

Custom Acoustic Sensor Health Care Light

SonicU NICU

Custom Health Care
Light Fixture with
NICU Acoustic Sensor
Kansas City, Missouri



Custom Acoustic Sensor Health Care Light

Saint Luke's Hospital - NICU

Project: Saint Luke's Neonatal Intensive Care Unit Suites (NICU)

Completed: 2018

Location: Kansas City, Missouri

Specifier: Benson Method

(Consulting Electrical Engineer James Beutler, WL Cassell & Associates, Inc.)

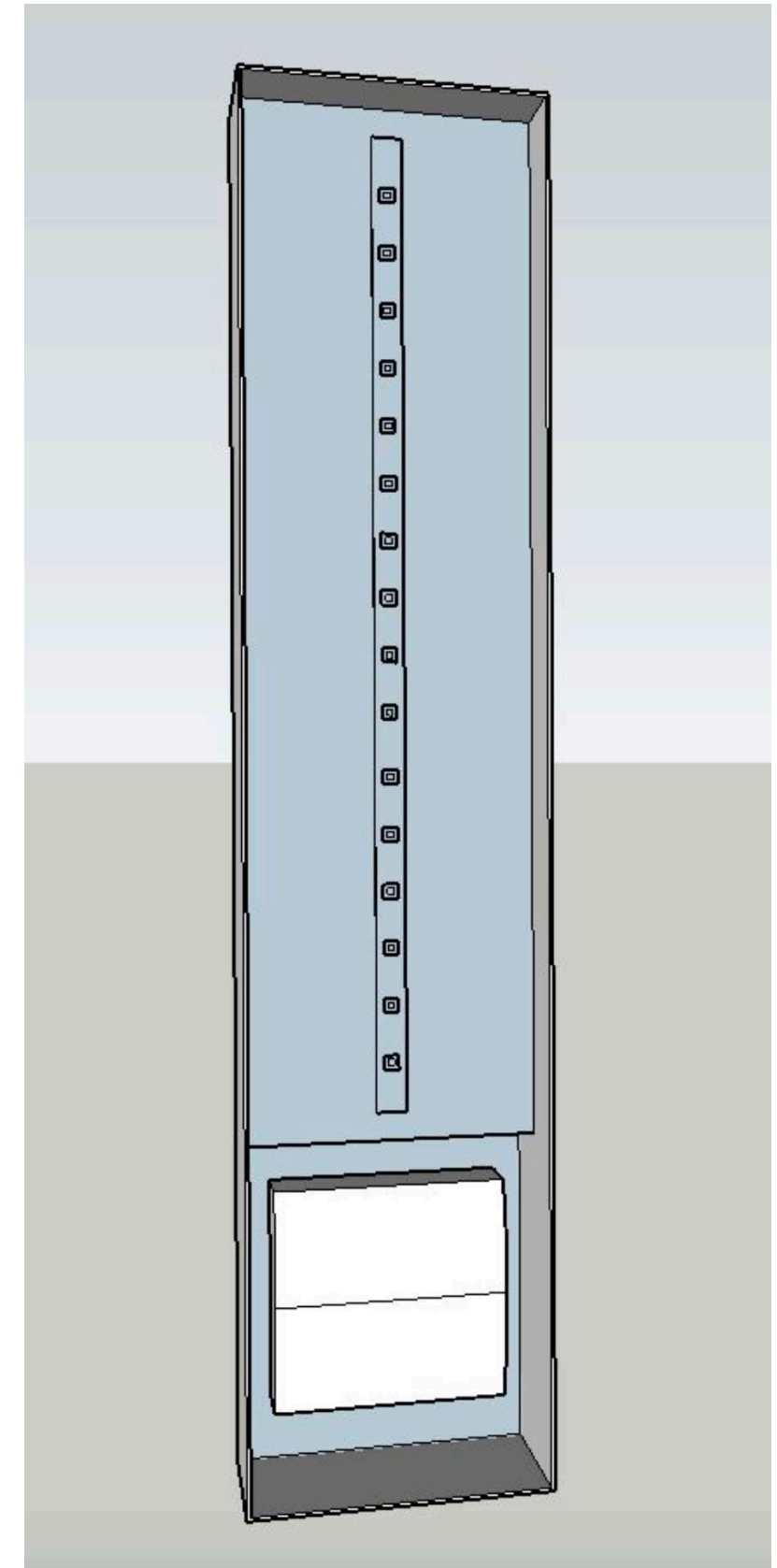
Project Overview

My Role - Project Manager

The original request received from the specifier was for (3) wall mounted lights for each of the (23) renovated NICU patient rooms with the caveat being...“we would like to have the LED light programmed for acoustics so that when people are talking loudly the light will turn to red and when speech is at a normal level the LED light is back to the normal color temperature”. Luckily, the hospital was able to outsource an electrical engineer who I worked closely with to understand all of the device needs and how to create a solution that would allow the product to function properly.

I acted as a conduit between the specifier, contracted electrical engineer, Sonic-U manufacturer, 3-form legal, installer, and the LightArt internal teams - design developer, CAD teammate, and fabricators. Through my diligence in research, sampling, verifying compatibility, and building a prototype, this micro-controller adapted lighting solution was a success.

Whereas other Project Managers would have turned down the initial request, stating it was simply a product we could not do. Not being one to shy away from a challenge, I addressed the risk upfront with all parties in agreement we moved forward towards a solution, provided that the samples and prototypes created benchmarks for small design tweaks and a final solution that was a one-of-a-kind meaningful light fixture and functional tool.



Custom Acoustic Sensor Health Care Light

Below: The initial budgetary quote

BUDGETARY QUOTE

NICU

PID # 286600

FOUR SCENCE + CUSTOM FOUR SCENCE WITH SONICU

23 NICU rooms - each room will have (1) standard Four Sconce with (2) custom Four Sconces with SonicU implemented within the design. A custom layup on the face material of the sconce will allow the SonicU to be visible through the material.

Unit Price: \$46,500

Quantity: (69) total; (3) per room - (1) standard (2) custom

Dimensions: 5"W x 4"D x 24"L

Lead-time: 10 weeks

Design Fee: 20% of full project cost deposit for a full scale mock-up.

Custom Material Fee: \$750 (one time fee)

MATERIALS

Material: Custom Pure White varia eco resin - more diffusion to see SonicU

Gauge: 1/16"

Front and Back Finish: TBD

Diffuser Material: White Opal

Diffuser Gauge: 1/4"

LIGHTING

- Solid State LED System

- 120v-277v input; 0-10v dimming compatible

- 3000k, 3500k or 4000k options (81 CRI light source)

HARDWARE

- Stainless steel backplate mounts to standard junction box in wall (provided by others) two separate exit holes in the backplate for separate connection to power sources.

- SonicU (provided by others) installed in custom sconces.

