83.74	2.51
17	84.34	2.38
18	84.88	2.26
19	85.37	2.16
20 (I)	85.81	2.06
21	86.23	1.97
22	86.60	1.89
23	86.95	1.82
24	87.27	1.75
25 (H)	87.57	1.68

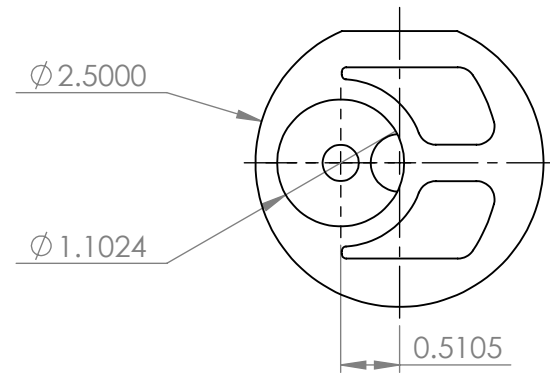
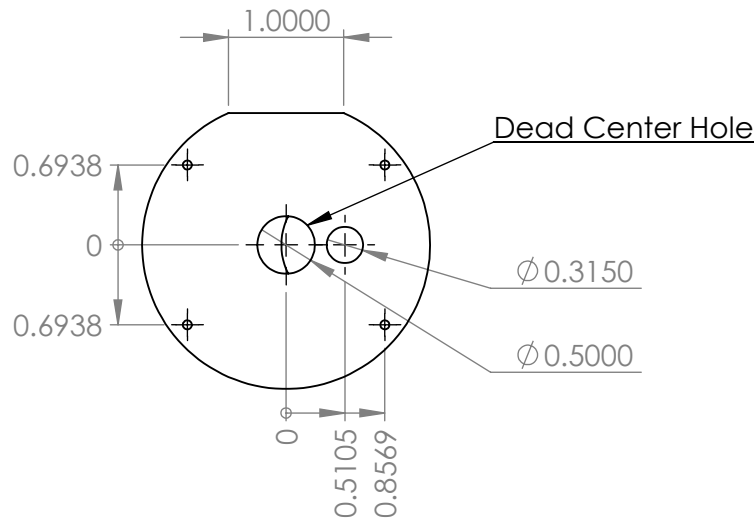
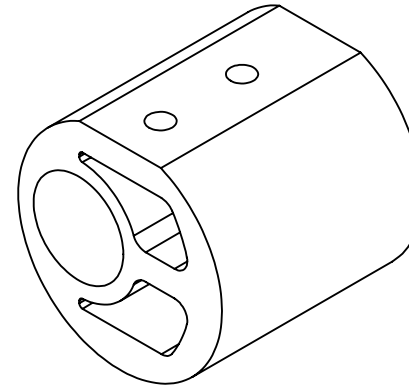
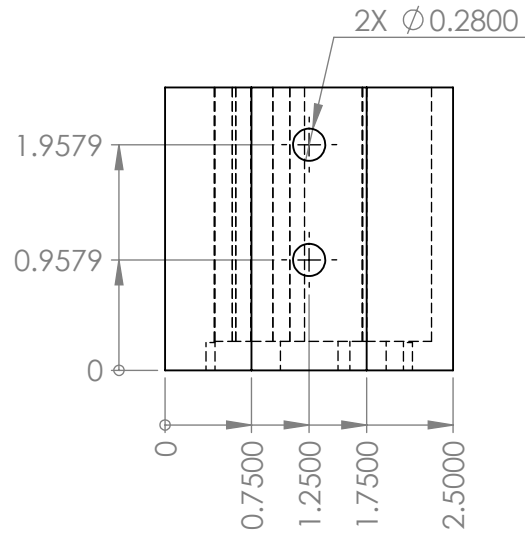


