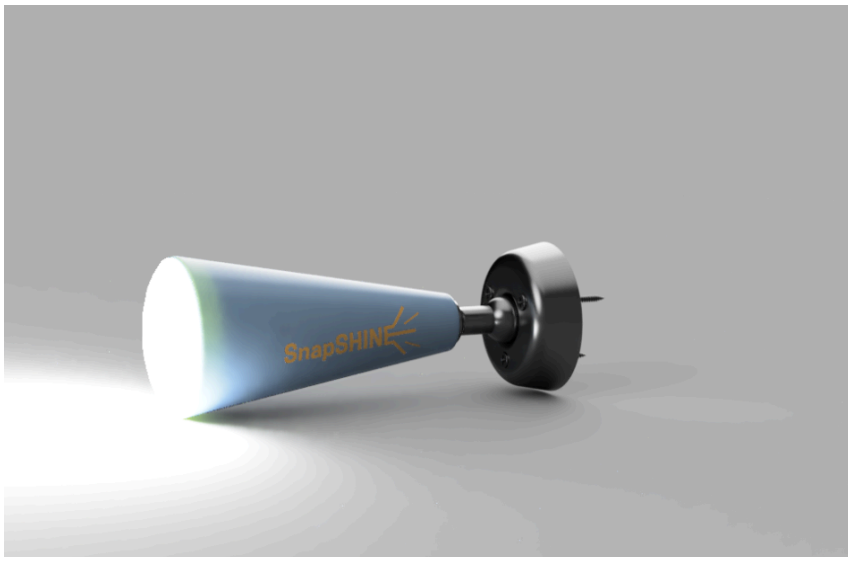


SnapSHINE

Detachable Desk Lamp

ME170 Design Team
AB5_01

Team Members:
Noah Manderfed
Sai Sanjay Bommisetty
Yuxiang Li
Neil Mody-Deshmukh

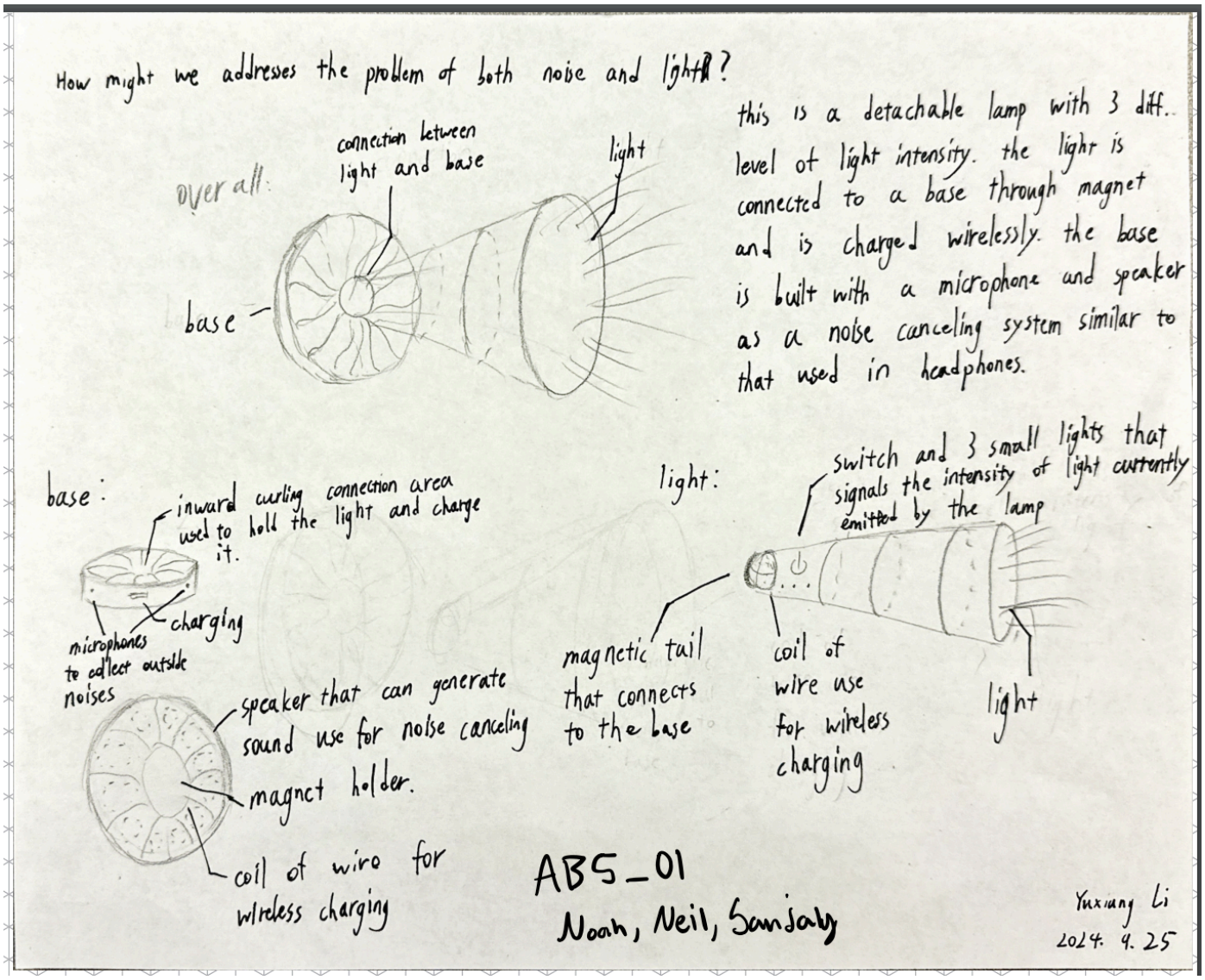
Date: 12/13/2024

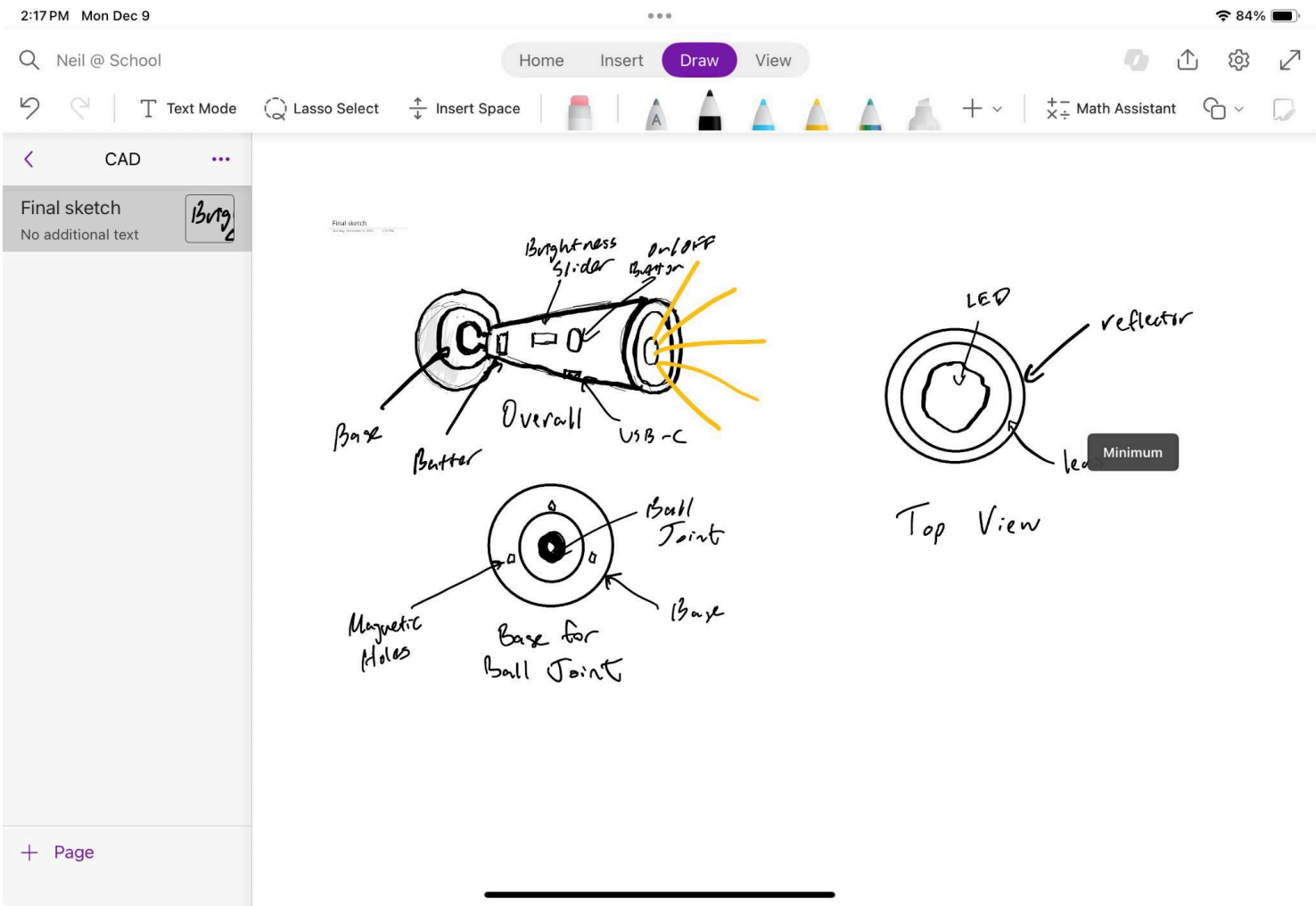
1. Product Description

The product our group designed is a detachable desk lamp that we call SnapSHINE. The idea of a detachable lamp came from our interview. While conducting interviews to find unmet needs, we focused our interview on the problems students face when living in a dorm or apartment with roommates, which describes the majority of college students. One key issue we found is the problems people have with light. When living with roommates, there are often times when one person has to go to sleep and the other is still awake for some reason. When this happens, the use of light by the person who is not asleep can be very disturbing to the person who needs to sleep. Sometimes it can be quite difficult to be a significant roommate when all the overhead lights are the only source of light. From this scenario comes our "how could we" question: "How could we have a light that could be useful in different situations to perform different tasks discreetly? An immediate idea that came to mind was to design a lamp with controllable light intensity, so that we can dim the light when someone needs to rest. But this is not enough. Although a lamp with adjustable light intensity is an improvement over current light sources, it does not completely answer the question. This lamp can be used in different situations, but it is still just a lamp that is placed on a desk and can be used to read or write or maybe work on a computer. However, sometimes these are not the reasons why someone needs to turn the light on. More often, the light is turned on because the person needs to do something in the room, such as do laundry or perhaps pack up some things. A lamp is certainly not helpful in these situations and one will be forced to turn on the headlights. To solve these problems, we thought of a product that can be useful: a flashlight. A flashlight can act as a light source that is helpful when you have to do some tasks away from the table. From this, we came up with the idea of combining a flashlight with a lamp, hence a detachable lamp. It should have a base so that when they are connected, it can be used as a lamp with adjustable light intensity, and it can be detached from the lamp to be used as a flashlight for other purposes. With our product, people will have a life without all the disturbances of light when living with a roommate who has a different schedule than you.

Our product is mainly targeted at college students and other people who live in dormitories or apartments with roommates who may not share their schedules and want to avoid disturbing them while they sleep. Unlike the traditional light sources in these places, our product provides controllable light for multiple scenarios. With our product, the user can sit at a table and work, or move around the room to perform other tasks without worrying that turning on the light will disturb other people and cause trouble. This product can improve the living experience for everyone in an apartment or dorm room.

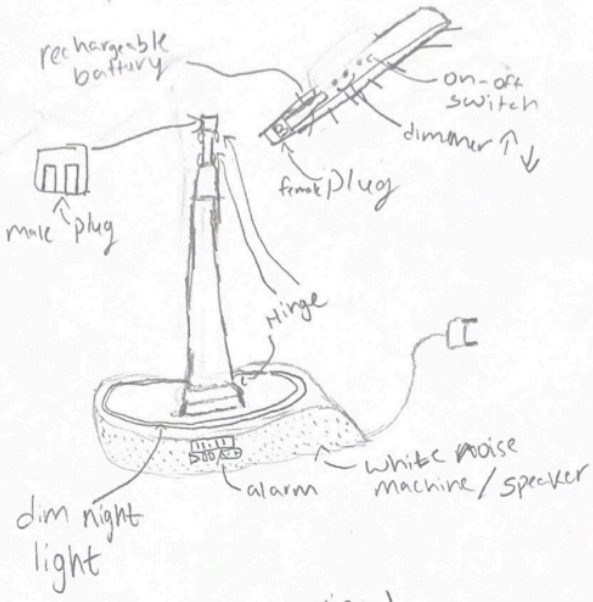
2. Concept Sketches – initial and finalized



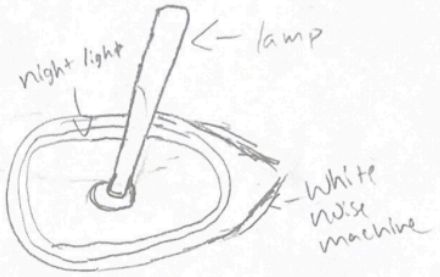

2:17 PM Mon Dec 9
84%
Neil @ School
Home
Insert
Draw
View
Text Mode
Lasso Select
Insert Space
Math Assistant
CAD
Final sketch
No additional text
Page
Brightness Slider
On/OFF Button
Base
Butter
Overall
USB-C
LED
reflector
Minimum
Top View
Ball Joint
Base
Magnetic Holes
Base for Ball Joint

H3 How might we create a solution that addresses the problem of both noise and light problems

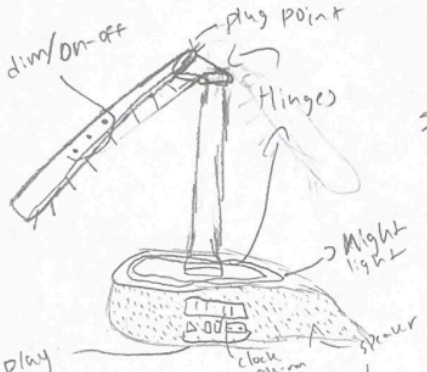
-Group 1, ABS
Sai Sanjay Bommisetty
ssb13@illinois.edu
09/25/2024
Sai Sanjay



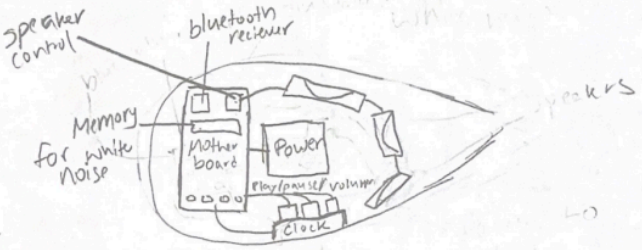
Detached view



Top



Attached view



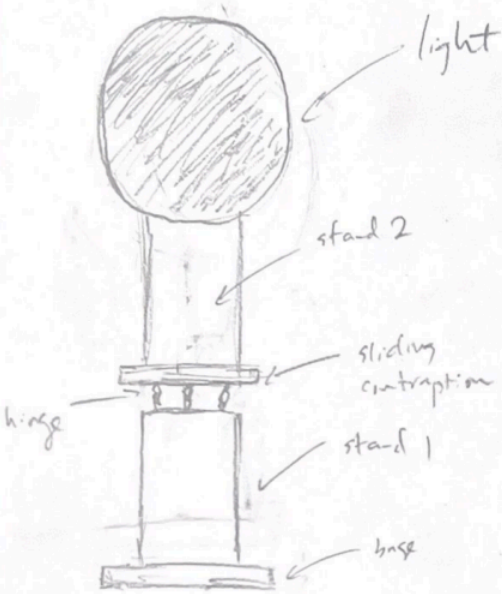
Internal

This a detachable lamp with a alarm clock, speaker, and pre-installed white noise. There is a plug at the point where the lamp and stand meet where it can detach. The hinges allow for free swivelling of lamp. The white noise plus alarm machine is a standard speaker/alarm system and is mostly thought about in the electric components needed for the product. You can also set a timer for white noise or music.

