

PROJECT SPECIFICATION

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Liquid Nanotint Investigation	28 September 2018	3

Liquid NanoTint Investigation

Project Requirements

Team Sunscreen

Authors

Chancler Vander Woude

Kendra Wallace

Oscar Lopez

Russell Stein

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Document History

Rev Number	Date	Modified By	Reason
0	25May2018	M. Swenson	Initial Release
1	26 Sept 2018	C. Vander Woude	Edited template to fit project
2	27 Sept 2018	K. Wallace	Filled out sections 2, 3, 5.1, and 5.2
3	28 Sept 2018	C. Vander Woude	Submitted for Approval

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2 OBJECTIVE

The objective of this document is to document the requirements for a tabletop demonstration of Liquid NanoTint. This document will also outline the requirements for using the Golf Pro Shop to test the effectiveness of the NanoTint coating.

3 SCOPE

The scope of this document is to define the requirements to design and build a tabletop demonstration that is portable, easily replicated, and tests the effectiveness of the NanoTint coating. This document will define the Golf Pro Shop case study requirements including application of the product and data collection before and after coating application.

4 REFERENCES

4.1 CITED DOCUMENTS

- 1) <https://drywired.com/liquid-nanotint-insulation-for-glass/>

4.2 ACRONYMS

EPO	Engineering Purchase Order
ER	Engineering Release
POC	Proof of Concept
VLT	Visible Light Transmittance
SHG	Solar Heat Gain

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5 LIQUID NANOTINT DEMONSTRATION UNIT

5.1 FUNCTIONAL REQUIREMENTS

5.1.1 User Interface Requirements

The user should be able to easily and clearly demonstrate the effectiveness of the Liquid NanoTint coating on windows on a small-scale tabletop setup.

5.1.2 What it should do

The Demonstration Unit should show the differences in UV and Infrared light transparency between uncoated and Liquid Nanotint coated glass.

5.2 MECHANICAL REQUIREMENTS

5.2.1 Strength Requirements

The design of the frame should be able to hold two panes of 1' x 1' glass.

5.2.2 Spatial Requirements

The Demonstration unit needs to be portable and fit on a table top.

Folding Tables are 2.5 feet wide. The Demonstration unit must be no larger than 2.5' by 2.5'.

5.2.3 Weight/Mass Requirements

The total system should not exceed 20lbs in order to stay easily portable.

5.2.4 Mounting / Interface Requirements

The glass should be mounted into a frame or box that will allow for UV sensors can be attached and so that the IR rays can measured.

5.2.5 Appearance Requirements

The final product needs to look professional enough that DryWired can use it to demonstrate Liquid NanoTint to other companies.

5.2.6 Durability Requirements

The system shall be designed to be withstand travel and be used for multiple demonstrations.

5.2.7 Reliability Requirements

The sensors on the demonstration should be reliable 90% of the time.

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5.3 ELECTRICAL REQUIREMENTS

5.3.1 Operational Voltage

Demonstration unit should operate off of a 120 V standard power outlet.

5.3.2 Operational Power Capability

Demonstration unit power draw should be less than 1875 Watts for compatibility with most power strips.

5.4 REGULATORY REQUIREMENTS

5.4.1 Shipping Requirements

The demonstration unit must be able to travel with someone on a plane either carryon or checking to be used for demonstrations with clients that are far away

5.5 COST REQUIREMENTS

5.5.1 Prototype Cost

Cost to build a POC prototype shall not exceed \$2,000.

5.6 SCHEDULE REQUIREMENTS

The following are the major Project Milestones:

DATE	MILESTONE
SEPT. 28, 2018	Approval of Requirements
OCT. 2, 2018	Approval of Schedule
NOV. 16, 2018	Concept Design Review
DEC. 8, 2018	EPO of long lead parts
FEB. 9, 2019	Detailed Design Review
MARCH 2, 2019	ER of drawing package
APRIL 5, 2019	Complete Prototype build
APRIL 27, 2019	UI Design EXPO
MAY 4, 2019	Final Report / Drawings

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6 GOLF PRO SHOP CASE STUDY

6.1 FUNCTIONAL REQUIREMENTS

6.1.1 What it should do

The Golf Pro Shop windows must be coated in Liquid Nanotint in order to obtain data on window SHG and energy savings. This must act as a case study on Liquid Nanotint efficacy and provide information to DryWired's potential customers.

6.2 APPLICATION REQUIREMENTS

6.2.1 Appearance Requirements

The Liquid Nanotint coating should not be noticeable aside from a slight blue hue. Liquid Nanotint permits 82% VLT¹. Reduction of VLT by more than 40% indicates application process failure. Dust or other contaminant inclusions should be kept below 0.5 inclusions per square inch. Sensors must be discretely placed and not impede window visibility.

6.2.2 Durability Requirements

The durability of this application coating will be held to the standards of the Nanotint material¹. Application coating must not peel, crack, bubble, or fade for a period of at least ten years, excepting in response to scratching or abrasion. To improve coating lifetime, facility must be informed not to abrade the coating.

6.2.3 Documentation Requirements

Application process must be thoroughly documented. Documentation must contain all information necessary to replicate the application process. Any deviations from the standard Liquid Nanotint application process must be documented.

6.3 SAFETY REQUIREMENTS

6.3.1 Application Safety

Safety requirements are based off Nanotint coating requires which includes dual cartridge facemasks, powder free gloves, and safety glasses. Ventilation of chemical fumes and vapor is preferred; if ventilation is not possible safety warning signs must be used and dual cartridge facemasks must be worn at all times inside the golf pro shop until the fumes have dispersed.

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6.4 COST REQUIREMENTS

6.4.1 Application Requirements

Application costs shall not exceed \$500.

6.5 SCHEDULE REQUIREMENTS

The following are the major Project Milestones:

DATE	MILESTONE
SEPT. 28, 2018	Approval of Requirements
OCT. 2, 2018	Approval of Schedule
NOV. 15, 2018	EPO of Application Equipment
JAN. 31, 2018	Liquid Nanotint Application Deadline
APRIL 2, 2019	Preliminary Analysis Deadline
APRIL 27, 2019	UI Design EXPO
MAY 4, 2019	Final Report