CRATING & SHIPPING

Crate Price: \$1,890

Shipping: \$2,835

Project Total: \$ 51,975

Use of an incandescent bulb will negate the warranty and damage our product

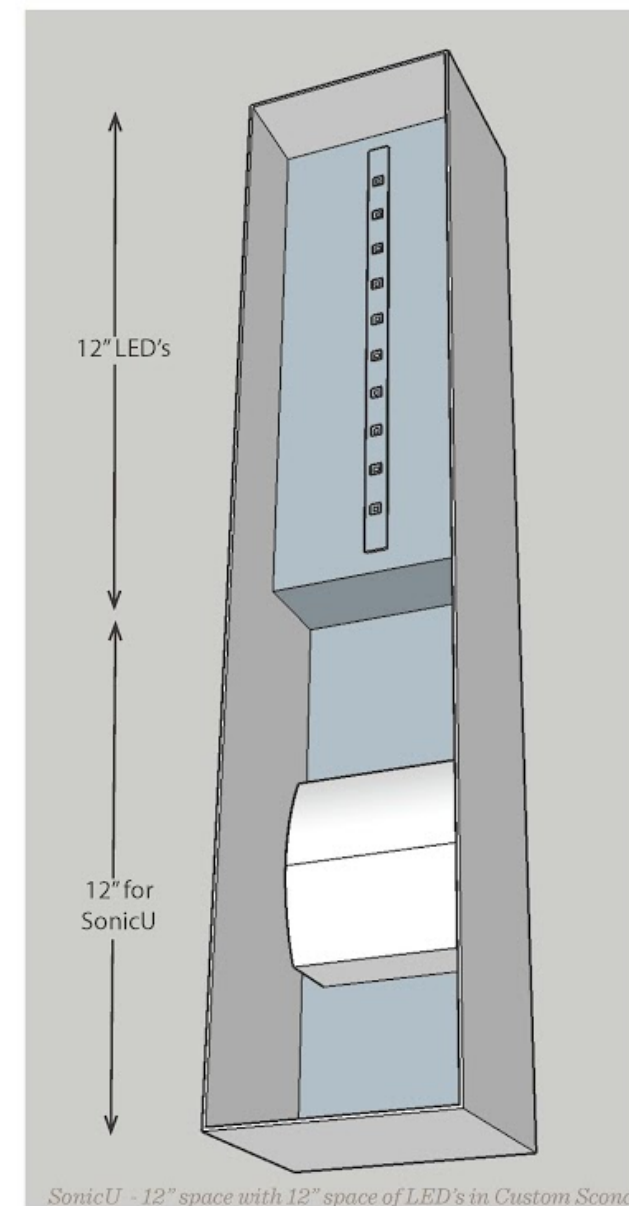
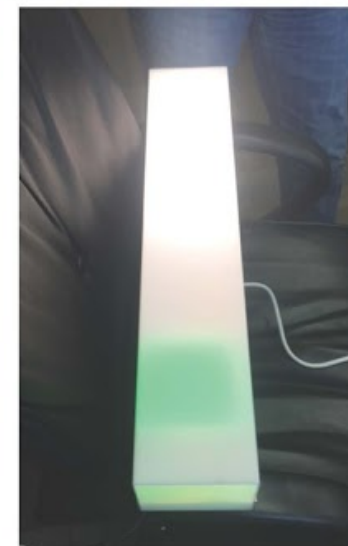
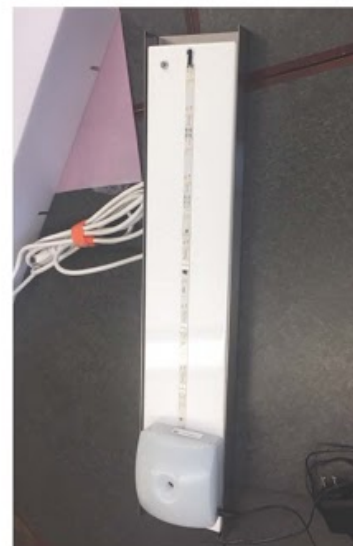
Lighting components are UL Labeled

Price does not include sales tax. State Sales Tax will be billed if 3-Form LightArt does not receive a valid Resale/Tax Exempt Certificate

** Changes in quantity and/or material will affect the unit price of this product**



Example of the (3) sconce install - with (1) Standard 24" Four Sconce and (2) Custom SonicU Four Sconces



SonicU - 12" space with 12" space of LED's in Custom Sconce

Custom Acoustic Sensor Health Care Light

Obstacles

Still under a quick time constraint to provide a solution with little detail from the specifier, they came back with more information requiring only (2) sconces per room, at a total of (56) sconces, keep the cost down by using stock material, undecided about the style of fixture and at the time we had told them that we would need to outsource a vendor for the programming of the LED's to react to specific acoustic values.

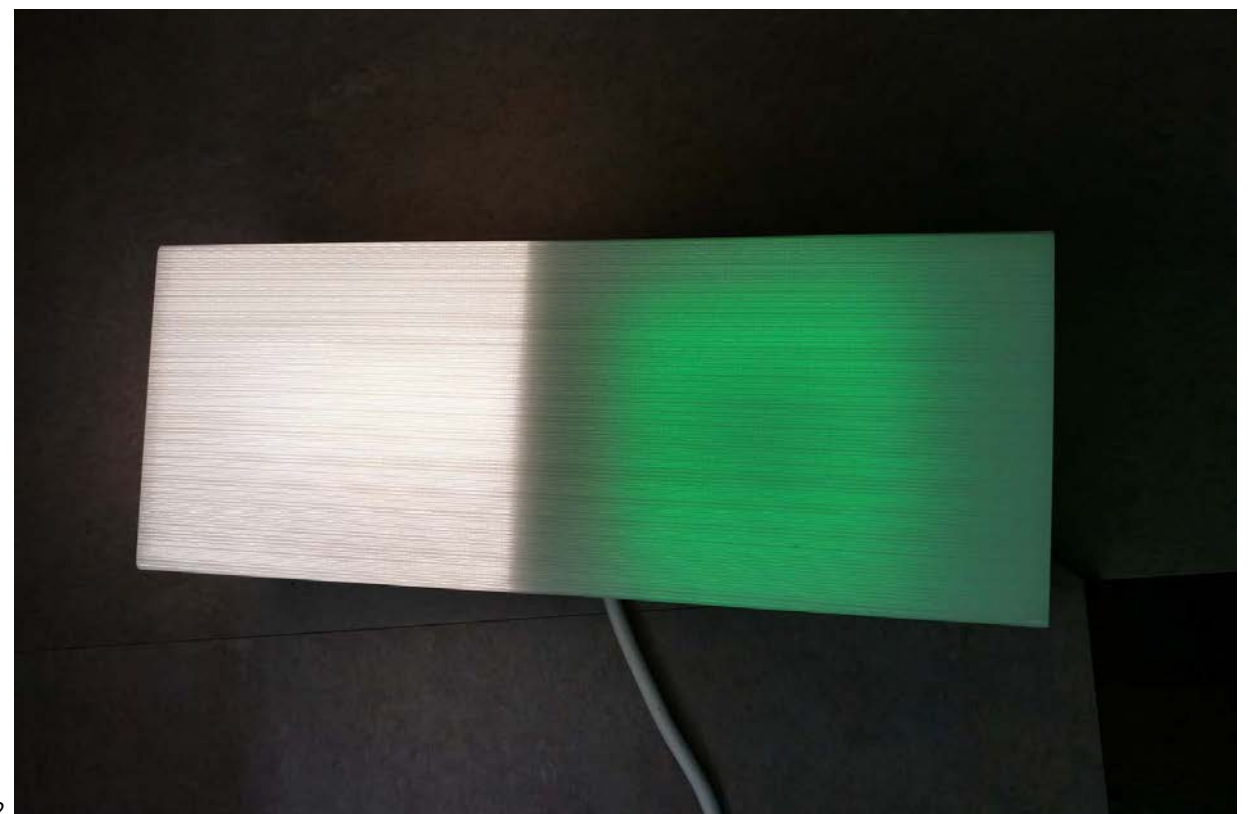
Additionally, after I was able to speak with my manager, the company owner, and our legal department to put everyone at ease and confirm that we would only provide warranty and accept responsibility for any functional issues on the shade portion of the fixture - not the programmable unit.