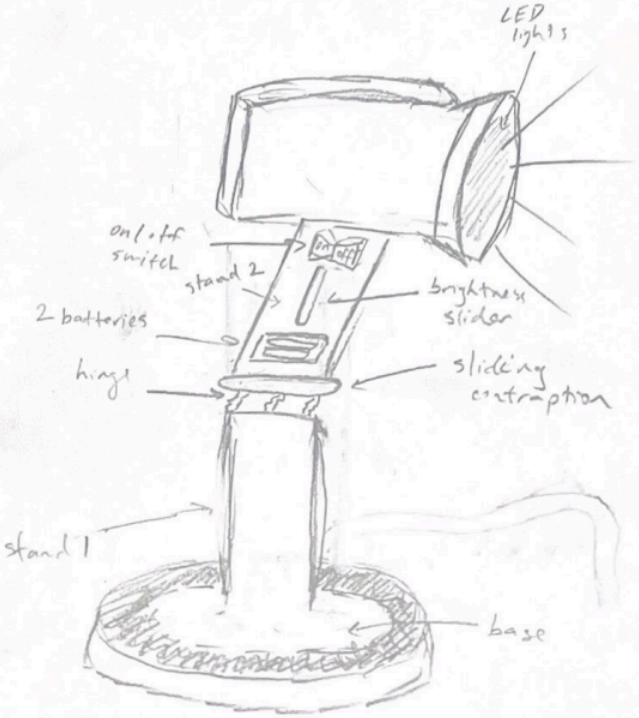
How might we create something that is easily accessible and won't disturb others in the room?

Group 1, ABS,
Neil, Noah, Sanjay, Hansen

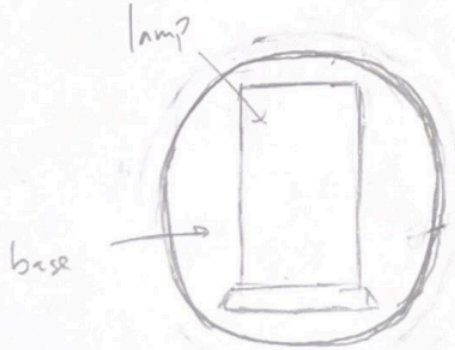
09/25/2024
Neil Mody-Bohmer



Front view

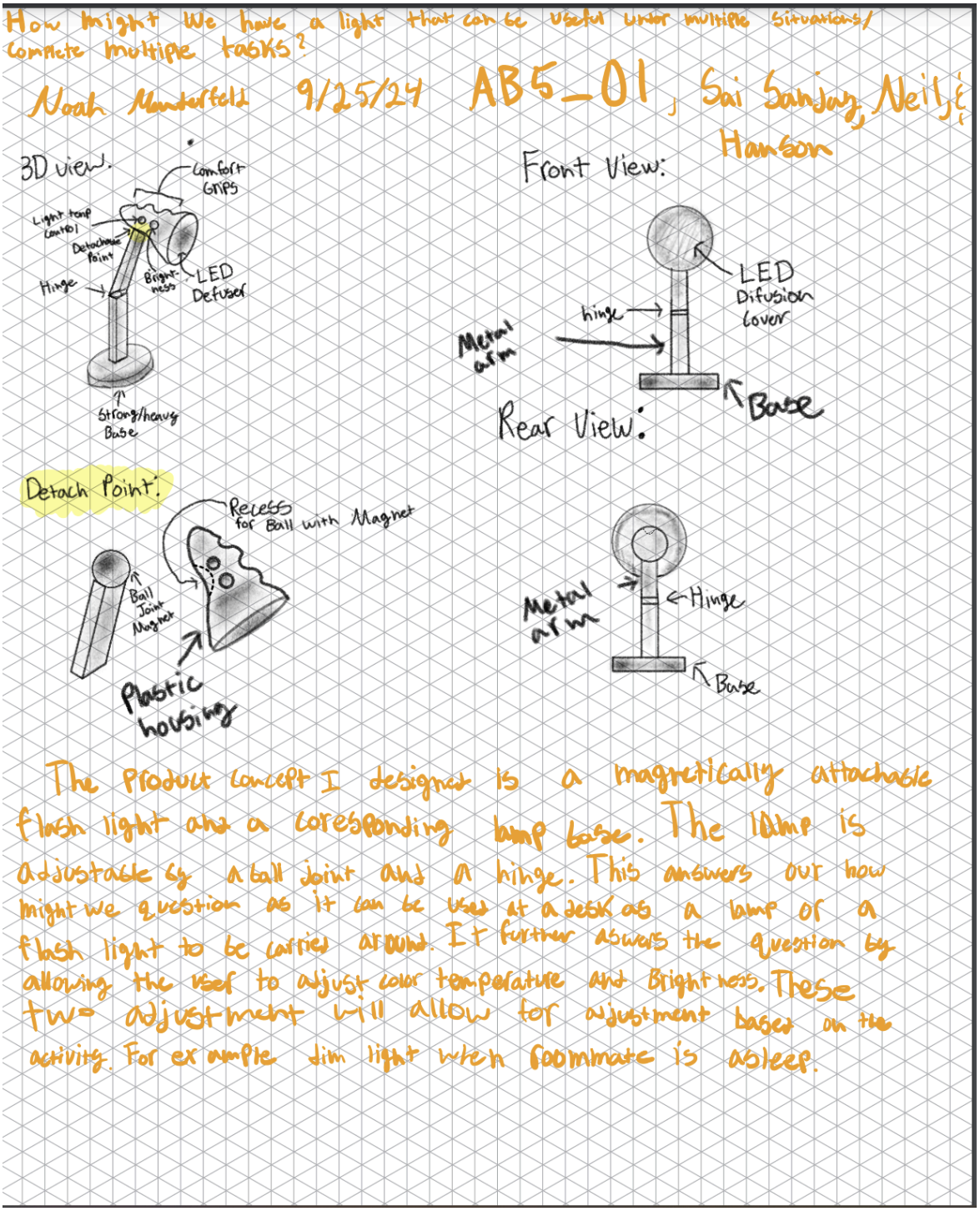


Side view



Top View

The detachable lamp will have a stand that is connected to the base. There will be hinges that allow for the lamp to move based on user preference. In addition, there is a sliding contraption to slide the "stand 2" which is connected to "stand 1". Finally, there is a on/off switch, battery holder, and brightness slider.



Taking all of our designs, we incorporated a bit of each into our final design (top right). We liked Hanson's idea best as it would the most unique and would help us lower manufacturing costs. The magnetic attachment was something we wanted to keep and also the attachment to the wall. From Sanjay's sketch, we improved on the hinge he had in his design and came up with a ball join which would allow for lots of movement. From Neil's sketch, we took the brightness

slider that would allow us to toggle with settings. And lastly, with Noah's sketch, we used the LED cover which is our reflector that pairs with the lens. Overall, using all of our ideas, we came up with SnapShine and our final design which will be talked about more later on in the report.

3. Concept Selection Process (Pugh Matrix)

10 Criteria	*Sketches are on the previous pages, In order of Noah, Neil, Hanson, Sai Sanjay*			
Datum: Noah Drawing				
	Datum(Noah)	Neil	Hanson	Sai Sanjay
Performance (light level and de/attachment)	D	-	-	S
Service Life	A	S	S	-
Cost and investment (including price to sell at)	T	"+"	-	-
Packing(price and feasibility)	U	S	"+"	-
Aesthetic	M	-	"+"	"+"
materials (cost and how well it fits our goal)		S	S	-
Size		"+"	S	S
Weight		-	"+"	"+"
Environment		-	-	S
Maintenance		-	S	-
Totals		"+": 2 | -: 5	"+": 3 | -: 3	"+": 2 | -: 5
	We are moving forward with Hanson's design. Although it scored equally to the datum, simplicity and creativity which can lower costs associated with manufacturing. We like that it is wall mounted allowing for more desk space and noise absorbing.			
	[1]			

After the Pugh Matrix selection process, we decided to go with Hanson's idea. We believed that it was very simple and creative and could have lower manufacturing costs. The concept of having a ball joint and magnetic attachment was really unique and we thought it would allow for SnapShine to be one of a kind. Furthermore, since it would attach to the wall, it would save space on already crowded desks. Overall, after the Pugh Matrix, Hanson's idea was the one to move forward with.

4. Product Design Specification (PDS)

1. Performance
    a. 5 different adjustments to the light (color temperature)
    b. Stand has 360 degrees of rotation
    c. 5 brightness settings
    d. Detachable and attachable in under 2 seconds
    e. Tolerances are within 1 mm
2. Environment
    a. Operational in 0-100 degrees Fahrenheit
    b. Water and dust-resistant construction in case of spills (IP65 rating)
    c. Operation and detachment is under 40dB
3. Service Life
    a. 100,000 hours of operational use (this is the lifespan of modern LED lights)
    b. The rechargeable battery may give out or lose efficiency before then, depending on usage
4. Maintenance
    a. No maintenance is needed on the light itself
    b. It may need to be cleaned 1-2 times a month or the stand greased
    c. Spares are probably not likely to be profitable; However, maybe we could sell replacement charging cords.
5. Target Costs
    a. $40-60 for retail (competitive with other amazon alternatives) link
    b. Likely investments would include tooling for injection molding
    c. Potential metal casting tooling costs for the base
    d. Potential Bar and tube tooling costs for the lamp arm
6. Competition
    a. There are other rechargeable lamps; however, the quality and prices vary a lot
    b. Few competitors combine all the features we aim to incorporate, and even fewer have competitive pricing.
7. Shipping
    a. Product will be manufactured overseas so we will need to ship to a fulfillment warehouse in the US ($1,500-$5,000 per container) price depends on route, fule, and season to list a few
    b. We will likely focus on ecommerce platforms like amazon to ship to customers (a single package would be $10-$20) we likely could get better deals if we are shipping high volumes
8. Product Volume (Quantity)-
    a. Aim to sell 100,000 units annually (based in part on incoming college students annually)
    b. To meet this demand we can use molds with multiple cavities (2-4)
9. Packing
    a. Aim for a $2 box

b. Aim for $2 in protective wrapping
c. Added $0.20 per box in other costs
d. $1 in labor per box
e. Box will be non descript as well will advertise on the internet not in person at a retail store
f. Weather proofing should not be a concern for our shipping methods

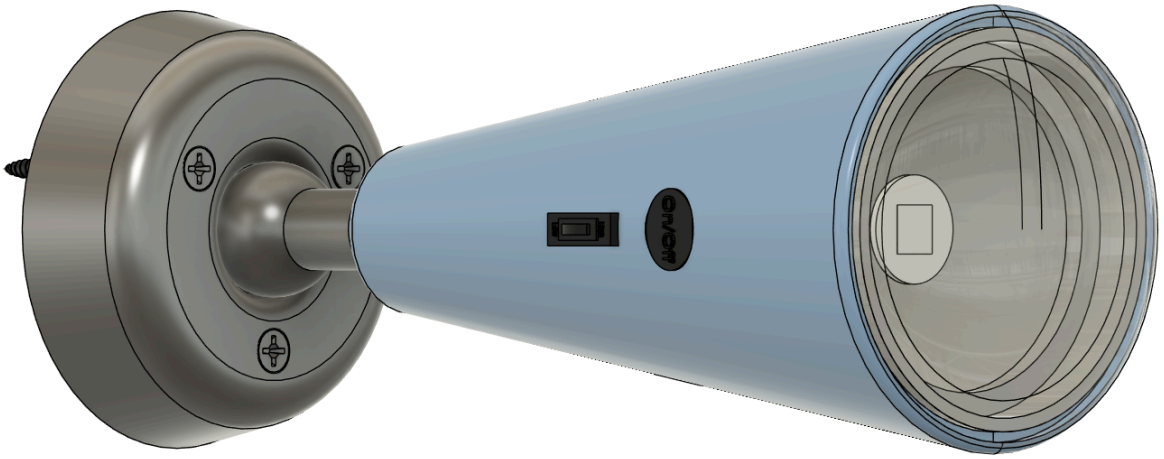
10. Manufacturing Facility
    a. We will utilize a manufacture overseas at an existing facility so we don't have to worry about developing a new facility
    b. We will still have to purchase new molds ($1,000-$5,000)
11. Size
    a. Max size: Base must take up no more than 9pi square inches, height under 18in, portable light must be under 8in in length and 3in in width
    b. Min size: Base must take up more than 4pi square inches, height over 10in, portable light must be over 4in in length and 2in in width
12. Weight
    a. Base must be sturdy so between 4-5lbs
    b. Light must be held up by arm and be comfortable to hold so between 0.75-1.5lbs
    c. These restrictions may also help with shipping costs
13. Aesthetics and Finish
    a. Have a variety of color options including (carbon grey, midnight black, navy blue colorways, glossy finish, option for designs)
    b. Have a modern aesthetic
14. Materials
    a. Aluminum for the arm (light and cheap)
    b. For the Base Steel (heavy and cheap)
    c. Polycarbonate for the outer shell of the light (strong, heat resistant)
15. Product Life Span
    a. Likely could have one version forever, the lamp hasn't had too much change in a while
    b. We could come up with a new version every 3-4 years as design trends change and so does battery tech

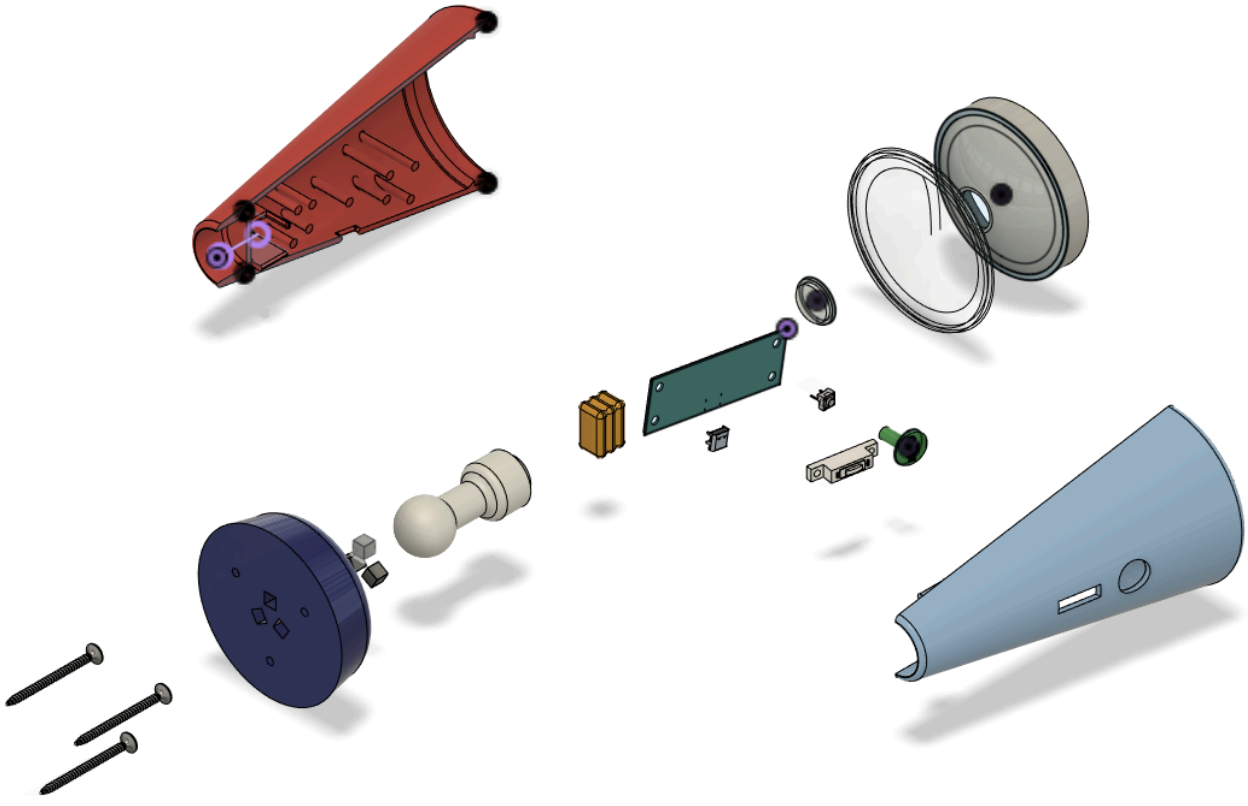
16. Standards, Specifications, and Legal Aspects
    a. Designing to established standards from the outset will streamline the development process
    b. There aren't many standards for lamps; however, there are some depending on the charger and battery system we use.
    c. Will incorporate rigorous testing protocols and quality assurance measures throughout the development process

