

NOISE MANAGING HEADPHONES: HARPA

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HARPA:

- Innovative selective noise canceling headphones
Revolutionary modules to detect ambient noise



Introduction

Currently headphones for cancelling all noise are widely available to everyone, but for many industrial work environments, having headphones that block out all noise can lead to dangerous conditions. A recently started company, Harpa, is designing a selective noise canceling headphone.

About the Client

Our client, Dipak Narula, is the project manager for this company here at Purdue. He was assisted by four Purdue polytechnic students and Mr. Narula helped them license their selective noise cancelling technology through the Purdue Research Foundation.

Harpa is working with both the Industrial Engineering team and a team of Purdue Polytechnic students. The Industrial Engineering students are working on a complete production process while the polytechnic team works on creating a working prototype.

Project Objectives

A Complete Process for Manufacturing the Desired Product

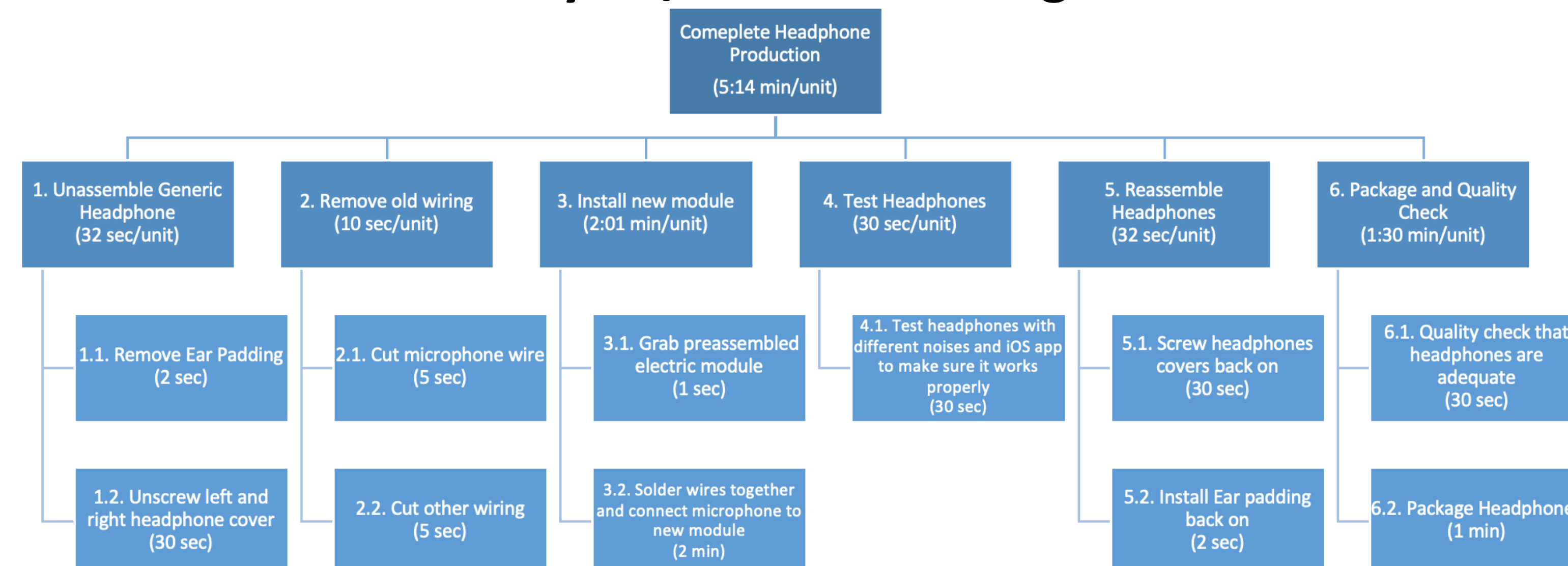
- Creating a manufacturing process with accurate time and labor analysis
Calculating a budget to determine how much it would cost to manufacture the desired product.
Making an accurate facility layout with maximum efficiency

Product Process Method

Overview:

Throughout this semester our group studied the problem the company was aimed to solve. We collaborated with the polytechnic team to understand the module they have developed to design an efficient product process.