Naca 2408 Profile

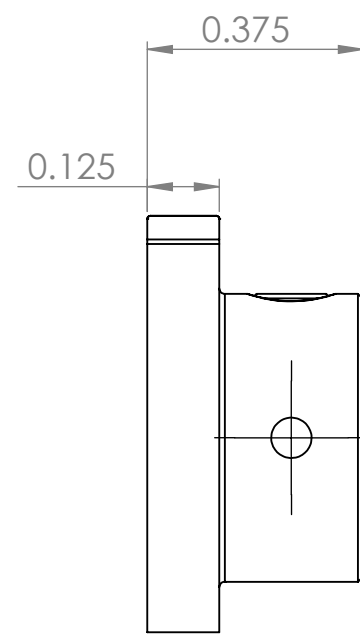
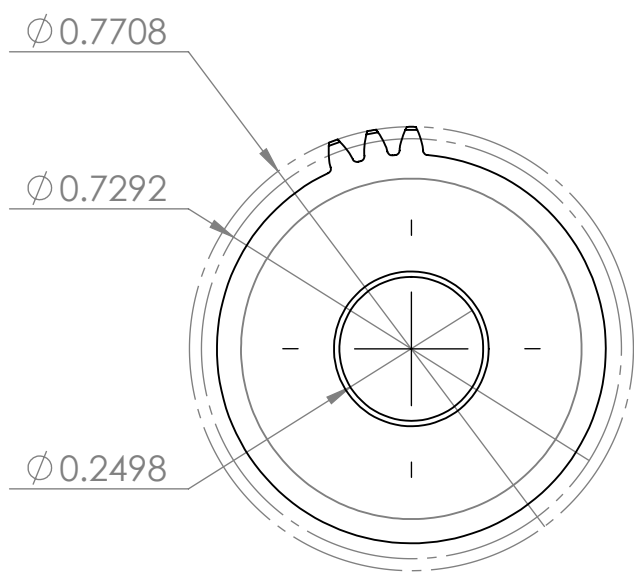
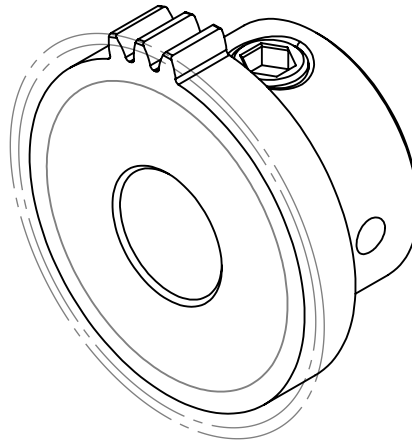
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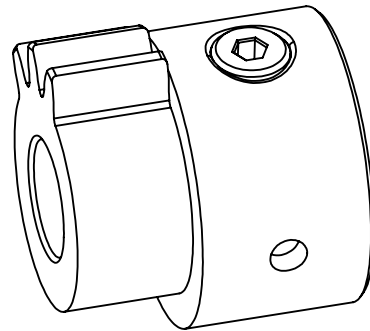
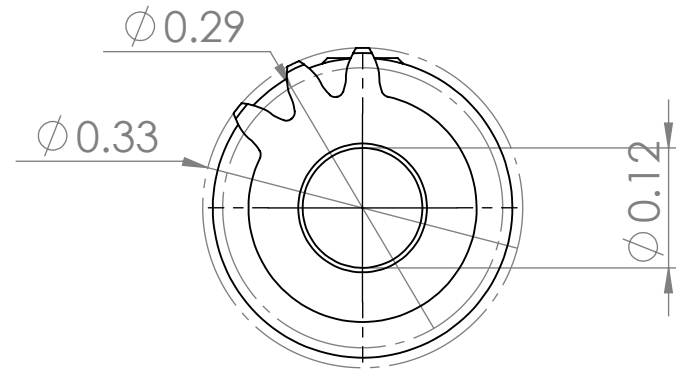
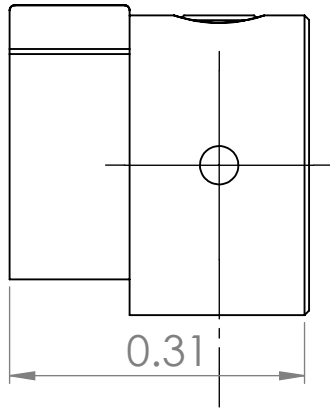
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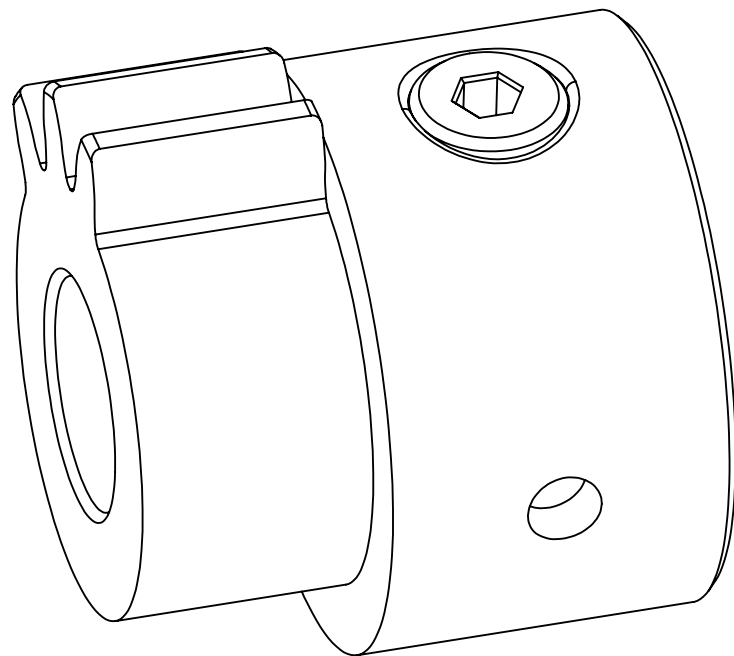