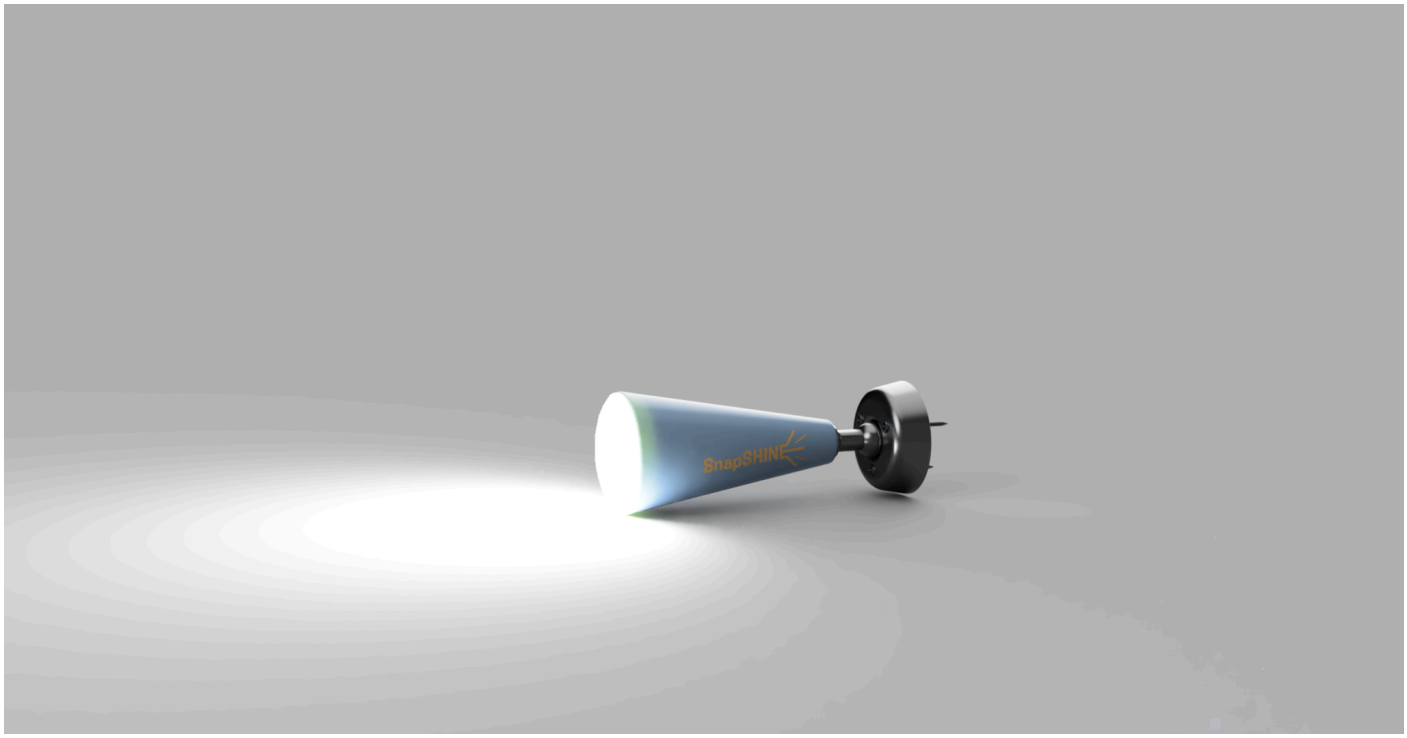
17. Ergonomics
    a. There will be torque involved as the lamp has a mechanism allowing it to adjust to a max height range and a max rotation range of between 0-18in and 0-360 degrees respectively
    b. Will have to balance center of mass to make sure lamp doesn't topple
18. Customer-
    a. college students main demographic as they have limited space and roommates who they dont want to disturb
    b. 2nd demographic is working class adults. Anyone who needs quick access to light fixture without disturbance
    c. Likes: Working at night, control over lighting, changing mood of lighting, portability
    d. Dislikes: having to use more light than necessary, harsh lighting overhead, disturbing roommates
19. Quality and Reliability
    a. Under 200 defects per 1000 units
    b. MTBF at 10 years
    c. MTTR 15min (customers are not likely to attempt a repair)
20. Shelf Life
    a. 10+ years, can stay on shelf for as long as needed Ideally
    b. Technology and design may overshadow the existing tech of the lamp though after 10 years
    c. We will use a non-removable long lasting, rechargeable Lithium battery which may be the limiting factor in shelf life as its efficiency may go down over time
21. Processes
    a. The lamp will be manufactured using injection molding for plastic components, die casting for the metal base, and potentially bar and tube for the arm. Then the parts will be assembled by hand.
22. Timescales
    a. Want to get final design in the next 3 months
    b. Move finish prototyping by the end of the year
    c. Mass production and sell within the next 1.5 years
23. Testing
    a. Will rent out a testing facility to figure out battery life
    b. We will also test the the arm through repetitive manipulation
    c. As they are lamps, don't need fancy testing equipment
24. Safety
    a. Will follow relevant wiring standards, such as the National Electrical Code (NEC) in the U.S. or IEC standards internationally
    b. Electrical caution stickers will be placed
    c. Voltage warnings as well will be used

25. Company Constraints (Pretend)
    a. One constraint we have at our company is that the product must be reliable and long lasting in order to uphold our image as a quality lamp manufacturer
    b. There is a group of 13 people working on the R&D, management, manufacturing and everything is done in shop and shipped out
26. Market Constraints
    a. There are certain other competitors like Amazon, IKEA, GE lighting, but none have the innovative aspect like us
    b. Other companies have begun to adopt USBC as the primary charging cable so we will want to follow this market constraint
    c. There is high demand for such an innovative product
    d. Overseas there is not much reach of such lamps so we will capitalize on this
27. Patents, Literature, and Product Data
    a. FDM and SLS patents that we have currently
    b. Certain arm designs have been patented, for example, one patent we found was for a gooseneck style arm
    c. The detachable clasp has also been patented
28. Political and Social Implications
    a. The product will be introduced into the desk lamp market of all countries, it would be a preferred product in a stable market where people will constantly have needs, and should not go beyond the market to have much political or social impacts other than the use of lamps in homes.
    b. The design of the appearance of the lamp may adapt to local culture as it is introduced into markets of different countries, but overall there should not be much to change since the design does not contain a lot of, if any, features that may be seen as politically or socially offensive.
29. Disposal-
    a. all recyclable materials, green and 100% eco-friendly ie. special cardboard packaging
    b. If given back after the lamp's life, can be used to make more advanced lamps

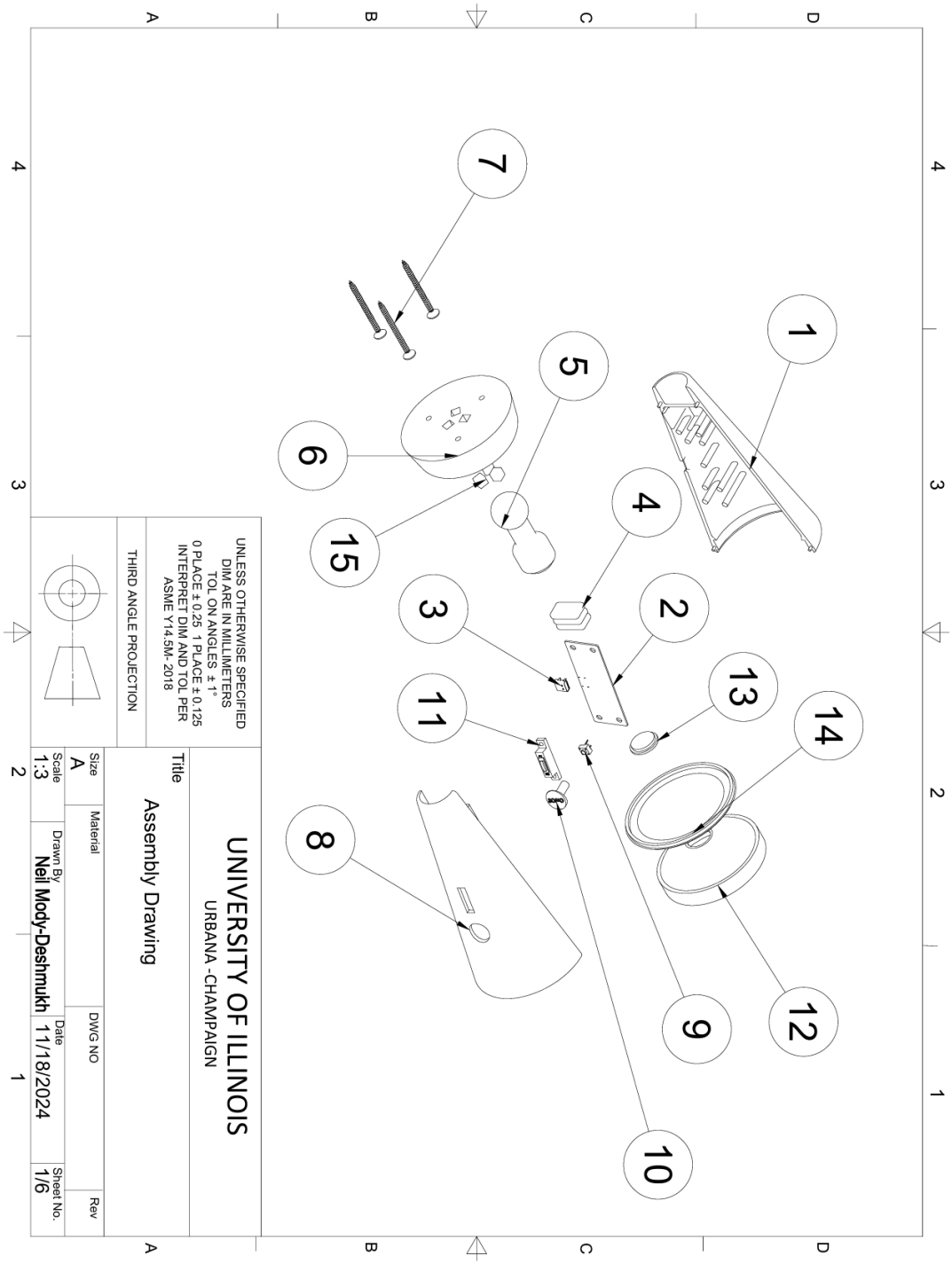
5. CAD Models – Part and Assembly Models






SnapSHINE

6. Exploded Assembly Drawing with Bill of Material (BOM)

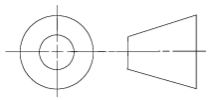


PARTS LIST

ITEM	QTY	PART NAME	DESCRIPTION	MATERIAL
1	1	CIRCUIT SIDE V3	CICUIT SIDE SHELL	ABS PLASTIC
2	1	CIRCUIT BOARD V4	CICUIT BOARD FOR LAMP	FR4
3	1	USB C PORT V2	USB C FOR CHARGING - DIGIKEY USB4125-GF-A-0190	STEEL
4	3	BATTERY V14	ALLOWS LAMP TO WORK	DISCRETE COMPONENT
5	1	BALL JOINT V4	CONNECTS TO BASE AND LAMP	STEEL, MAN-TEN
6	1	BASE V5	MOUNTS TO WALL	STEEL
7	3	SCREWS V3	SCREWS FOR DRYWALL - MCMASTER-CARR 900092A118	STEEL
8	1	SWITCH SIDE V6	SWITCH SIDE SHELL	ABS PLASTIC
9	1	BUTTON SWITCH V4	BUTTON SWITCH FOR POWER - DIGIKEY TL59AF160Q	STEEL
10	1	POWER BUTTON V9	BUTTON TO TURN ON LAMP	ABS PLASTIC
11	1	BRIGHTNESS SLIDER V7	CHANGES BRIGHTNESS OF LIGHT	ABS PLASTIC
12	1	LIGHT REFLECTOR V3	REFLECTS LIGHT FROM LED OUT	ABS PLASTIC
13	1	LED V5	LIGHT SOURCE	
14	1	LIGHT COVER V4	COVER FOR THE LIGHT SOURCE	PLASTIC, TRANSPARENT
15	3	MAGNET V3	NEODYMIUM MAGNET FOR BALL JOINT - MCMASTER-CARR 5848K91	STEEL

UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

THIRD ANGLE PROJECTION



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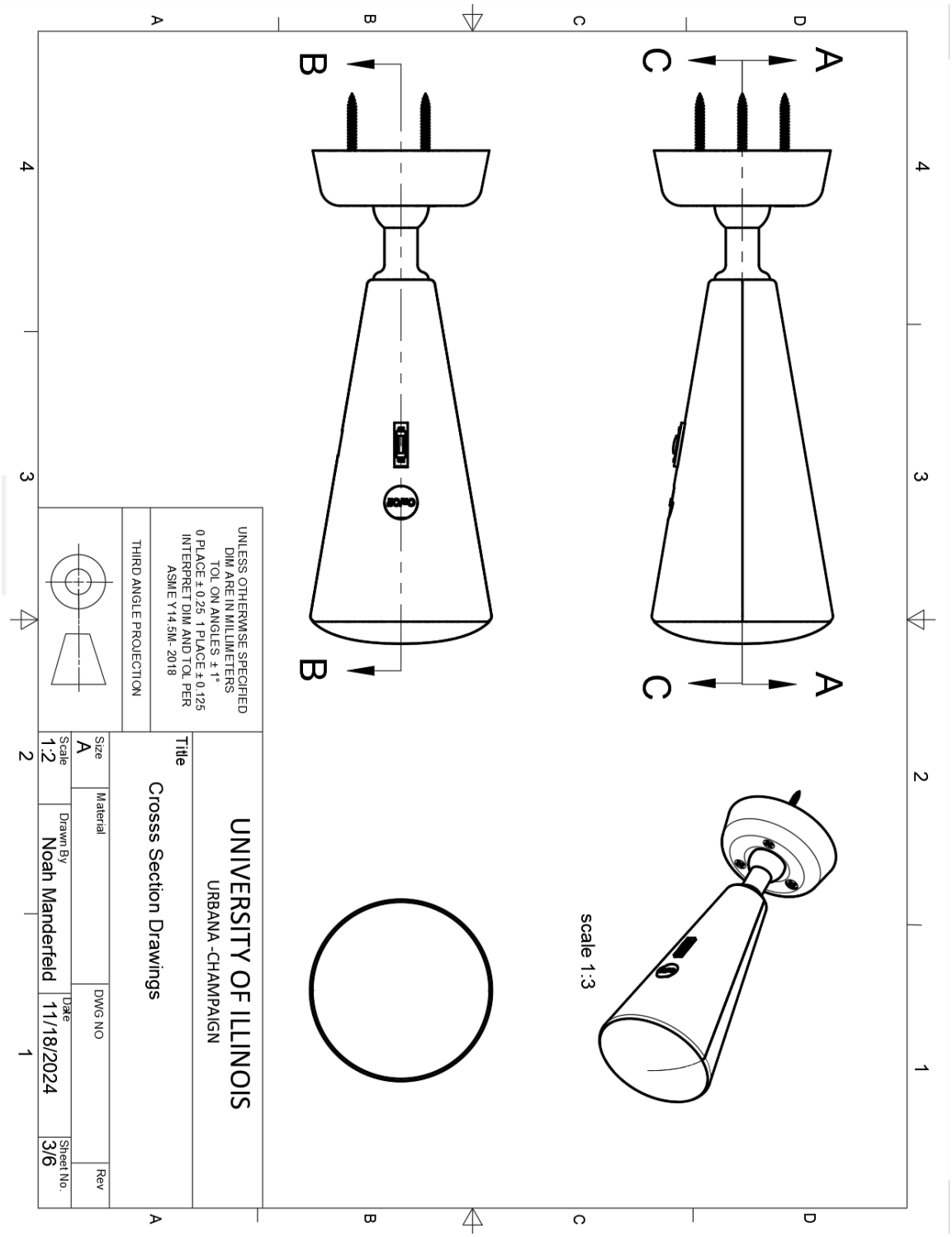
Title: Parts List