These fixtures required CSA certification, which meant additional costs added to the budget for the contracted inspector and scheduling in the inspection time within the timeline constraints of the project. *CSA = The CSA registered mark shows that a product has been independently tested and certified to meet recognized standards for safety or performance.* The registered mark is a certification sticker with a unique number, the on-site inspector documents and applies to the interior of the light fixture in the final QC check before the fixture is packaged to ship.

Photo 1 + 2 Right: Show the first round of sample testing the electrical engineer, specifier and LightArt sales rep completed to come to a conclusion of diffusion and patternless shade material needed and how the Sonic-U would function and fit within a standard LightArt LA2 Four sconce (standard fixture) to reduce modifications and costs to an existing functional light design. An additional design consideration, was to incorporate a partition to section off the bleed of the colored light from the Sonic-U to the standard constant white LED light output of the top portion of the fixture.



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Custom Acoustic Sensor Health Care Light

Below: The second budgetary quote

BUDGETARY QUOTE

NICU

PID # 286600

FOUR SCOURCE + CUSTOM FOUR SCOURCE TO ACCEPT SONICU

23 NICU rooms - each room will have (1) standard Four Sconce with (1) custom Four Sconces with SonicU implemented within the design. A custom layup on the face material of the sconce will allow the SonicU to be visable through the material.

Unit Price: \$28,595

Quantity: (46) total; (2) per room - (1) standard (1) custom

Dimensions: 5"W x 4"D x 24"L

Lead-time: 10 weeks

Design Fee: 20% of full project cost deposit for a full scale mock-up.

Custom Material Fee: \$750 (one time fee) **Included in unit price above.**

MATERIALS

Material: Custom Varia Eco Resin - Pure White + Powder D03 (approved)

Gauge: 1/16"

Front Finish: Vellum F04

Back Finish: Patina F02

Diffuser Material: White Opal

Diffuser Gauge: 1/4"

LIGHTING

- Solid State LED System

- 120v-277v input; 0-10v dimming compatible

- 3000k, 3500k or 4000k options (81 CRI light source) TBD

- SonicU driver provided by others (LightArt will design space in backplate to accomodate chosen driver for SonicU)

HARDWARE

- Stainless steel backplate mounts to standard junction box in wall (provided by others) two separate exit holes in the backplate for separate connection to power sources.

- LightArt will design connection/mounting parts for SonicU to connect to LightArt sconce on-site.

- SonicU (provied by others) installed in custom sconces on-site by others.

CRATING & SHIPPING

Crate Price: \$1,373

Shipping: \$2,059

Project Total: \$ 32,027

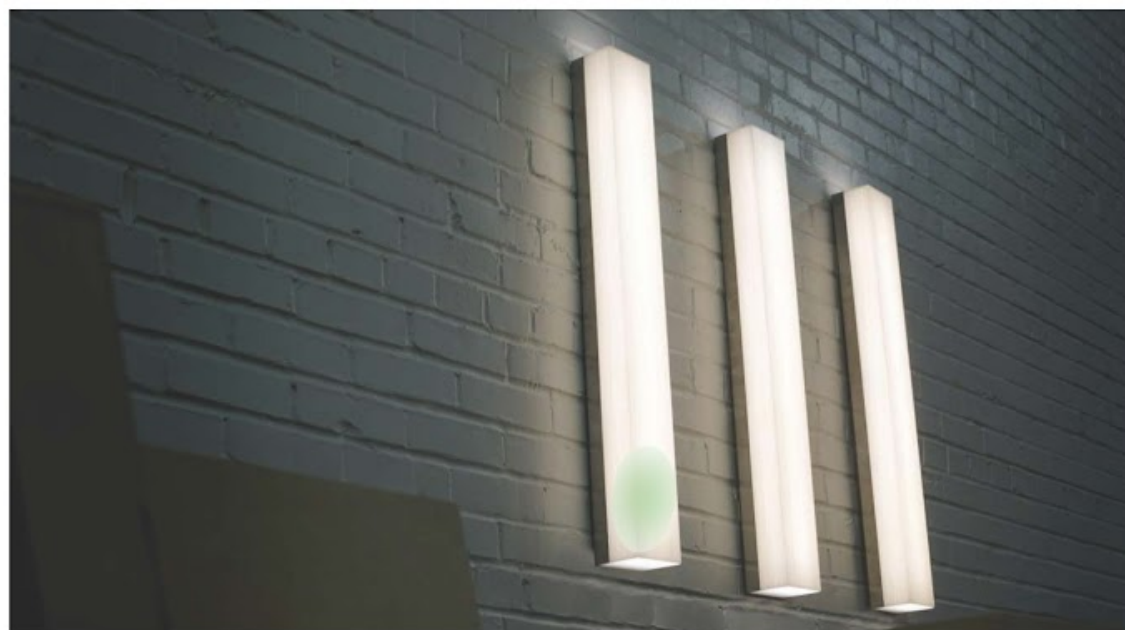
Use of an incandescent bulb will negate the warranty and damage our product