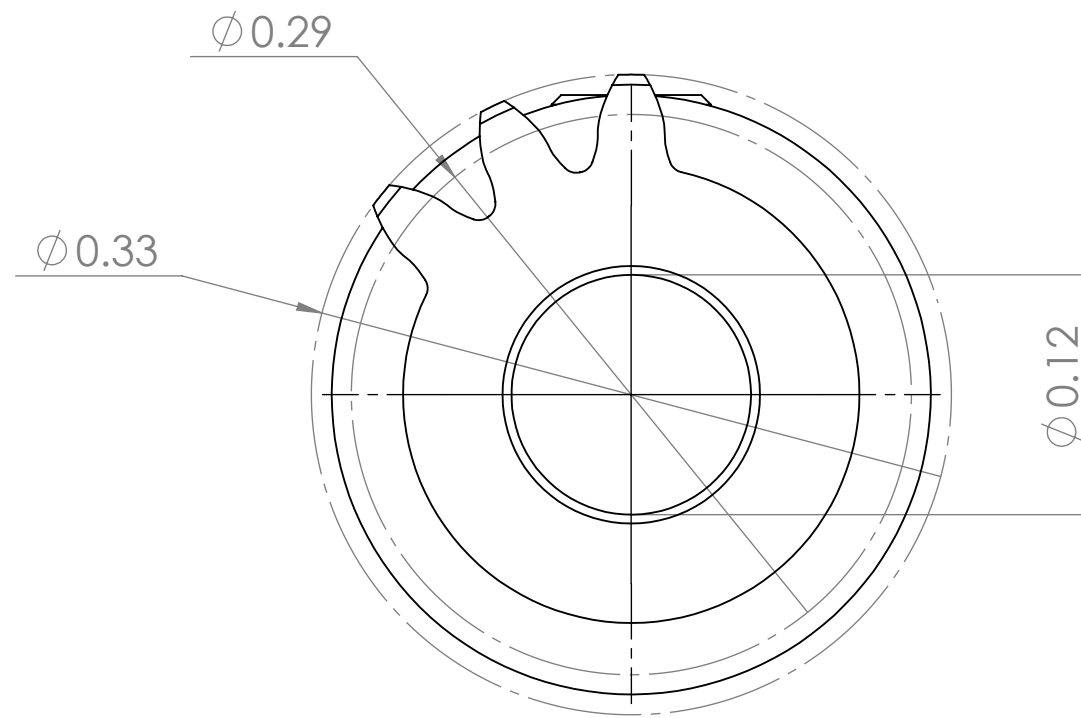
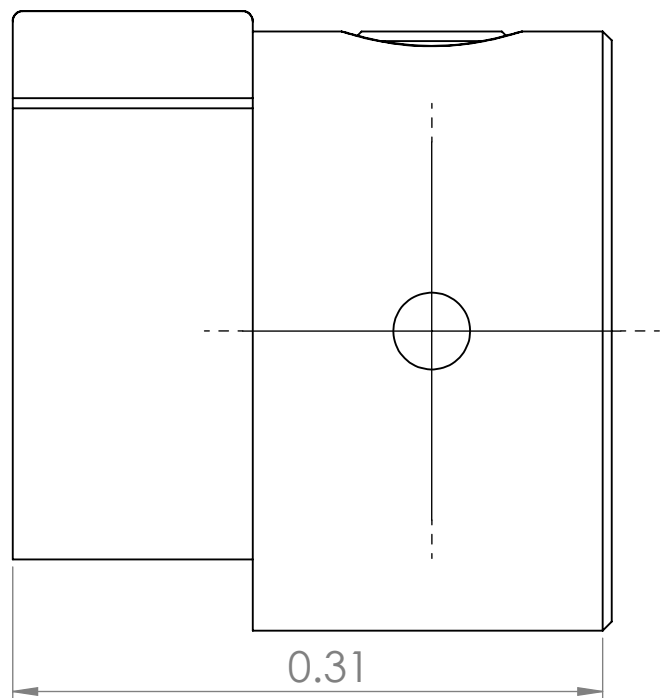
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ± INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL ABS Plastic/ Aluminum FINISH DO NOT SCALE DRAWING		NAME	DATE	GOJUICE TITLE: Motor Housing		
	DRAWN	M. Dube	4/18/14			
	CHECKED			SIZE	DWG. NO.	REV
	ENG APPR.			A	Motor_Housing	1
	MFG APPR.			SCALE: 3:5	WEIGHT:	SHEET 1 OF 1
	COMMENTS:					