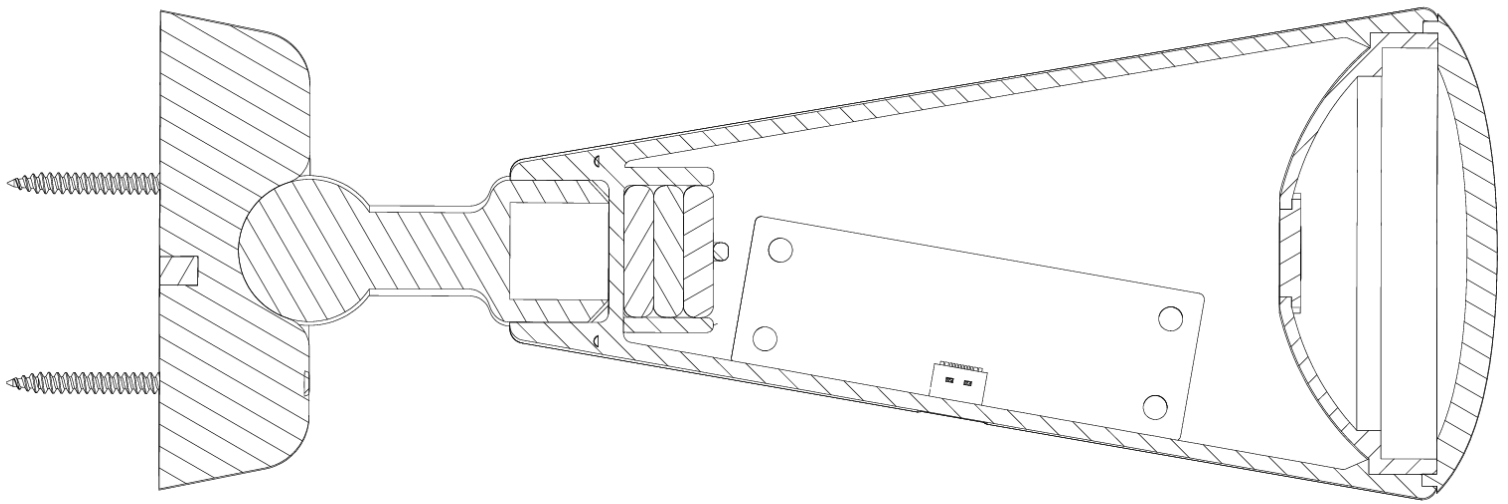
Size	Material	DWG NO	Rev
A			

Scale	Drawn By	Date	Sheet No.
	Neil Mody-Deshmukh	11/18/2024	2/6

7. Assembly Drawing with Cross-Sections

Cutting Planes





SECTION A-A
SCALE 1:1

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0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

THIRD ANGLE PROJECTION

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Title
Crosss Section Drawings

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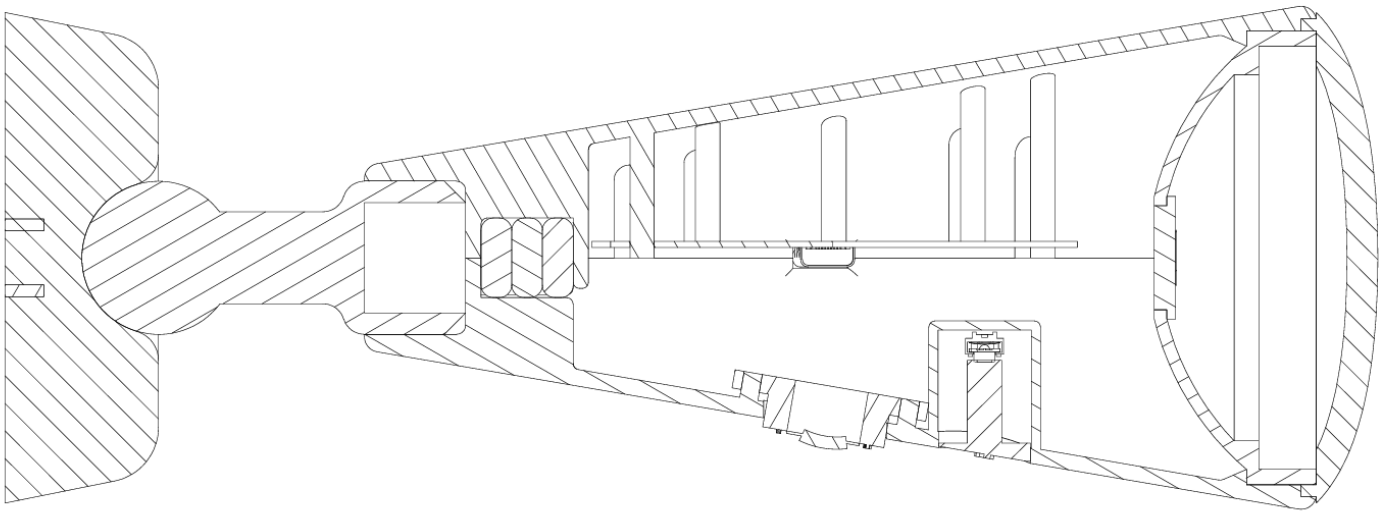
A			

Scale	Drawn By	Date	Sheet No.
1:1	Noah Manderfeld	11/18/2024	4/6



SECTION B-B SCALE 1:1

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0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

THIRD ANGLE PROJECTION

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Title
Crosss Section Drawings

Size	Material	DWG NO	Rev
A			

Scale	Drawn By	Date	Sheet No.
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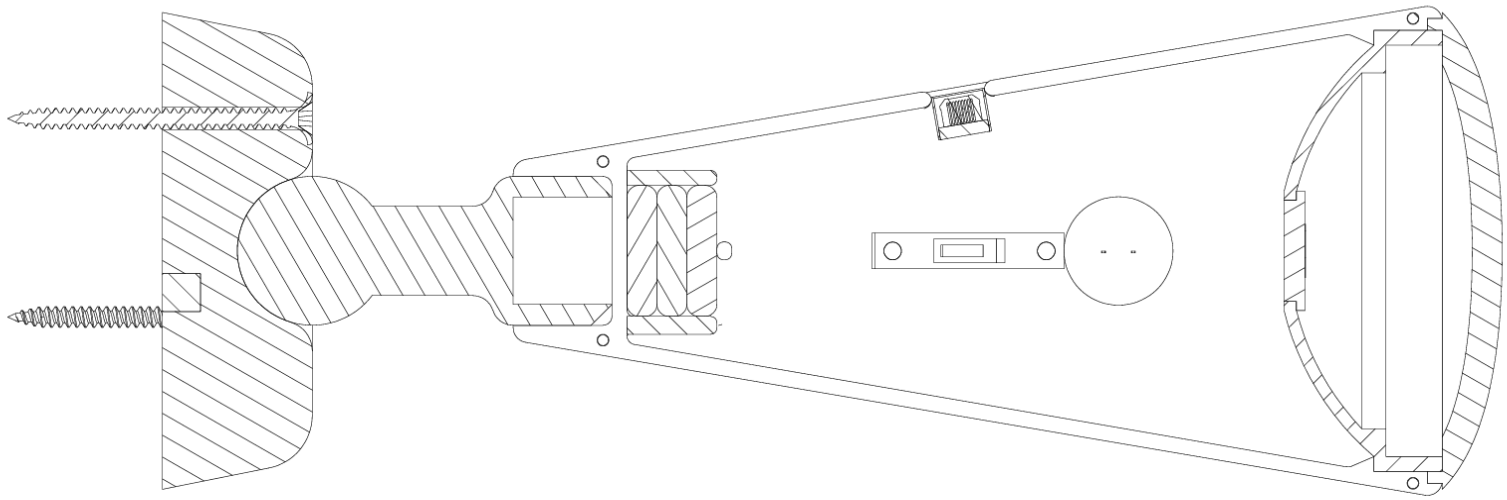

SECTION C-C
SCALE 1:1

UNLESS OTHERWISE SPECIFIED
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0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