Lighting components are UL Labeled

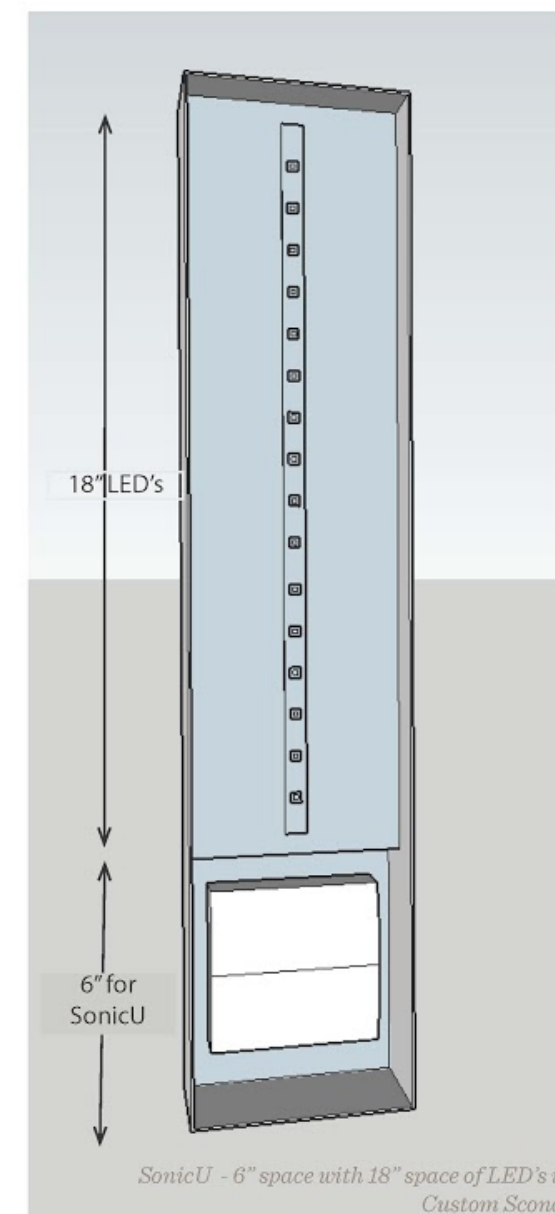
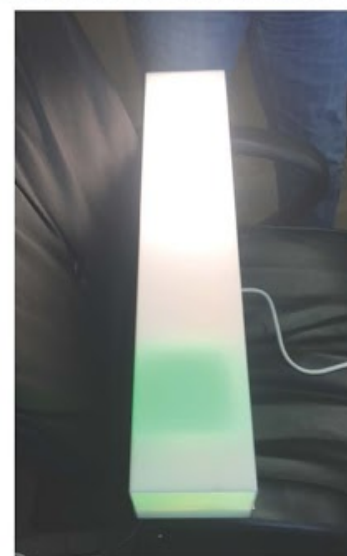
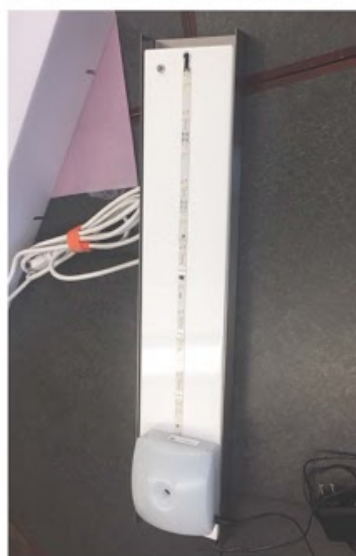
Price does not include sales tax. State Sales Tax will be billed if 3-Form LightArt does not receive a valid Resale/Tax Exempt Certificate

*** Changes in quantity and/or material will affect the unit price of this product***

This document is prepared for budgetary purposes only. It does not represent a binding quote or an agreement for services. Pricing is valid for 30 days.



Example of the (3) sconce install - with (1) Standard 24" Four Sconce and (2) Custom SonicU Four Sconces



SonicU - 6" space with 18" space of LED's in Custom Sconce

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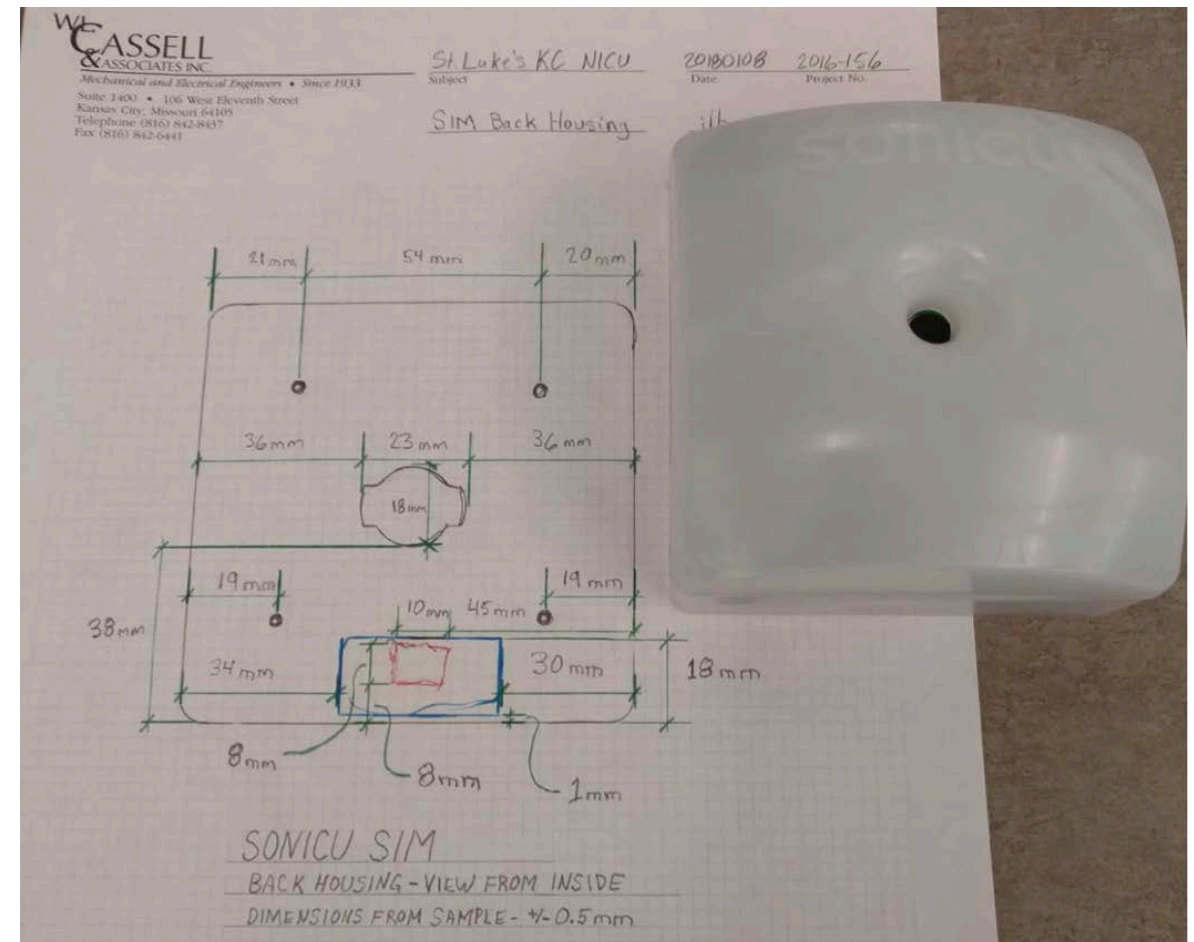
Obstacles + Project Process Details

I was able to request a Sonic-U module from the manufacturer so that we could have a hands-on component to check against while working with CAD and our metal manufacturers, lighting lab, and shade fabricators to produce a product where all the pieces fit seamlessly.