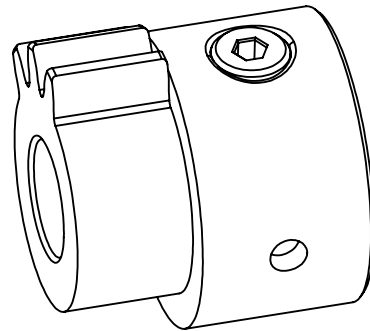
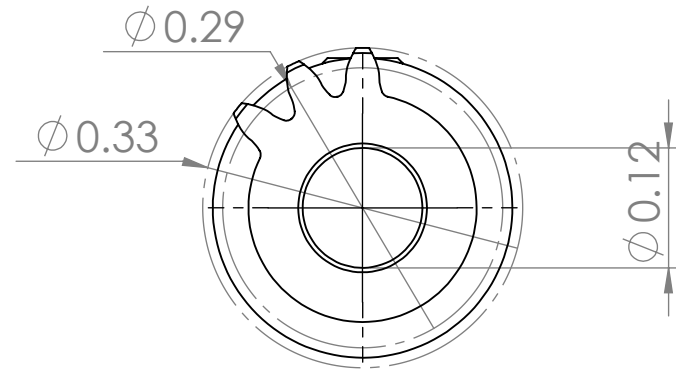
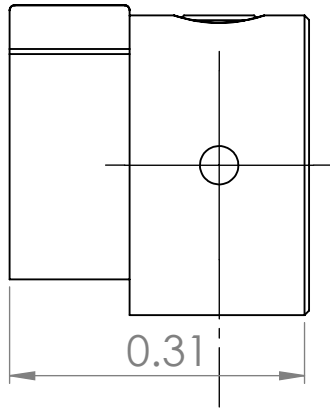
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL \pm ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL STAINLESS STEEL FINISH DO NOT SCALE DRAWING	DRAWN M. DUBE	NAME M. DUBE	DATE 4/18/14	GOJUICE TITLE: PINION GEAR			
	CHECKED	ENG APPR.	MFG APPR.				SIZE A
	COMMENTS:				SCALE: 3:1	WEIGHT:	SHEET 1 OF 1