THIRD ANGLE PROJECTION

UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN

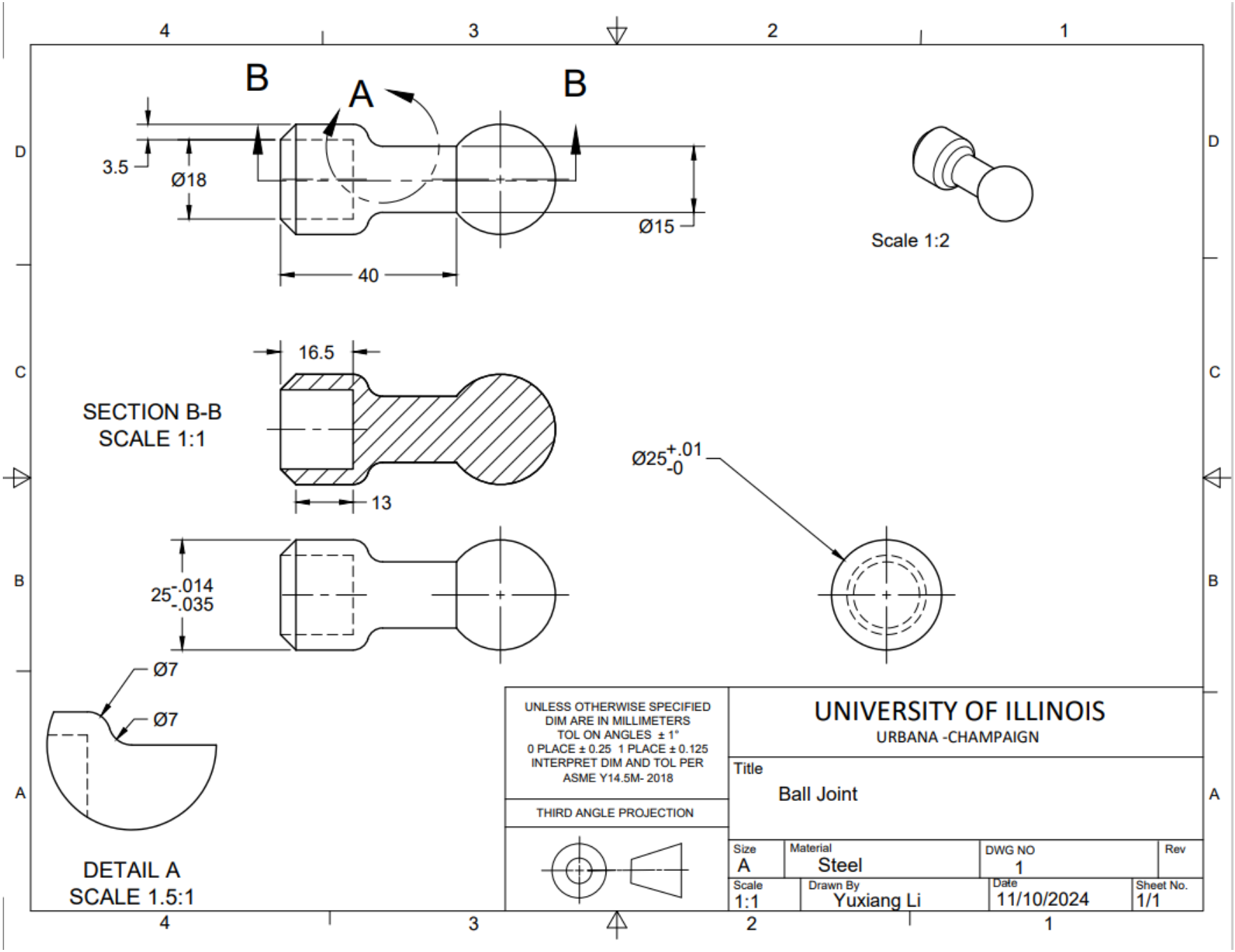
Title: Crosss Section Drawings

Size	Material	DWG NO	Rev
A			

Scale	Drawn By	Date	Sheet No.
1:1	Noah Manderfeld	11/18/2024	6/6

8. Detailed Engineering Part Drawings

Drawing PDFs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A
B
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Ø18
Ø15
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16.5
SECTION B-B
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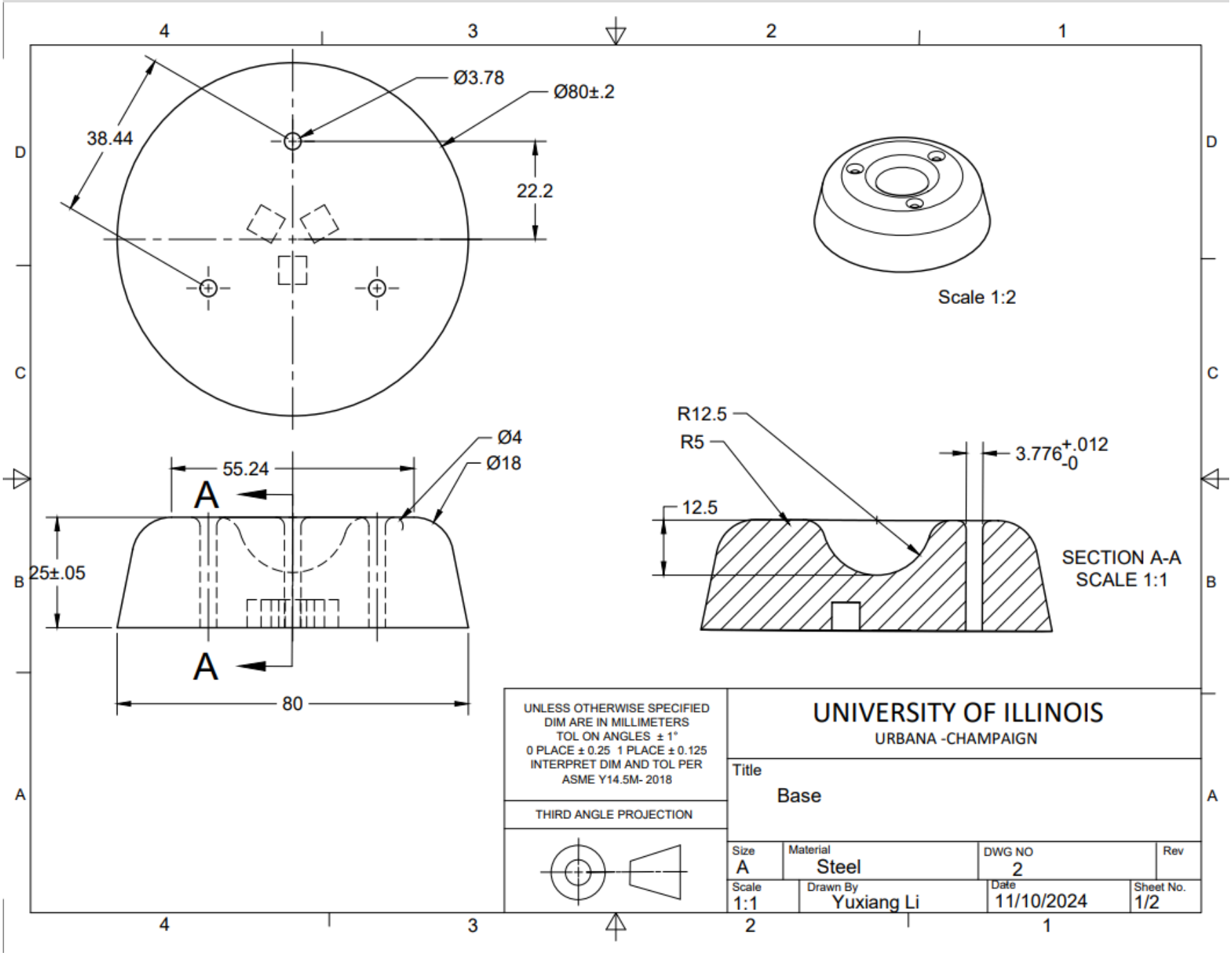
Ø25 +.01 -0
Ø7
Ø7
DETAIL A
SCALE 1.5:1
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Ball Joint
Size
A
Material
Steel
DWG NO
1
Rev
Scale
1:1
Drawn By
Yuxiang Li
Date
11/10/2024
Sheet No.
1/1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22.2
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Ø18
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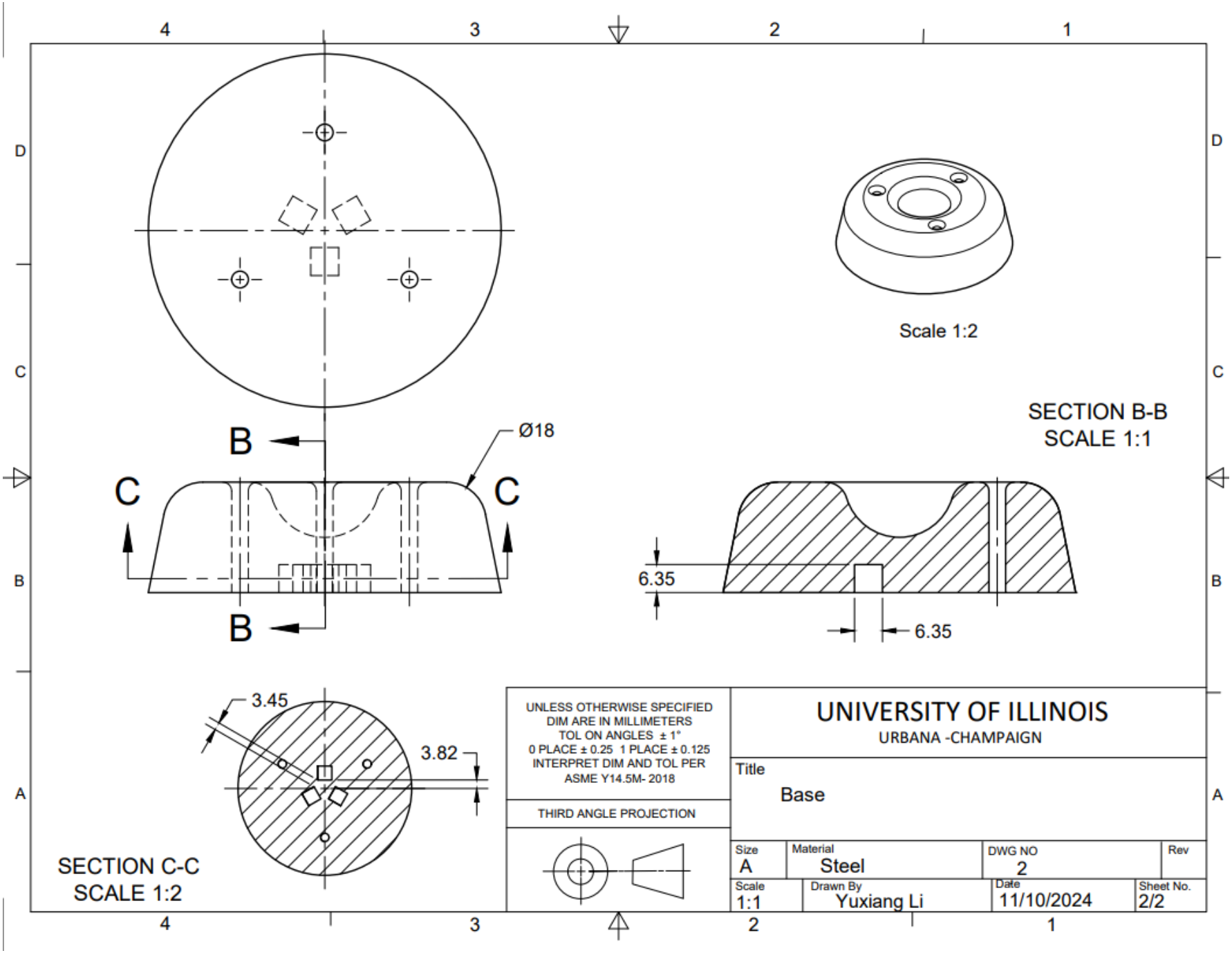
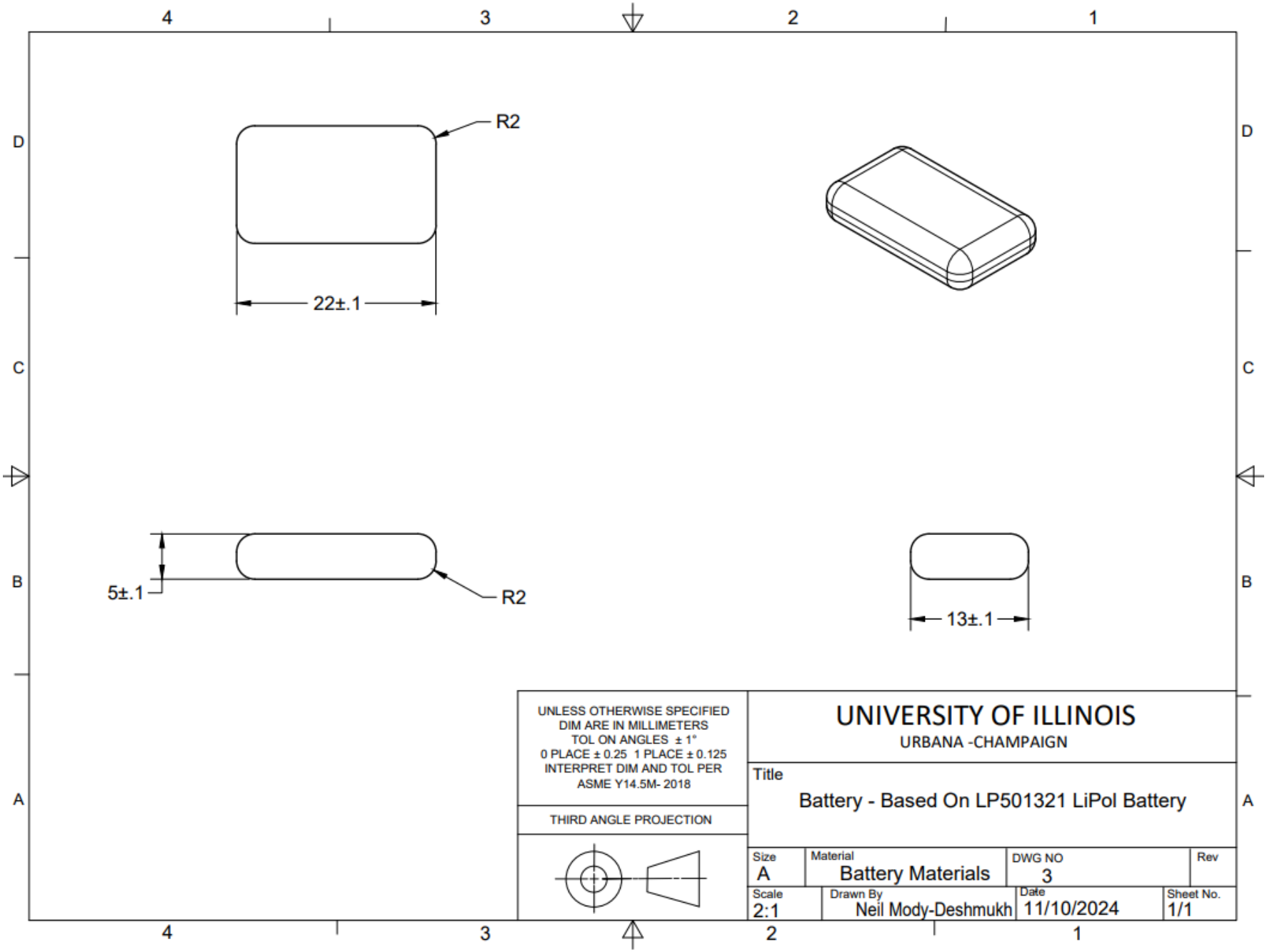
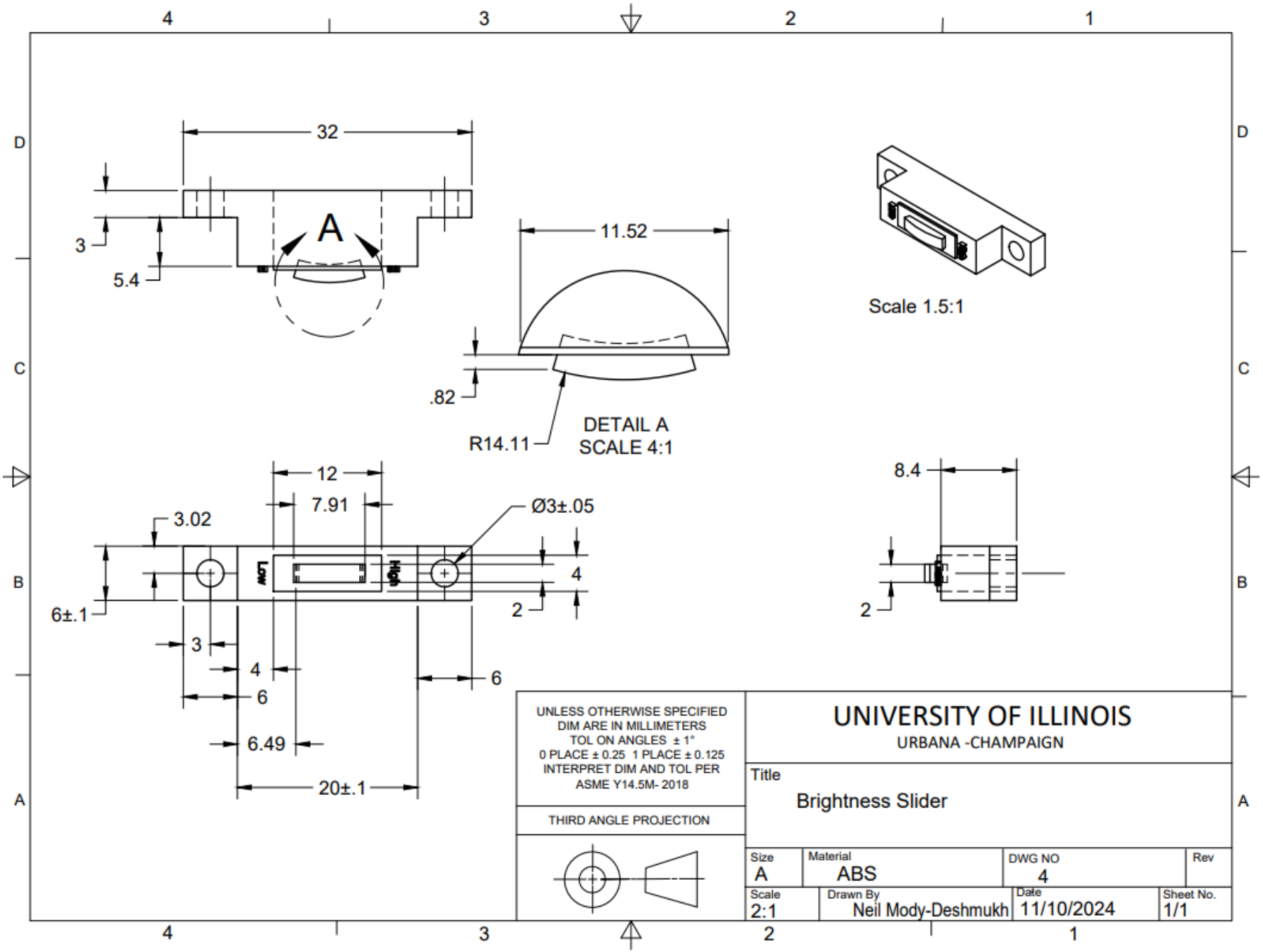
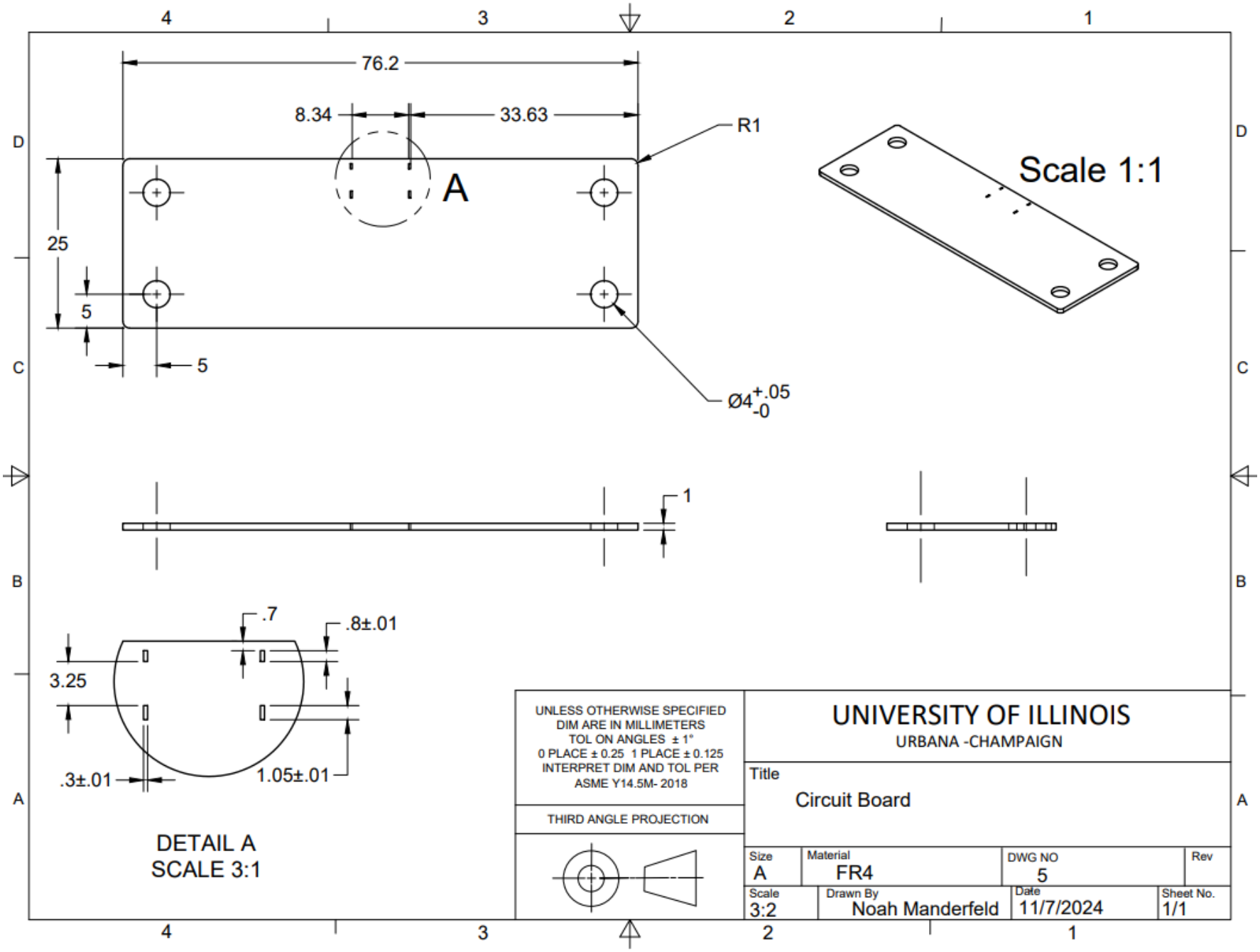
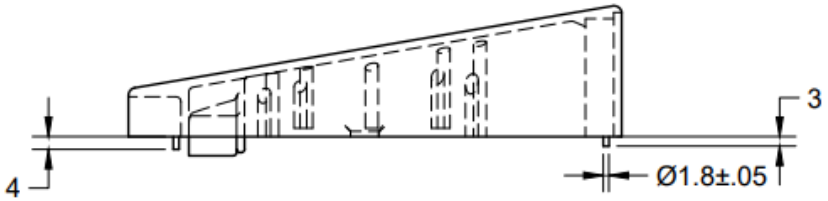
A
25±.05
A
80
R12.5
R5
12.5
3.776 +.012 -0
SECTION A-A
SCALE 1:1
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Base
Size
A
Material
Steel
DWG NO
2
Rev
Scale
1:1
Drawn By
Yuxiang Li
Date
11/10/2024
Sheet No.
1/2

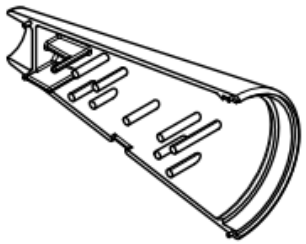

4
3
2
1
D
C
B
A
B
C
C
B
Ø18
Scale 1:2
SECTION B-B
SCALE 1:1
6.35
6.35
3.45
3.82
SECTION C-C
SCALE 1:2
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Base
Size
A
Material
Steel
DWG NO
2
Rev
Scale
1:1
Drawn By
Yuxiang Li
Date
11/10/2024
Sheet No.
2/2