I worked with the sales rep to order a variety of 8"x8" samples of white fabric + white film layered within the resin sheet that would meet the diffusion and functionality requirements for this custom fixture. Not only did it have to pass a diffusion test, but also pass the routing fabrication test to make sure that there would not be any faulty seams or light leak.

I created a variety of renderings and quotes, presented on the following pages for the specifier to present, electrical engineer to sign off on, and hospital board to approve. As this project gained momentum, the feedback allowed the scope to narrow and the final specifications to come to fruition in a real, functional product.

Photo 1 + 2 Right: The detailed drawing by the electrical engineer, James Beutler, to help me understand the components, electrical input/output location, and mounting points. I made sure when choosing a power supply that 1) the stock we needed for this project was readily available and 2) that it would be compatible for both the standard LED's in the top portion of the sconce as well as meet the needs for the power supply needed for the Sonic-U component.



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Below: It was important for me to understand the functionality and the electrical power needs for the Sonic-U component and the LightArt portion of the fixture. Detailed consideration was taken by myself, double checking with the electrical engineer, and verifying internally with the LightArt design developer - that yes, in fact all that has been chosen would function according to plan + drawings. * **See drawings on the following page** *

Sound Indicating Meter Installation Guide



Ordering Information



100033 / 100035 SIM

Determine the number of SIMs and power sources required for your installation. For new installations we recommend ceiling mount. For retrofit, often wall mount is the most practical solution. Contact us for assistance.



100040 12VAC Power Supply



100024 power module

Part No.	Description
100033	SIM with 900MHz transmitter
100035	SIM with WiFi connectivity
100040	Power wall adapter, 12VAC
100024	Low voltage power module (up to 4 SIMs)
100034	Ceiling mount kit

Sound Indicating Meters

Dimensions: 3.9" x 3.9" x 2.1" Weight: 4.6 oz.

Power Requirements: 12VDC, 150mA, 1.8 watts

Options: 12 VDC, 1A wall adapter (wall mount or portable) or Junction box mountable power supply with low voltage outputs for supplying up to 4 SIMs.

Radio Options: Wi-Fi or 900 MHz, recommended maximum RF distance from gateway: Wi-Fi option up to 100 feet*. 900 MHz option up to 1000 feet*.

*Open air distance, with direct line of sight between SIM and receiver. Actual maximum distance will depend on obstructions between SIM and receiver. Walls, doors, and building layout can greatly decrease the maximum distance.

Sound Performance:

Sensitivity: Low end 35 dBA, High end 95 dBA.

Response Time: 1 Second, SPL data collected every second, sent in a batch every 10 seconds.

Configurable LED Settings

Normal (red, yellow, green)

Warning (red and yellow)

Alarm (red Only)

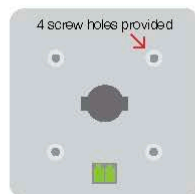
None (all LEDs off)

Wall Mount Installation

1. Determine the best location for the SIM within reach of a 110VAC power outlet and mount the SIM to the wall using 2 or more screws. Note provided screw holes
2. Connect Part No. 100040 Power Adapter to the SIM. Plug in the power adapter into the outlet.
4. The SIM is now ready for operation.



front of SIM

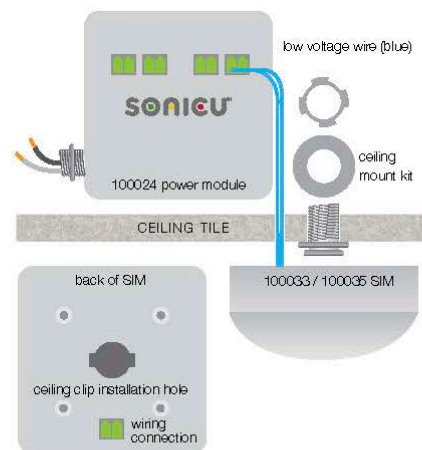


back of SIM

Ceiling Mount Installation

Refer to the illustration below.

1. Cut a 3/4" hole in the ceiling tile in your preferred location.
2. Hard wire Part No. 100024 power module above ceiling tiles in a convenient location out of view. Install in accordance with your local building codes. 1 power module can support up to 4 SIMs.
3. Drill small hole in ceiling tile for low-voltage wire approx. 1 inch from ceiling mount hole. Install 1 end of the low voltage quick-connect wire to the power supply. Thread the wire through the hole and connect to the back of the SIM.
4. Install the SIM into the ceiling clip, making sure it seats properly, then rotate the SIM 90 degrees to secure it. The finished installation will be a flush fit to the ceiling tile.



16W Single Output Switching Power Supply

APV-16 series

Power supply SONICU said could be used.



Features :