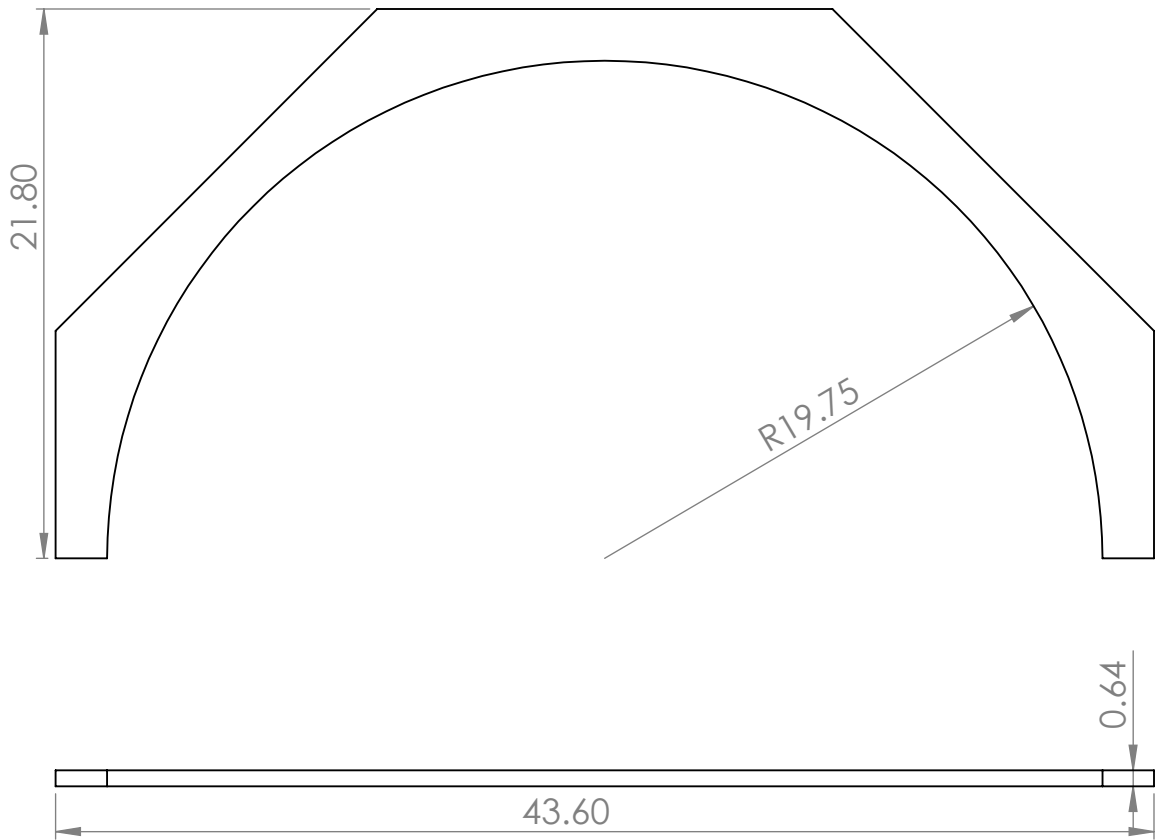
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ± INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL Stainless Steel FINISH DO NOT SCALE DRAWING		NAME	DATE	GOJUICE TITLE: Spur Gear	
	DRAWN	ES	4/18/2014		
	CHECKED			SIZE DWG. NO. REV	
	ENG APPR.				
	MFG APPR.			SCALE: 5:1 WEIGHT: SHEET 1 OF 1	
	Q.A.				
	COMMENTS:				