R2
22±.1
5±.1
R2
13±.1
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Battery - Based On LP501321 LiPol Battery
Size
A
Material
Battery Materials
DWG NO
3
Rev
Scale
2:1
Drawn By
Neil Mody-Deshmukh
Date
11/10/2024
Sheet No.
1/1

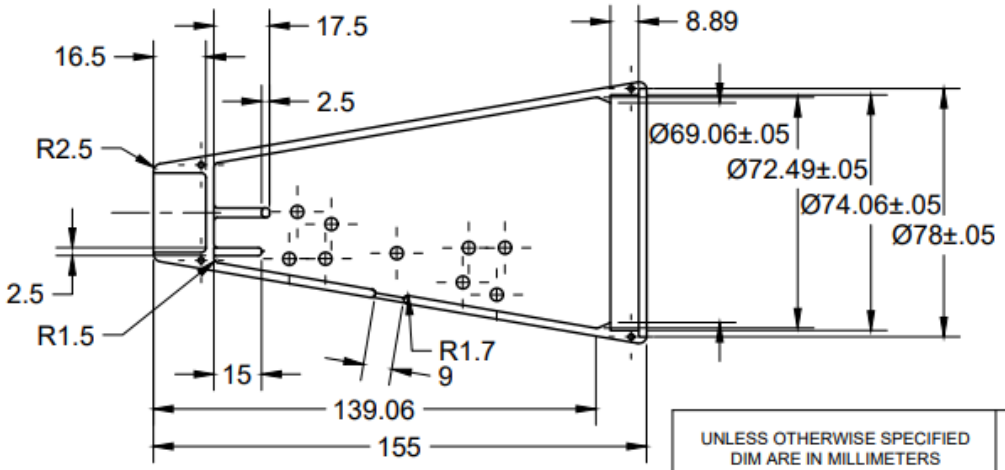

32
3
5.4
A
11.52
.82
R14.11
DETAIL A
SCALE 4:1
Scale 1.5:1
12
7.91
3.02
Ø3±.05
4
2
6±.1
3
4
6
6.49
20±.1
6
8.4
2
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Brightness Slider
Size
A
Material
ABS
DWG NO
4
Rev
Scale
2:1
Drawn By
Neil Mody-Deshmukh
Date
11/10/2024
Sheet No.
1/1

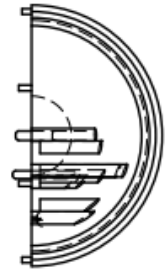

76.2
8.34
33.63
R1
A
25
5
5
Ø4 +.05 -0
Scale 1:1
1
.7
.8±.01
3.25
.3±.01
1.05±.01
DETAIL A
SCALE 3:1
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Circuit Board
Size
A
Material
FR4
DWG NO
5
Rev
Scale
3:2
Drawn By
Noah Manderfeld
Date
11/7/2024
Sheet No.
1/1





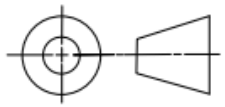
Scale 1:3





UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

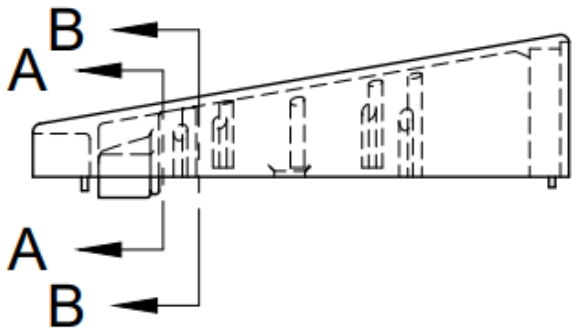
THIRD ANGLE PROJECTION

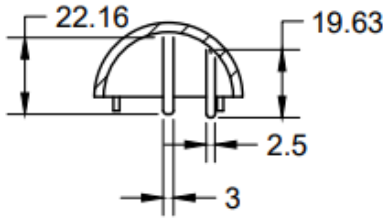


UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN

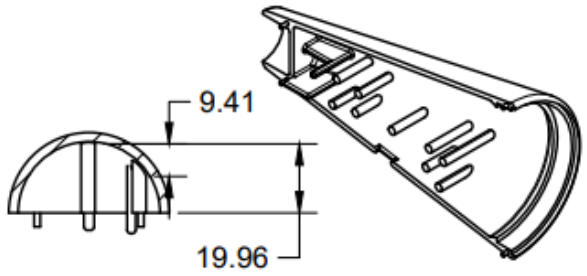
Title
Circuit side Updated for drawing

Size	Material	DWG NO	Rev
A	ABS	6	
Scale	Drawn By	Date	Sheet No.
1:2	Noah Manderfeld	11/17/2024	1/4



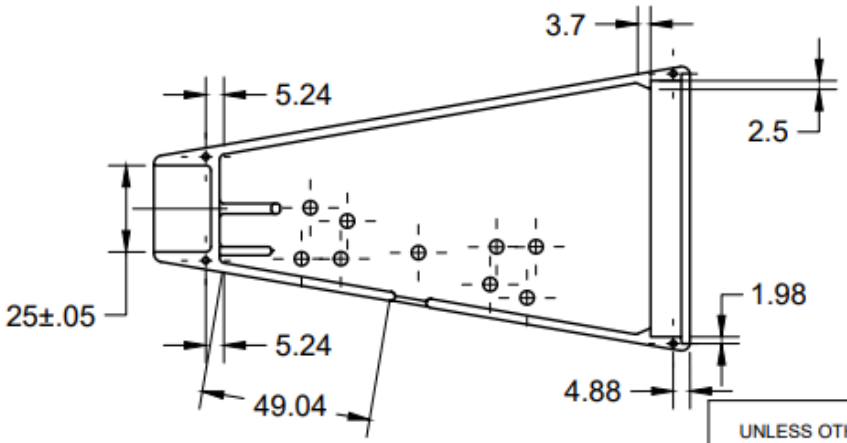


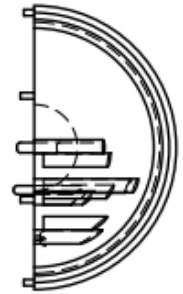
SECTION A-A
SCALE 1:2



SECTION B-B
SCALE 1:2

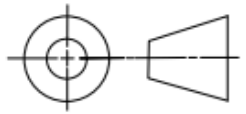
Scale 1:3





UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

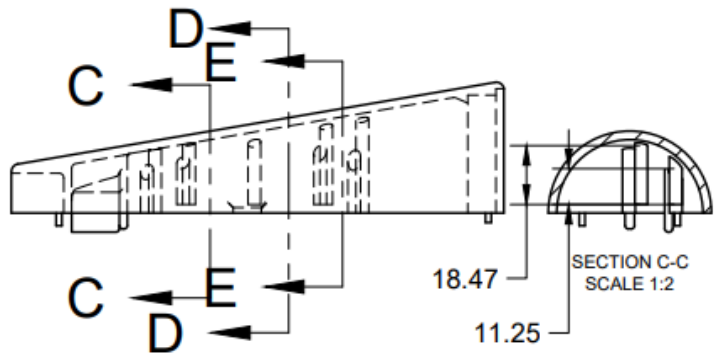
THIRD ANGLE PROJECTION

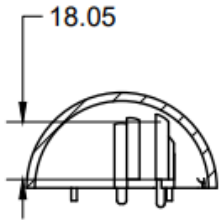


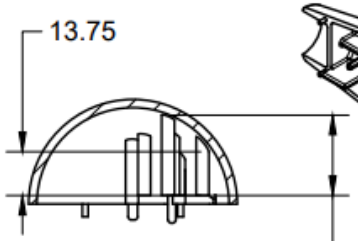
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN

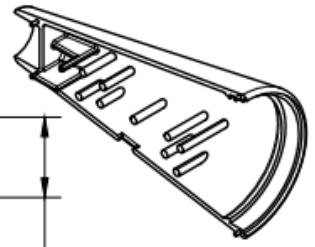
Title
Circuit side Updated for drawing

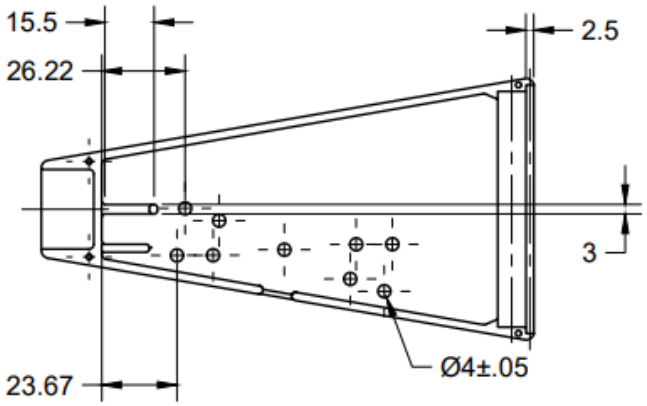
Size	Material	DWG NO	Rev
A	ABS	6	
Scale	Drawn By	Date	Sheet No.
1:2	Neil Mody-Deshmukh	11/17/2024	2/4





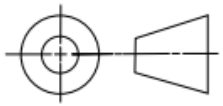






UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

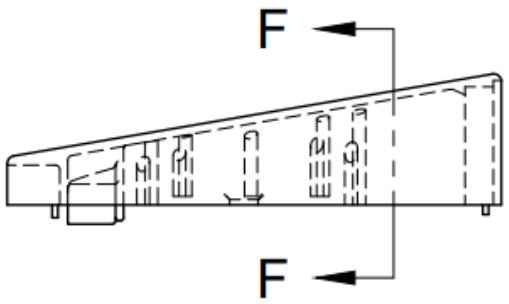
THIRD ANGLE PROJECTION



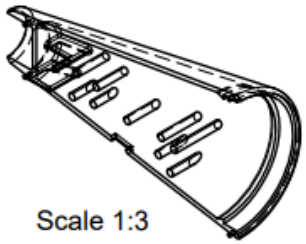
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN

Title
Circuit side Updated for drawing

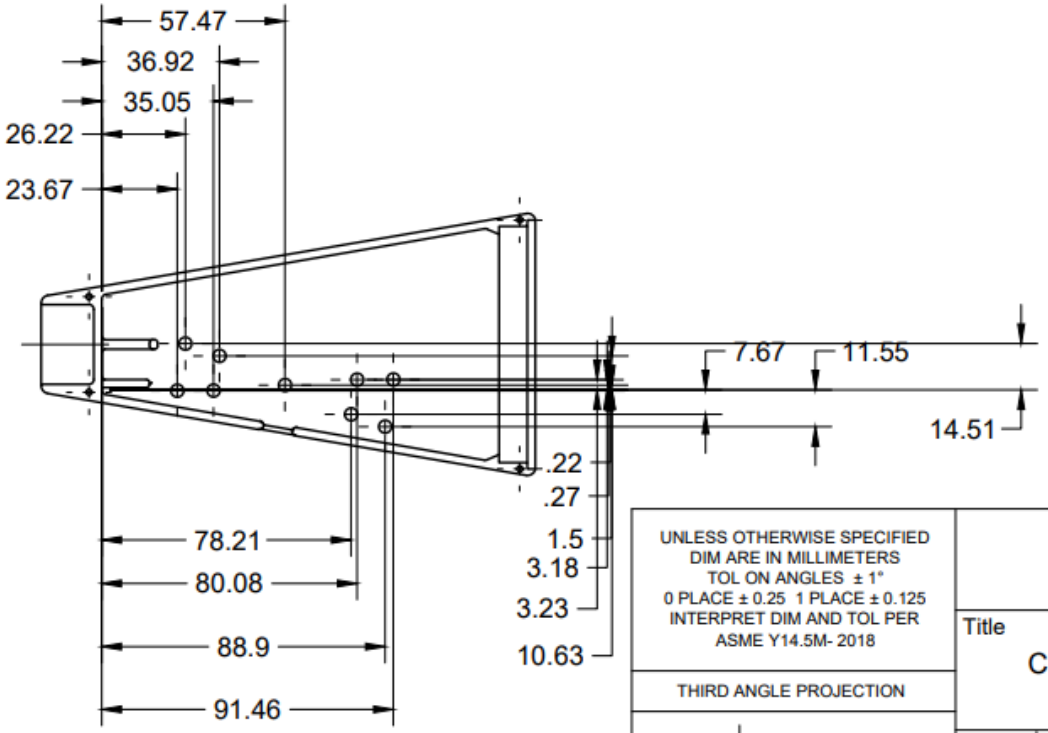
Size	Material	DWG NO	Rev
A	ABS	6	
Scale	Drawn By	Date	Sheet No.
1:2	Neil Mody-Deshmukh	11/17/2024	3/4