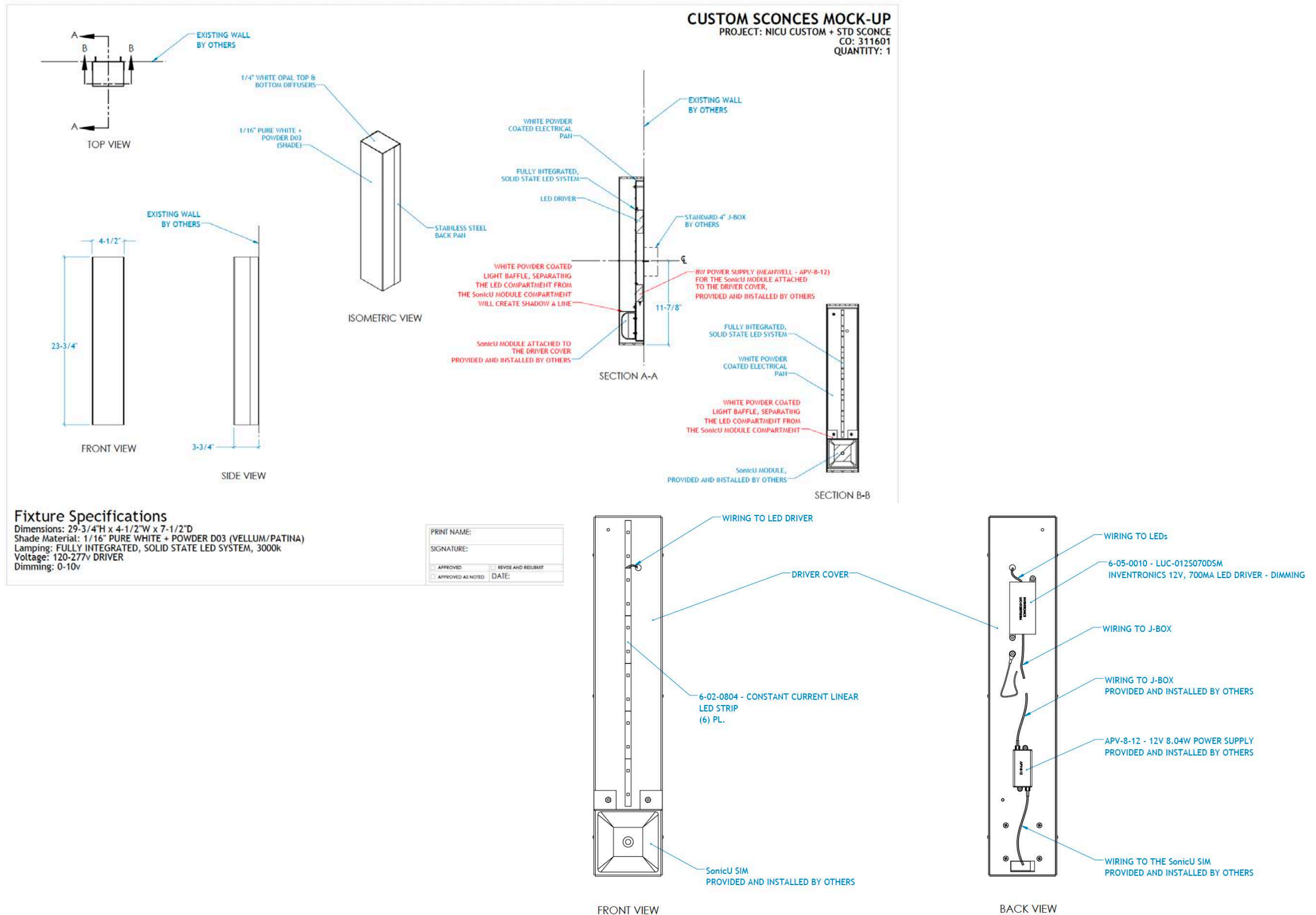
- Constant voltage design
- Universal AC input / Full range
- Protections: Short circuit / Over load / Over voltage
- Fully isolated plastic case
- Cooling by free air convection
- Small and compact size
- Class II power unit, no FG
- Class 2 power unit
- Pass LPS
- IP42 design
- Suitable for LED related fixture or appliance (such as LED Decoration or Advertisement devices)
- 100% full load burn-in test
- Low cost, high reliability
- 2 years warranty

SPECIFICATION

MODEL	APV-16-5	APV-16-12	APV-16-15	APV-16-24	
OUTPUT	DC VOLTAGE	5V	12V	15V	
	RATED CURRENT	2.6A	1.25A	1A	
	CURRENT RANGE	0 ~ 2.6A	0 ~ 1.25A	0 ~ 1A	0 ~ 0.67A
	RATED POWER	13W	15W	15W	16.08W
	RIPPLE & NOISE (max.) Note.2	100mVp-p	120mVp-p	120mVp-p	150mVp-p
	VOLTAGE TOLERANCE Note.3	±5.0%			
	LINE REGULATION	±1.0%			
INPUT	LOAD REGULATION	±2.0%			
	SETUP, RISE TIME Note.6	1500ms, 30ms / 230VAC	1500ms, 30ms / 115VAC at full load		
	HOLD UP TIME (Typ.)	20ms/230VAC	12ms/115VAC at full load		
	VOLTAGE RANGE Note.4	90 ~ 264VAC	127 ~ 370VDC		
	FREQUENCY RANGE	47 ~ 63Hz			
	EFFICIENCY (Typ.)	76%	80%	81%	83%
	AC CURRENT	0.3A/230VAC	0.5A/115VAC		
PROTECTION	INRUSH CURRENT(Typ.)	COLD START 50A(twidth=185µs measured at 50% Ipeak) at 230VAC			
	MAX. No. of PSUs on 16A CIRCUIT BREAKER	13 units (circuit breaker of type B) / 22 units (circuit breaker of type C) at 230VAC			
	LEAKAGE CURRENT	0.25mA / 240VAC			
	OVER LOAD	Above 105% rated output power Protection type : Hiccup mode, recovers automatically after fault condition is removed			
ENVIRONMENT	OVER VOLTAGE	5.75 ~ 6.75V	13.8 ~ 16V	17.5 ~ 21V	
	WORKING TEMP.	Protection type : Shut off o/p voltage, clamping by zener diode			
SAFETY & EMC	WORKING HUMIDITY	-30 ~ +70°C (Refer to "Derating Curve")			
	STORAGE TEMP., HUMIDITY	20 ~ 90% RH non-condensing			
	TEMP. COEFFICIENT	-40 ~ +80°C, 10 ~ 95% RH			
	VIBRATION	±0.03%/°C (0 ~ 50°C)			
OTHERS	SAFETY STANDARDS Note.8	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes			
	WITHSTAND VOLTAGE	UL8750, CSA C22.2 No.250.0-08, ENEC EN61347-1, EN61347-2-13, EN62384 Independent, IP42 Approved; design refer to EN60950-1			
	ISOLATION RESISTANCE	I/P-O/P: >100M Ohms / 500VDC / 25°C / 70% RH			
	EMC EMISSION	Compliance to EN55032, EN61000-3-2 Class A, EN61000-3-3			
NOTE	EMC IMMUNITY	Compliance to EN55024, EN61000-4-2, 3, 4, 5, 6, 8, 11; light industry level (surge 2KV), criteria A			
	MTBF	1145.7K hrs min. MIL-HDBK-217F (25°C)			
	DIMENSION	77*40*29mm (L*W*H)			
OTHERS	PACKING	0.1Kg; 120pcs/14Kg/1.08CUFT			
	NOTE	1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1µf & 47µf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. Derating may be needed under low input voltage. Please check the static characteristics for more details. 5. The power supply is considered as a component that will be operated in combination with final equipment. Since EMC performance will be affected by the complete installation, the final equipment manufacturers must re-qualify EMC Directive on the complete installation again. 6. Length of set up time is measured at first cold start. Turning ON/OFF the power supply may lead to increase of the set up time. 7. The unit might not be suitable for lighting applications in EU countries. Please check with your local authorities for the possible use of the unit. 8. The model certified for CCC (GB19510.14, GB19510.1, GB17743 and GB17625.1) is an optional model. Please contact MEAN WELL for details.			

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Below: Drawings for the final prototype mock up for review and signature approval by electrical engineer, specifier and hospital board.