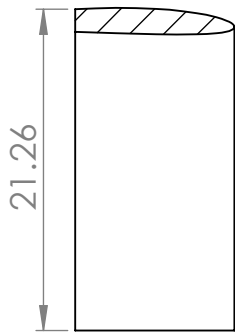
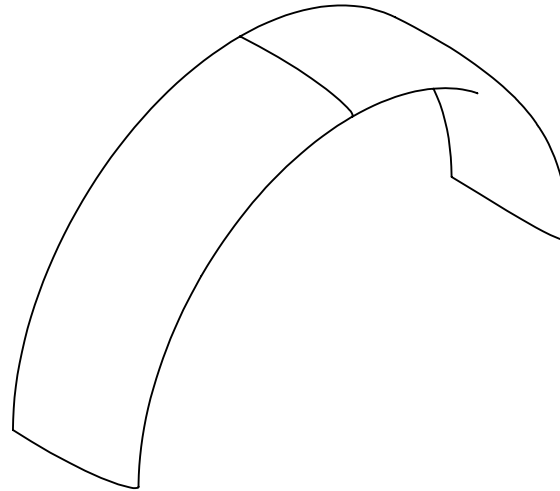
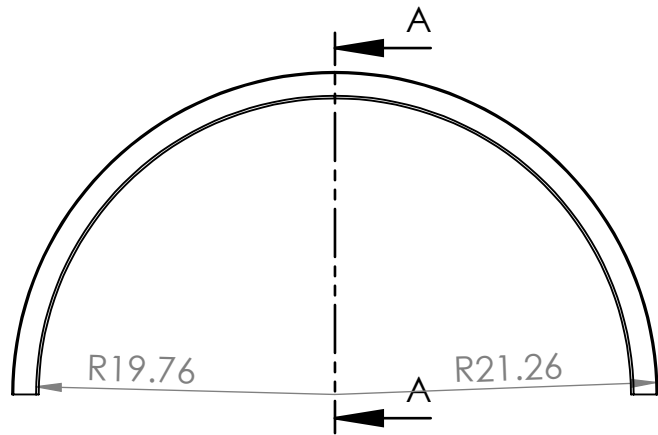
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES SURFACE FINISH: TOLERANCES: LINEAR: ANGULAR:				FINISH:		DEBUR AND BREAK SHARP EDGES		DO NOT SCALE DRAWING		REVISION	
								TITLE: <h1>GoJuice</h1>			
DRAWN Erika Sjoberg				SIGNATURE		DATE 4/18/2014		DWG NO. <h1>Spur Gear</h1>			
CHK'D								SCALE:10:1			
APPV'D								SHEET 1 OF 1			
MFG											
Q.A						MATERIAL: Stainless Steel		A3			
						WEIGHT:					



UNLESS OTHERWISE SPECIFIED:		NAME	DATE	GOJUICE	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL \pm ANGULAR: MACH \pm BEND \pm TWO PLACE DECIMAL \pm THREE PLACE DECIMAL \pm		DRAWN	ES 4/18/2014		
INTERPRET GEOMETRIC TOLERANCING PER:		CHECKED		TITLE:	
MATERIAL Stainless Steel		ENG APPR.			
FINISH		MFG APPR.		SCALE: 5:1 WEIGHT: SHEET 1 OF 1	
DO NOT SCALE DRAWING		Q.A.			
		COMMENTS:			



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN mm TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ± INTERPRET GEOMETRIC TOLERANCING PER: MATERIAL FINISH DO NOT SCALE DRAWING		NAME	DATE	GO JUICE TITLE: Diffuser Half	
	DRAWN	MKS	4/18/14		
	CHECKED			SIZE DWG. NO. REV A 1	
	ENG APPR.				
	MFG APPR.				
	Q.A.			SCALE: 1:3 WEIGHT: SHEET 1 OF 1	
COMMENTS:					



SECTION A-A

SCALE 1 : 5

UNLESS OTHERWISE SPECIFIED:		NAME	DATE	GO JUICE	
DIMENSIONS ARE IN CM TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±		DRAWN	MKS 4/18/14		
INTERPRET GEOMETRIC TOLERANCING PER:		CHECKED		SIZE DWG. NO. REV	
MATERIAL		ENG APPR.		A 1	
FINISH		MFG APPR.		SCALE: 1:10 WEIGHT: SHEET 1 OF 1	
DO NOT SCALE DRAWING		Q.A.			
		COMMENTS:			