Communication Construction Helmet

Mahdia Choudhury, Damaris Lopez, Whitney Randolph, Maya Woods,
Capstone Advisor: Dr. Pfister, Instructor: Dr. Schesser
Department of Biomedical Engineering, New Jersey Institute of Technology, Newark, NJ, USA

Abstract

This is a communication construction helmet with some advanced features as opposed to conventional construction helmets that are currently out in the market. This helmet will seek to minimize construction site head injuries due to inefficient material type and structural properties while allowing workers to use helmet accessories in more safe and convenient way. This final prototype was made with ABS material, but the actual design seeks for fiberglass outer shell with EPS foam insert for more durability, energy absorption and aesthetic purpose. The helmet, however, needs to be decreased in size for better fit. The prototype has vents as designed, but also requires carbon mesh to securely minimize sharp and small object penetration injuries. It has a flesh light for concept proof attached, but a more secure attachment should be designed. There is a Bluetooth attached for the person wearing it so that phone handling is more secure. But the Bluetooth requires a compartment in the ear flap. A ratchet system attachment shall be designed and attached for eye and ear protection. The straps need little to no improvement as it serves its purpose.

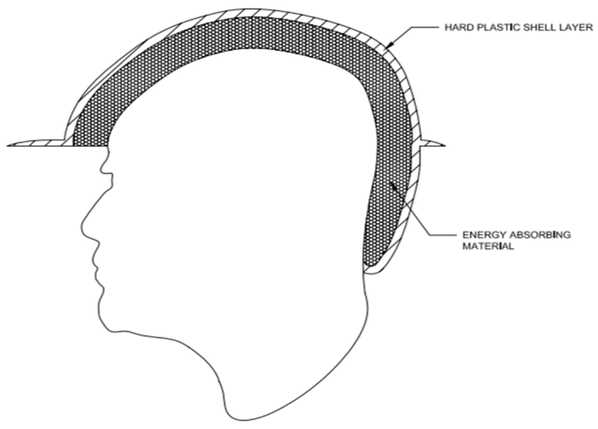
Customer Needs

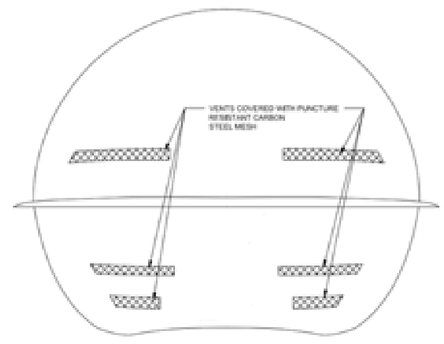
Our customer had specific needs that needed to be met in order to make the construction helmet different from what already exists. The customer needs were: Bluetooth, strap design, vent design on the sides, comfortable material, LED head light, collapsible foam insert, and ability to print radially.

Design Concept

Description of Communication Construction Helmet:

- **Unique Communication Component**
- **Goals- Quality, Safety, and Comfort**
- **ANSI Requirement**





Outer Shell: Final prototype consists of ABS material

Inner Foam: Final prototype has a foam insert which was made but cutting sheets of foam and bending to make into hat shape

Bluetooth Component: Our final prototype comes with Hussar Magicbuds Bluetooth.

LED Light: LED light is attached with a strap

Strap Design: Strap was attached as designed to the sides of helmet to be worn around the ear for comfort.

Vent Design: Vents were placed on the sides and back of the helmet.

Test Plan

TEST CASE	DIRECT REQUIREMENT	TEST	PASS/FAIL
010	REQ010 REQ 020 REQ030	DIMENSIONS	PASS
020	REQ610	BLUETOOTH	PASS
030	REQ 630 REQ 640	INNER FOAM AND HARD HAT	PASS

[Test Case 030] Hard outer hat drop test

Purpose: To ensure the outer hard hat and the inner foam liner can withstand a certain amount of impact on falling without breaking, or the components falling apart.

Specification: REQ020-40, REQ100, REQ170

Test Architecture:

5 ft. and 3 ft. 5 ft. and 3 ft.

Figure Ten: Drop Test

Equipment:

1. Construction Communication Helmet

Test Procedure:

1. Place the hard hat as the first position in figure 9 at a height of 5 and 2.33 ft.

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References

[1] SMITH, CHRIS. "Hard Knocks." *Forbes* 194.3 (2014): 66-70. *Business Source Premier*. Web.
[2] "Helmets: How They Work and What Standards Do." Helmets: How They Work and What Standards Do. N.p., n.d. Web. 23 Oct. 2016.
[3] "ANSI Z89.1 - hard hat types & classes,". [Online].
[4] "U.S. Bureau of Labor Statistics." U.S. Bureau of Labor Statistics. U.S. Bureau of Labor Statistics, n.d.
[5] Masters, Jacob. "Despite Hardhats, Traumatic Brain Injuries Still Common on Construction Sites - Brain Injury Society." Brain Injury Society. N.p., 09 Dec. 2014. Web. 06 Nov. 2016.