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Obstacles

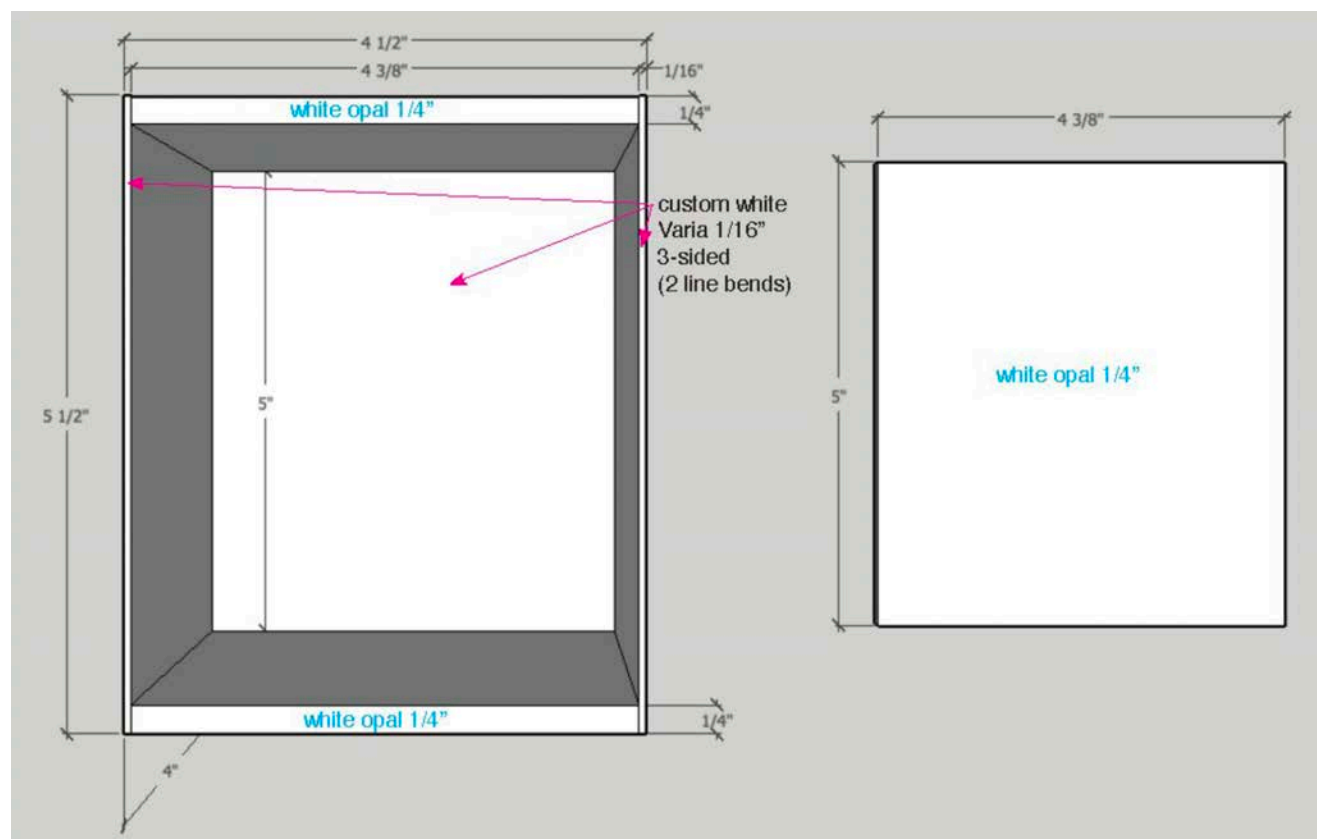
The last obstacle was when the manufacturer of Sonic-U received the final prototype and realized it would not fit in their calibration chamber to make sure that all of the Sonic-U modules would function with the shade enclosure. He asked me if he could just "cut the fixture to fit" in the chamber, to which I told him this would not be a reasonable solution - however, that I could provide him with a smaller sub-prototype to create his calibrations if he provided me with the measurements of the sound chamber.

Photo 1 + 2 Right: The noted renderings I created for the CAD teammate to create the cut files and the fabrication team to quickly use scraps from the prototype fabrication sheet to create the calibration chamber box for Sonic-U to make their last adjustments for the final installation of the fixtures + Sonic-U modules.

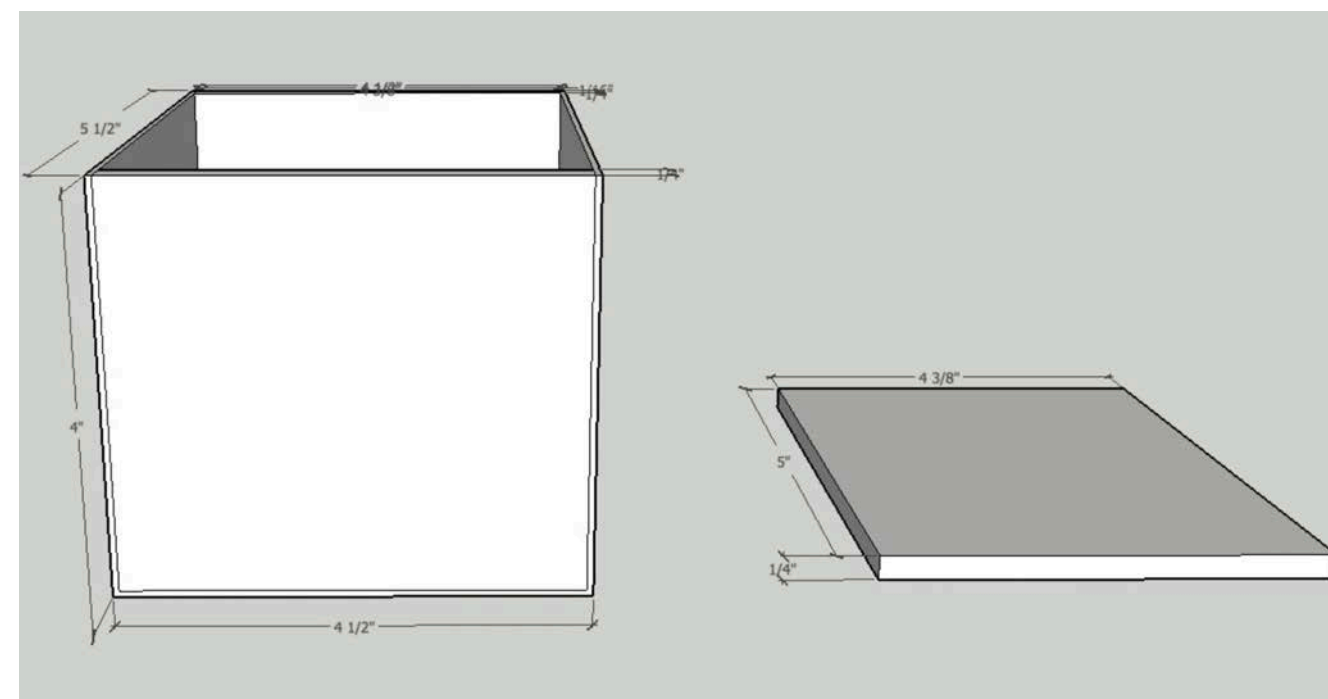
Following page:

Photo 1 + 2 Following Page: The second prototype, after the selected all white shade material layup with the exact diffusion needed had been approved, the full scale prototype was created to show the custom metal partition and LED strip top portion interaction, shade fit, assembly and functionality of the Sonic-U when installed in specific mounted position.