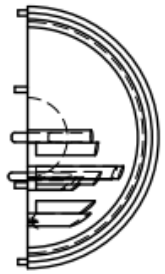


SECTION F-F
SCALE 1:2



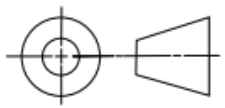
Scale 1:3





UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

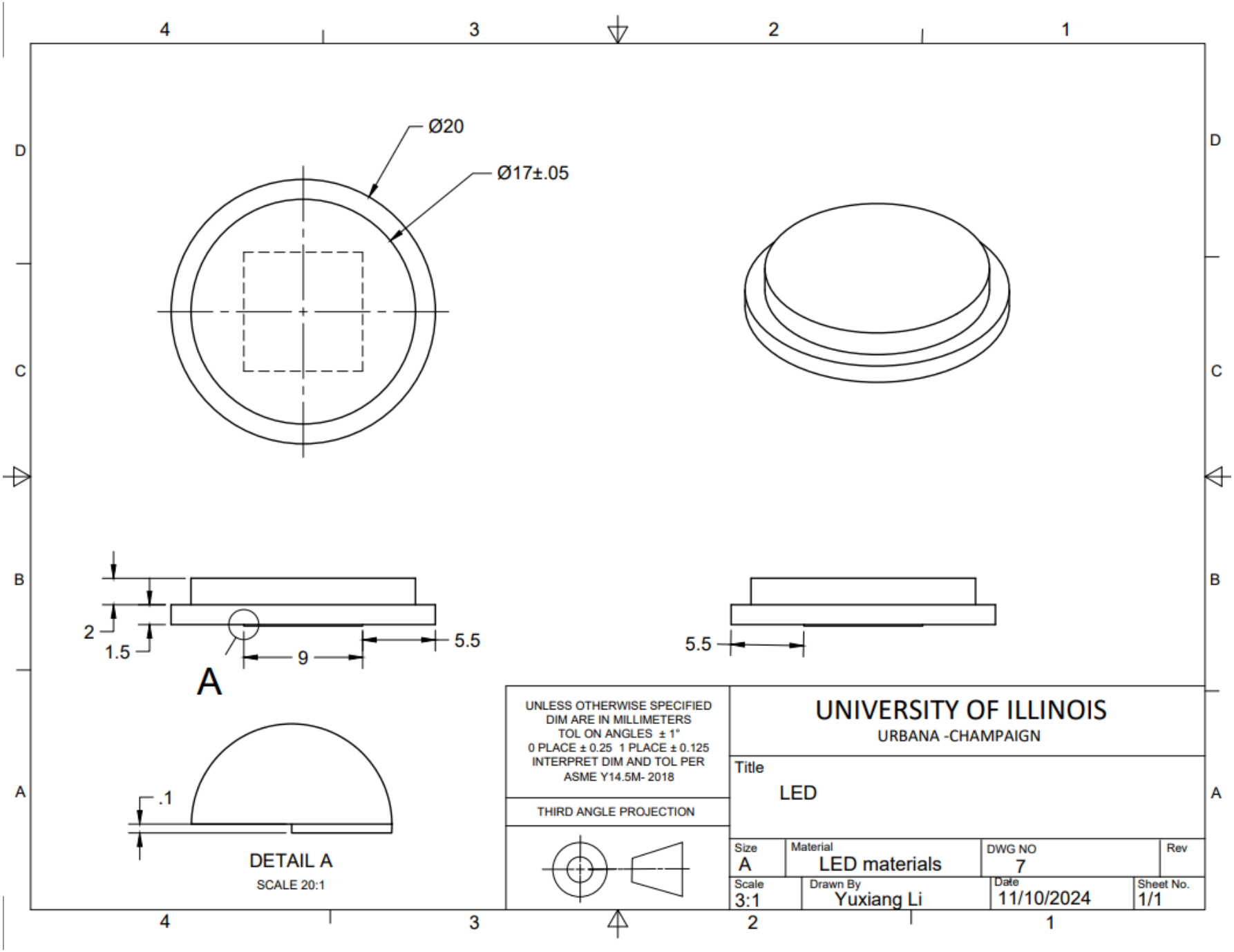
THIRD ANGLE PROJECTION

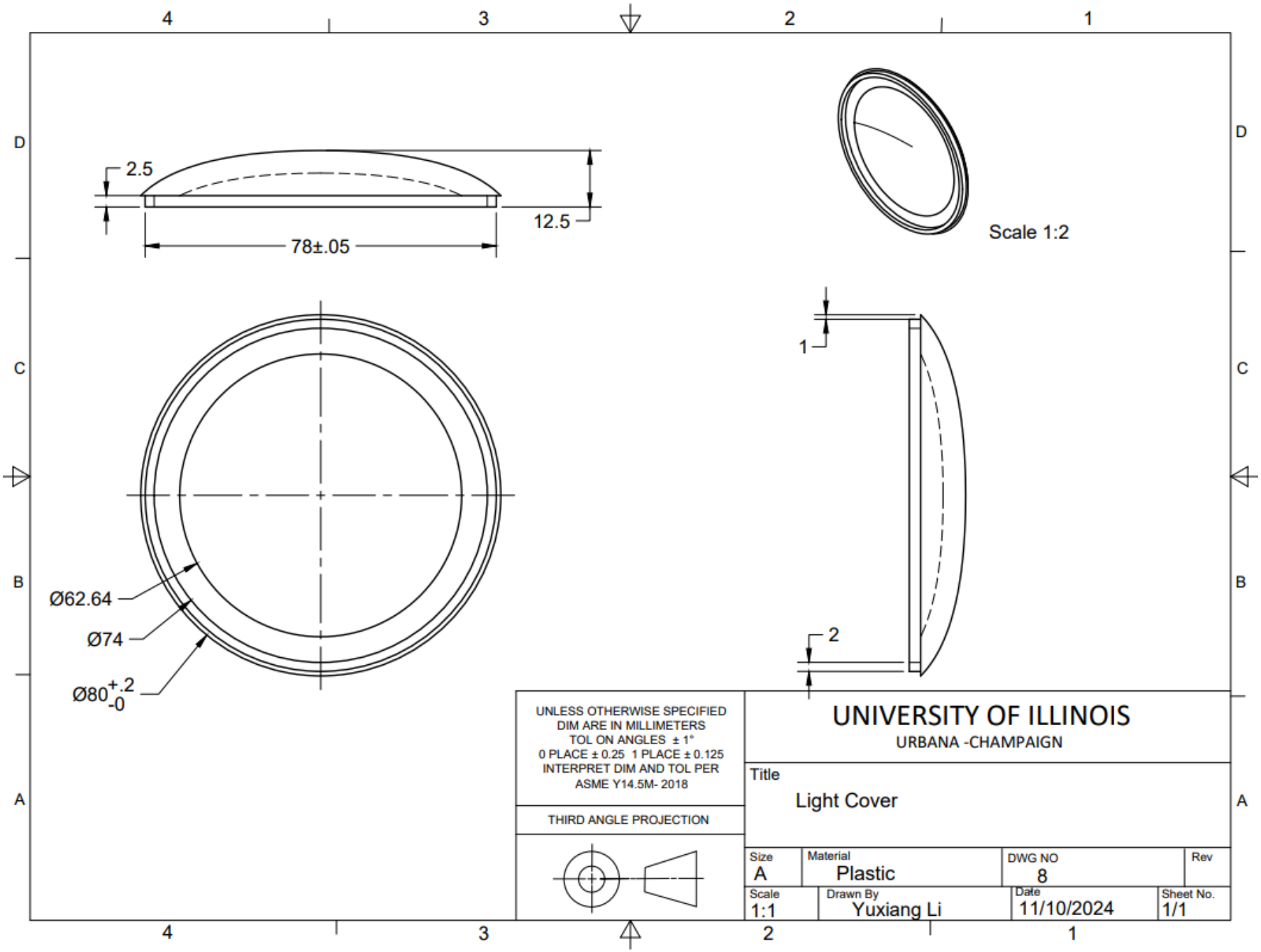


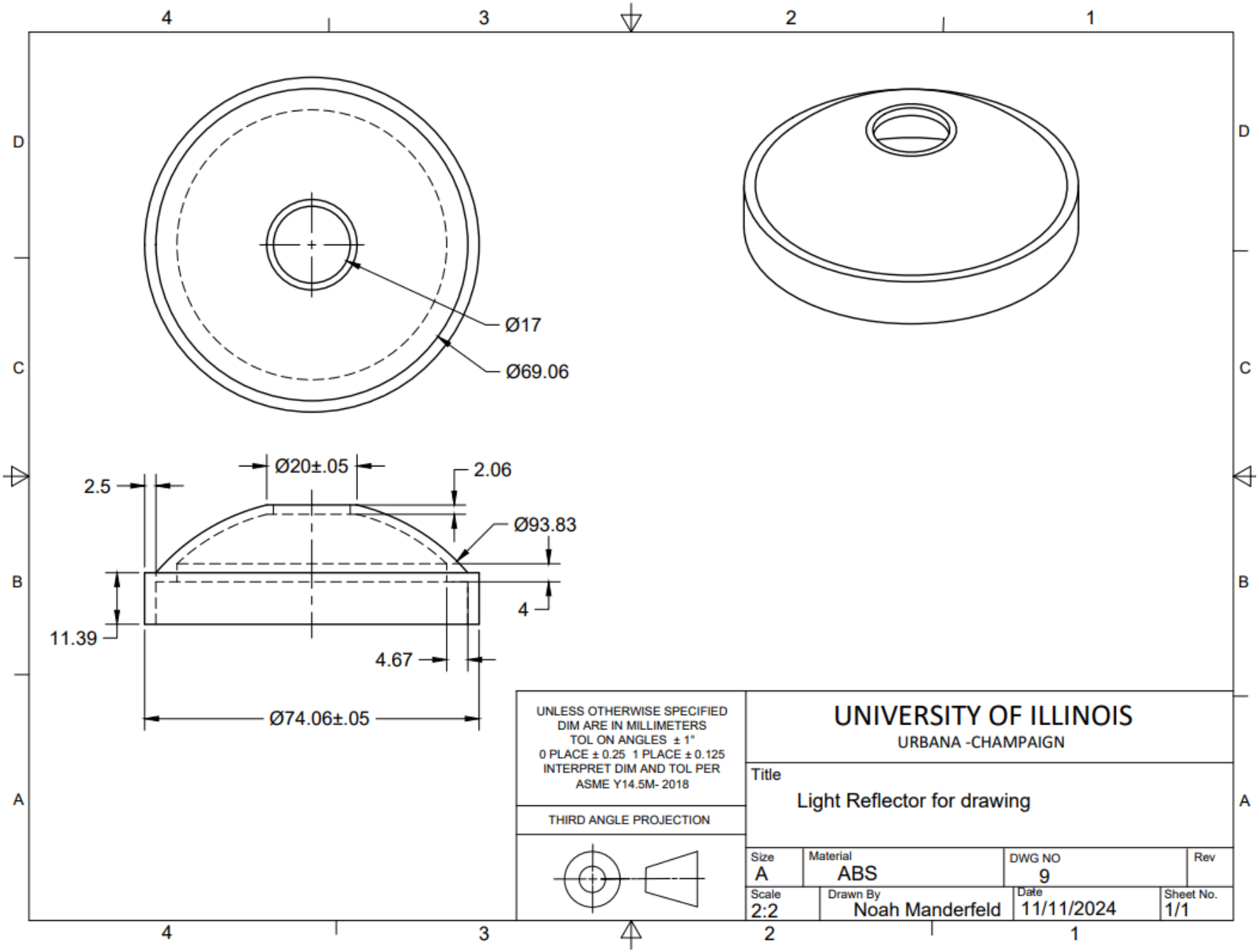
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN

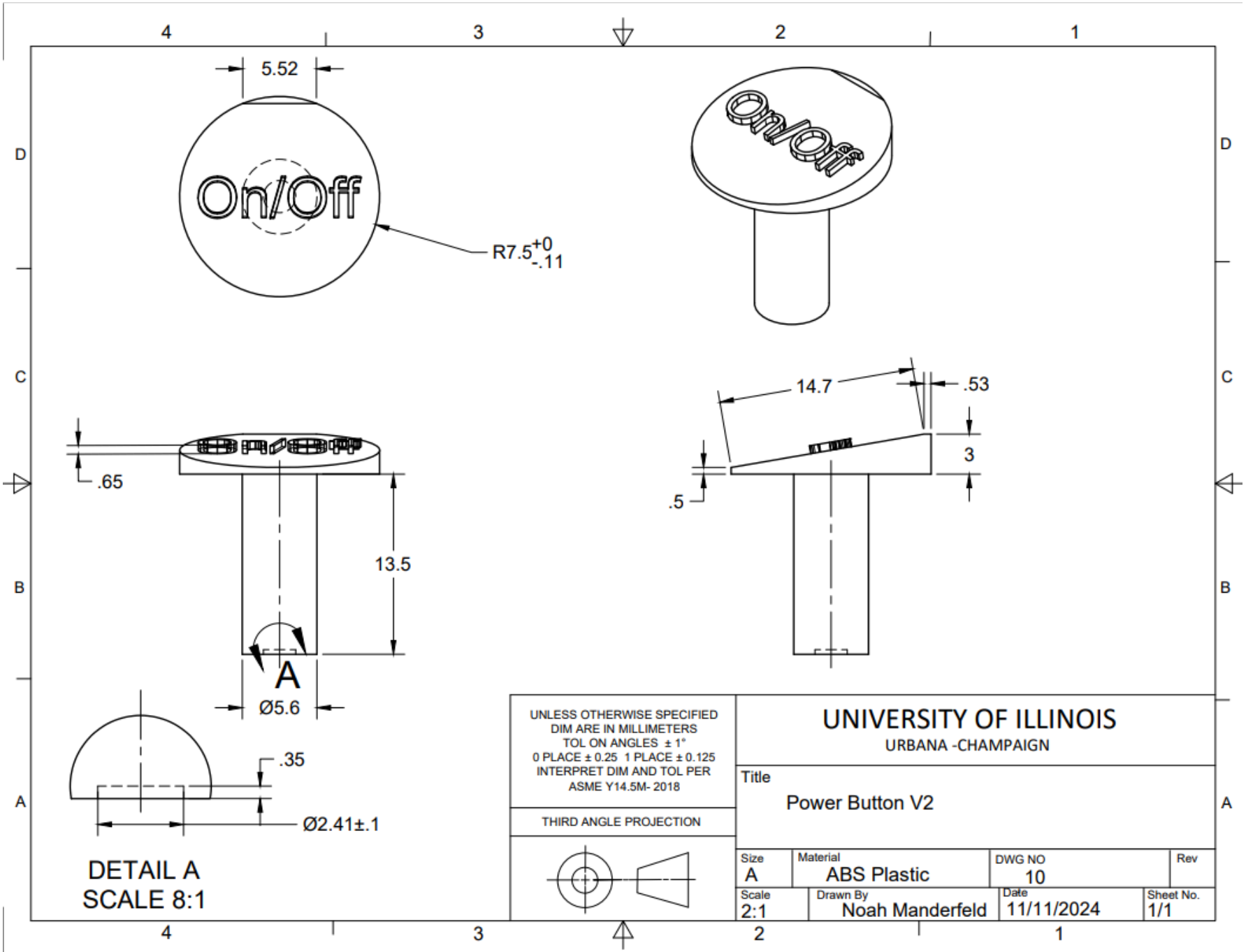
Title
Circuit side Updated for drawing

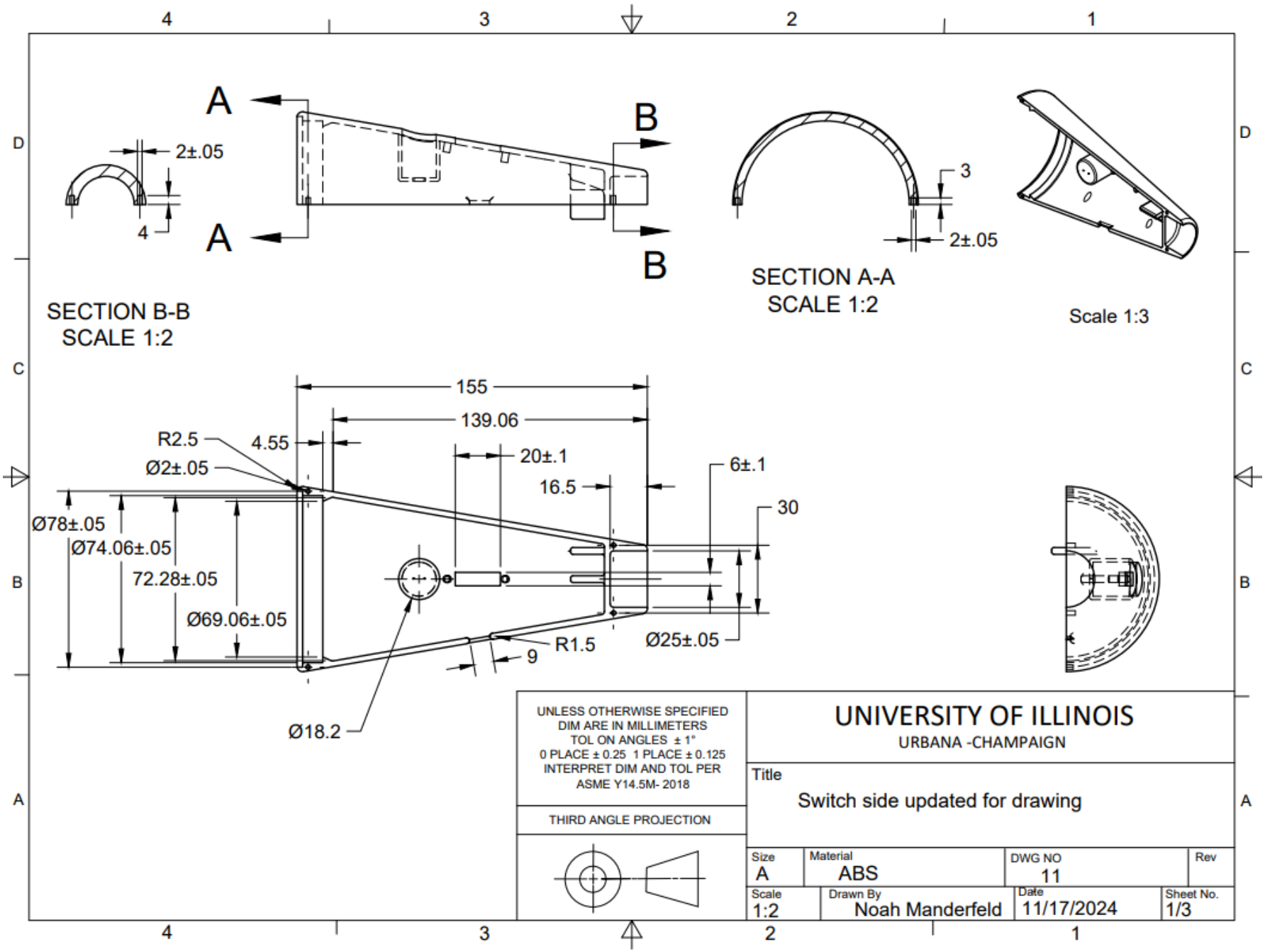
Size	Material	DWG NO	Rev
A	ABS	6	
Scale	Drawn By	Date	Sheet No.
1:2	Neil Mody-Deshmukh	11/17/2024	4/4