Photo 3 + 4 + 5 Following Page: These images correspond to the video sound and functionality test that occurred in studio with LightArt fabrication team members. The green is to indicate that there is a light auditory reading within range of the infant, the yellow acts as a cautionary "lower your voice" indicator, and the red indicated that there is too much auditory noise within range of the infant and to curtail human behavior to meet NICU healthy auditory limitations.



- Box enclosure with white opal base, for Sonic U device to test and calibrate sound through sconce shade enclosure.
- 1/16" custom white shade w/ 2 line bends to create 3-sides.
 - 1/4" white opal top and bottom glued to shade to create 2-sides.
 - 1/4" white opal base, to allow for shade to be closed for testing around the SonicU device.



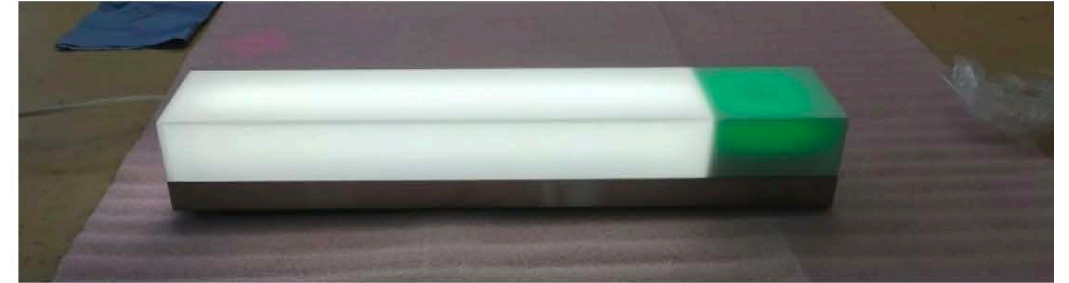
Custom Acoustic Sensor Health Care Light



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Custom Acoustic Sensor Health Care Light

Below: The final budgetary quote



PROJECT BUDGET QUOTATION

2018-03-01 BQ-819697

A formal quote must be produced to initiate order.



PROJECT BUDGET QUOTATION

2018-03-01 BQ-819697

A formal quote must be produced to initiate order.



PROJECT BUDGET QUOTATION

2018-03-01 BQ-819697

A formal quote must be produced to initiate order.

HARDWARE & LIGHTING

Part Id	Description	Qty	Price	Ext Price
6-07-5013-K	[TYPE S] LA2 Four Medium DIMENSIONS: 23.75"H x 4.5"W x 3.75"D MATERIALS: - Shade Material: Varia Ecoresin - Pure White + Powder D03 (approved layup) - Gauge: 1/16" - Front Finish: Vellum - Back Finish: Patina - White Opal (top & bottom diffusers) LIGHTING: - Fully integrated, solid state LED system - 120-277v drivers - Dimming 0-10v - 3000k - Lighting components are CSA approved to UL standards HARDWARE: - Stainless steel back plate mounts to standard junction box Junction box is located in the center of the backplate ADA Compliant *Use of an incandescent bulb will negate the warranty and damage our product*	23.00	US\$465.00	US\$10,695.00

Part Id	Description	Qty	Price	Ext Price
6-07-CUST-K	[TYPE S1] Custom LightArt Product MODIFIED // LA2 Four Medium Sconce DIMENSIONS: 23.75"H x 4.5"W x 3.75"D *** detailed dimensions 18" LED illuminated space in upper inner body of sconce, bottom 6" designed open space dedicated to accept SonicU module*** MATERIALS: - Shade Material: Varia Ecoresin - Pure White + Powder D03 (approved layup) - Gauge: 1/16" - Front Finish: Vellum - Back Finish: Patina - White Opal (top & bottom diffusers) LIGHTING: - Fully integrated, solid state LED system - 120-277v drivers - Dimming 0-10v - 3000k * Custom sconce is not CSA approved. * * SonicU driver will be provided by others (LightArt will design space in backplate to accommodate chosen driver to power SonicU module.) HARDWARE: - Stainless steel back plate mounts to standard junction box Junction box is located in the center of the backplate ADA Compliant *Use of an incandescent bulb will negate the warranty and damage our product*	23.00	US\$745.66	US\$17,150.18

Type	Description	Price	Ext Price
LightArt	Custom Material Upcharge: - One time \$ 750 fee for custom layup varia eco resin in Pure White + Powder D03.	US\$750.00	US\$750.00

TOTALS

Solutions total:	US\$0.00
Hardware Total:	US\$27,845.18
Services Total:	US\$750.00
Shipping And Packaging	US\$3,432.00
Subtotal	US\$32,027.18
Sales tax	US\$2,313.96
Total	US\$34,341.14

Notes

- Changes in quantity and/or material will affect the unit price of this product.
- State Sales Tax will be billed if 3-form LightArt does not receive a valid Resale/Tax Exemption Certificate.
- Use of an incandescent or halogen lamp will negate the warranty and damage our product.

Disclaimer

In order for 3form to ensure this quote meets your project requirements, additional information may be required. To ensure accuracy, please review all details and contact your PM if a revision is needed. If no revision is requested, 3form assumes that the specifications in this quote are accurate and complete and the order will be produced accordingly.

SERVICES

Custom Acoustic Sensor Health Care Light

Project Takeaways

- Follow your intuition, if asking the right questions and having the right resources allow you to move forward towards a solution, communicate the plan of action and make sure everyone is on agreement to move forward towards a collective solution.
- Modifying what already exists to meet a customer's needs is another way of not rewriting the wheel, rather making it fit another chassis. Saving time and money.
- Doing the research and understanding what one is working with is key to making sure everyone is confident about the plan of action and what to expect.
- Double checking the fine print and setting expectations about what each party involved in a given project is responsible for. In terms of warranty and the nuances of environment for a very vulnerable young life, would be an important detail in making sure the operation of devices is accounted for and the correct direct contacts are noted in the paperwork for routine maintenance.
- This project became a shared learning tool for the national sales team in terms of what LightArt could achieve with pairing a custom fixture with another vendor's micro sensor. Something that had been achieved before in the LightArt product line.