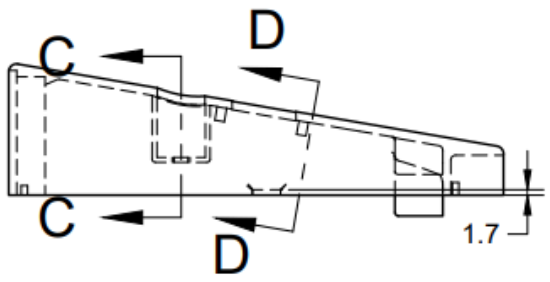

Ø20
Ø17±.05
2
1.5
9
5.5
A
5.5
.1
DETAIL A
SCALE 20:1
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
LED
Size
A
Material
LED materials
DWG NO
7
Rev
Scale
3:1
Drawn By
Yuxiang Li
Date
11/10/2024
Sheet No.
1/1

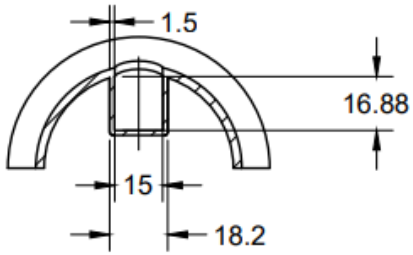

4
3
2
1
D
C
B
A
2.5
12.5
78±.05
Scale 1:2
1
2
Ø62.64
Ø74
Ø80 +.2 -0
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Light Cover
Size
A
Material
Plastic
DWG NO
8
Rev
Scale
1:1
Drawn By
Yuxiang Li
Date
11/10/2024
Sheet No.
1/1


Ø17
Ø69.06
Ø20±.05
2.06
2.5
Ø93.83
4
11.39
4.67
Ø74.06±.05
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Light Reflector for drawing
Size
A
Material
ABS
DWG NO
9
Rev
Scale
2:2
Drawn By
Noah Manderfeld
Date
11/11/2024
Sheet No.
1/1

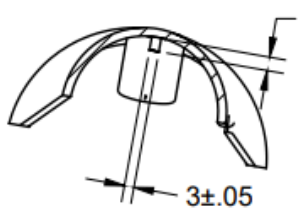

5.52
On/Off
R7.5 +0 -.11
On/Off
14.7
.53
3
.5
.65
13.5
A
Ø5.6
.35
Ø2.41±.1
DETAIL A
SCALE 8:1
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Power Button V2
Size
A
Material
ABS Plastic
DWG NO
10
Rev
Scale
2:1
Drawn By
Noah Manderfeld
Date
11/11/2024
Sheet No.
1/1

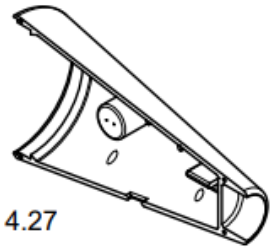

A
B
A
B
2±.05
4
SECTION B-B
SCALE 1:2
3
2±.05
SECTION A-A
SCALE 1:2
Scale 1:3
155
139.06
R2.5
4.55
20±.1
Ø2±.05
16.5
6±.1
30
Ø78±.05
Ø74.06±.05
72.28±.05
Ø69.06±.05
R1.5
9
Ø25±.05
Ø18.2
UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018
THIRD ANGLE PROJECTION
UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN
Title
Switch side updated for drawing
Size
A
Material
ABS
DWG NO
11
Rev
Scale
1:2
Drawn By
Noah Manderfeld
Date
11/17/2024
Sheet No.
1/3





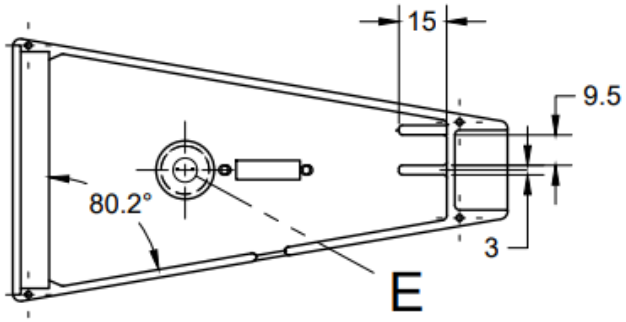
SECTION C-C
SCALE 1:2

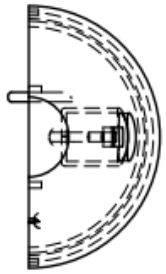


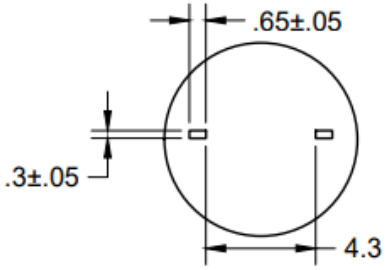


Scale 1:3

SECTION D-D
SCALE 1:2



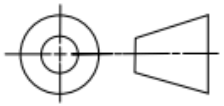




DETAIL E
SCALE 4

UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

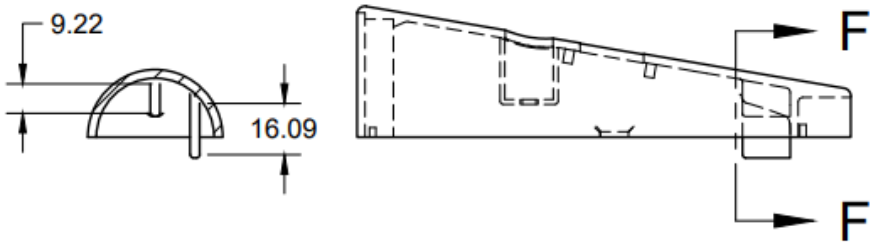
THIRD ANGLE PROJECTION

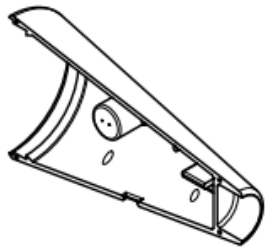


UNIVERSITY OF ILLINOIS
URBANA -CHAMPAIGN

Title
Switch side updated for drawing

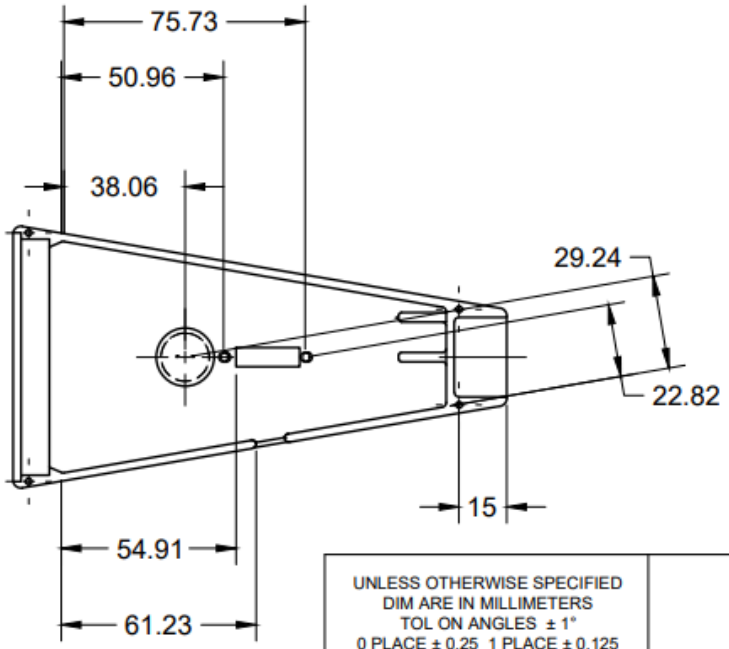
Size	Material	DWG NO	Rev
A	ABS	11	
Scale	Drawn By	Date	Sheet No.
1:2	Noah Manderfeld	11/17/2024	2/3

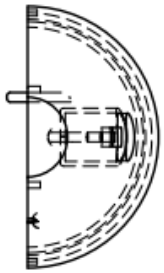




Scale 1:3

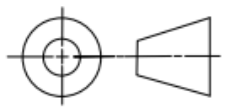
SECTION F-F
SCALE 1:2





UNLESS OTHERWISE SPECIFIED
DIM ARE IN MILLIMETERS
TOL ON ANGLES ± 1°
0 PLACE ± 0.25 1 PLACE ± 0.125
INTERPRET DIM AND TOL PER
ASME Y14.5M- 2018

THIRD ANGLE PROJECTION



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Title
Switch side updated for drawing

Size	Material	DWG NO	Rev
A	ABS	11	
Scale	Drawn By	Date	Sheet No.
1:2	Noah Manderfeld	11/17/2024	3/3

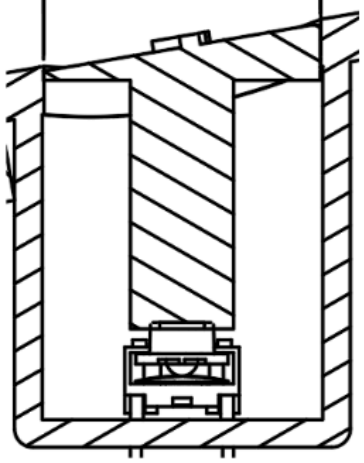
9. Tolerance Analysis

Clearance Fit: close running

15F8

Hole(housing) → $15^{+.043}_{+.016}$

Shaft(button) → $15^{+0}_{-.018}$



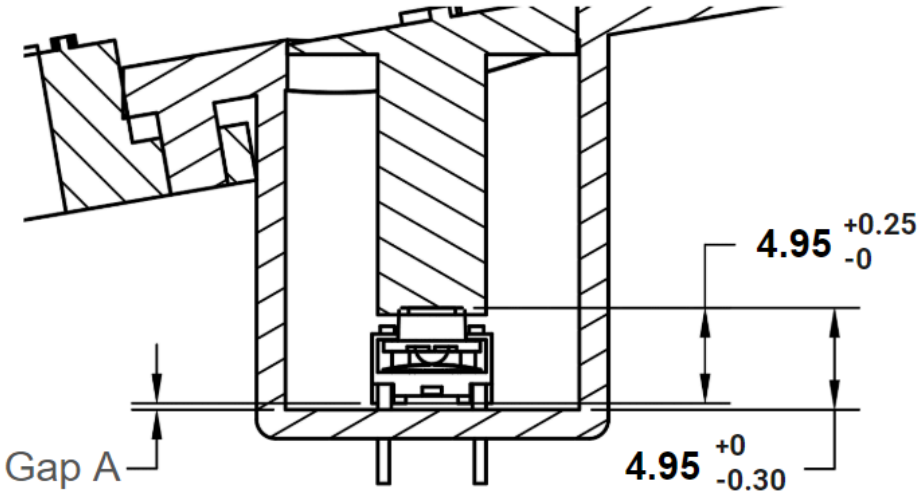
Clearance: 15.043-14.982 = 0.061 mm

Allowance: 15.016-15.000 = 0.016 mm

This is a radial tolerance analysis of our power button and its housing. We wanted a close running fit because we wanted the button to have minimal side to side movement while still being able to be pushed with limited resistance. Using the standards fit chart we found that an F8/h7 tolerance would give us the desired fit. While this leads to a desired fit, we are concerned that the tolerances necessary to achieve it may exceed the possibilities of injection molding.

Clearance Fit

Gap A
Allowance = 0 – 0 = 0
Clearance = 5.2 – 4.65 = 0.55



For our axial fit analysis we chose to take a look at the gap between our button switch and the base of the housing. We will not be manufacturing the button switch so we had to use manufacturer tolerances for it. This left us to decide the tolerances of the distance between the housing and the bottom of the power button. We wanted a clearance fit here as the button can not sit within the walls of the housing. While we cant have any overlap, we also wanted to avoid too much clearance as we didnt want there to be too much stress on the button's leads nor for the power button to sit above the surface of the shell to avoid accidental presses. The axial fit we ended up going with archives both of these.

10. Cost Analysis and Manufacturability

Part #	Description	Material and Manufacturing Method (or order details if an off-the-shelf item)	Part Cost (fully burdened and	Quantity	Total Part Costs	Investment Costs (tooling, fixtures etc)
Part 1	Ball Joint	Steel Cast ASTM A915 SC1020 (Casting)	$2.45	1	$2.45	$46,372
Part 2	Base	Steel Cast ASTM A915 SC1020 (Casting)	$5.25	1	$5.25	$5,335.63
Part 3	Battery	LP501321, 3.7V, 80mA (purchase)	$2.75	3	$8.25	$0
Part 4	Brightness Slider	DigiKey SS-13D16-VG 4 PA (purchase)	$0.17	1	$0.17	$0.00
Part 5	Circuit Board	Advanced PCB (purchase)	$0.53	1	$0.53	$0
Part 6	Circuit Side	ABS (Injection Molding)	$0.33	1	$0.33	$9,731.46
Part 7	LED	Comparable found on DigiKey, 158303230A (purchase)	$0.11	1	$0.11	$0
Part 8	Light Cover	ABS Transparent (Injection Molding)	$0.33	1	$0.33	$7,327.96
Part 9	Light reflector	ABS 10% Glass (Injection Molding)	$0.19	1	$0.19	$7,660
Part 10	Power Button	ABS (Injection Molding)	$0.11	1	$0.11	$7,238.79
Part 11	Switch Side	ABS (Injection Molding)	$0.31	1	$0.31	$9,599
Part 12	Magnet	McMaster-Carr 5848K91 (purchase)	$1.88	3	$5.64	$0.00
Part 13	Screws	McMaster-Carr 900092A118 (purchase)	$0.02	3	$0.05	$0
Part 14	Button Switch	DigiKey TL59AF160Q (purchase)	$0.04	1	$0.04	$0
Part 15	USB C Port	DigiKey USB4125-GF-A-0190 (purchase)	$0.09	1	$0.09	$0
				TOTALS	$23.85	$93,264.10

**All off the shelf parts have an assumed volume discount applied : Estimates made based on China manufacturing*

We have mainly put the parts of our light into three types: plastic components, metal components, and off the shelf parts. For the plastic parts, we chose three different types. We use ABS plastic for the outer cover of the light and the power button because of its toughness and cost effectiveness. Additionally, we use ABS transparent plastic for the light cover. Transparent plastic has advantages over glass in several ways: it is cheaper, easier to produce, and more durable compared to delicate glass. Lastly, we choose ABS 10% Glass as the material for the light reflector in the lamp. We choose ABS 10% Glass because it offers better gloss than pure ABS, a trait that is useful for light reflection. For all of the plastic parts, we choose to use injection molding as the production method because we are expecting a high production volume and want our production method to be economical for consumers.

We will make the base and the ball joint of our lamp out of steel. More specifically, we will make it out of ASTM A915 SC1020, a carbon and low alloy steel. We choose this steel specifically because it is good for casting, is lightweight, and durable. We will be making the ball joint out of steel because it is the connecting part between the main body of the lamp and the base, and since the lamp is going to be heavier and bigger than the base, we need the ball joint to be strong enough to hold the main body and not break. It will have to be able to not just hold the lamp still, but also withstand the torque that will be applied to it when the light is being rotated. Additionally, it must be magnetic in order to attach to our base with embedded magnets. The base too is made out of steel because it needs to be magnetic, strong, and durable. Durability is

especially important while it is being attached to the wall. We will be using casting to make these two parts because it is the most realistic and economical method of manufacture for these parts. This allows us to pass these savings onto the customer in our selling price.

We have several off-the-shelf parts including a circuit board, batteries, magnets, screws, an LED, switches, and A USBc port. We have chosen to buy these parts off the shelf as again it is much more economical to buy these parts rather than to invest the time and money required to develop them.

By repeatedly looking for ways to find the best and most economical manufacturing process we were able to get our cost per lamp to $23.85. This will allow us to sell the lamp at a quite affordable price to consumers and hit our goal price range of $40-$60.

11. Conclusion

In conclusion, SnapSHINE is an attempt to solve the unmet need for people living with others that do not share their schedule. We believe that our product is a mature product that can be put into market and compete with existing lamps. We will be investing a total of $93,264.10 for tooling, and producing the products at $23.85. We will be selling our product at $40-60, which is a relatively reasonable and low price compared to the similar products in the market, which could cost $90 and more. We believe there will be a low risk for us to enter the market since the need for a lamp is always present and our product not only provides more function, but also comes at a more reasonable price.

To take this project to the next step, we might consult some existing lamp companies or flashlight companies to see what are some of their concerns for their product, some things that we should be more careful about and so on. We need more experiences and data and feedback to make our product better, so we also might use 3D printing or other cheap methods to create a couple and run some tests with people and make more adjustments with feedback. We could also need someone with electrical engineering expertise to help improve our product.