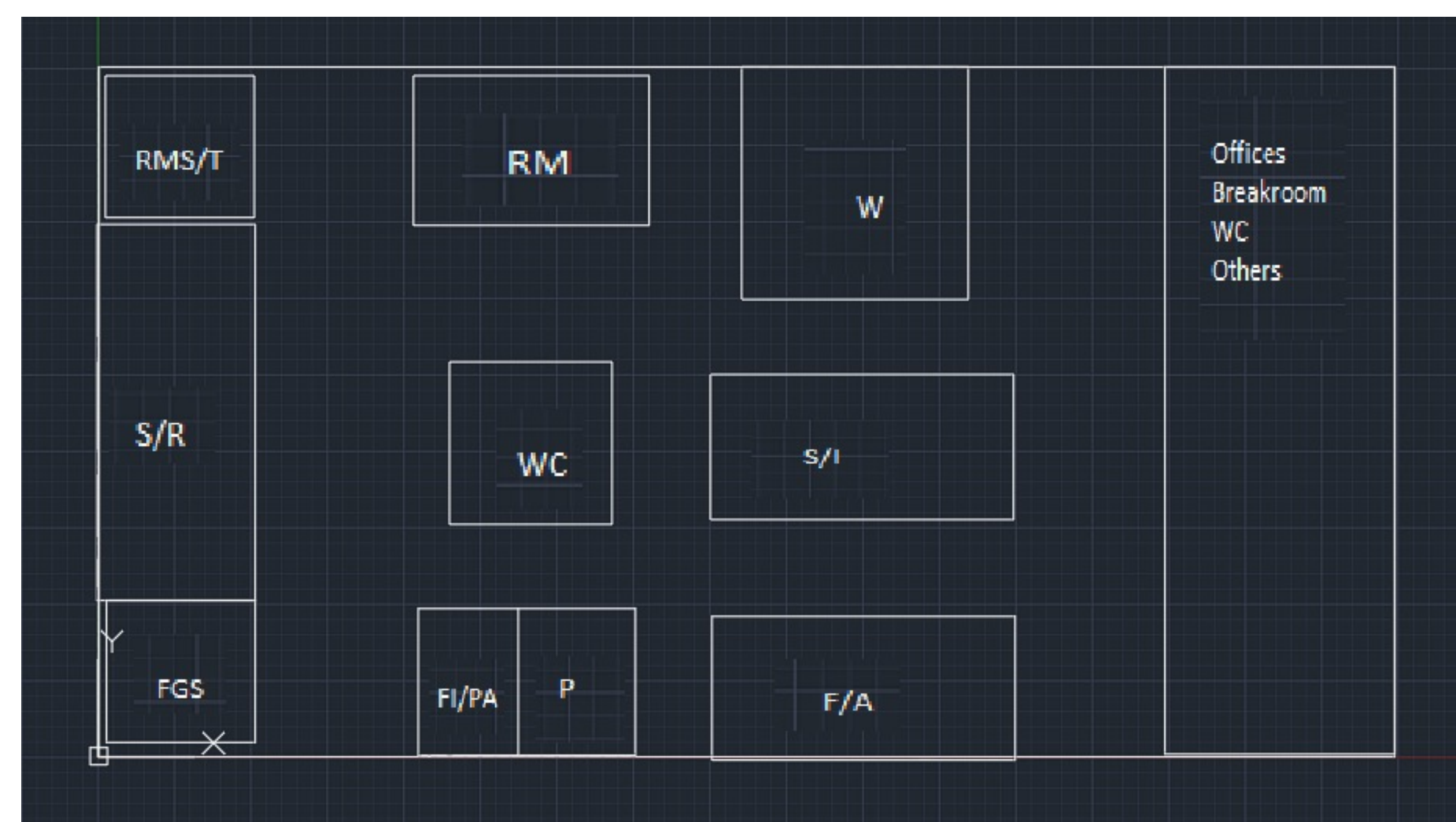
Hierarchical Task Analysis / Manufacturing Process



Key Concepts from Manufacturing Process

- Broke down each step down into sub-steps
Used time studies and estimations to find final times for each step.
5:14 min/unit -> 22,026.72 units/year (8-hour work weeks)
7 workers needed. 1 worker for each step, but we expect a bottleneck at step 3, so 2 workers will be stationed there.

Facility Layout



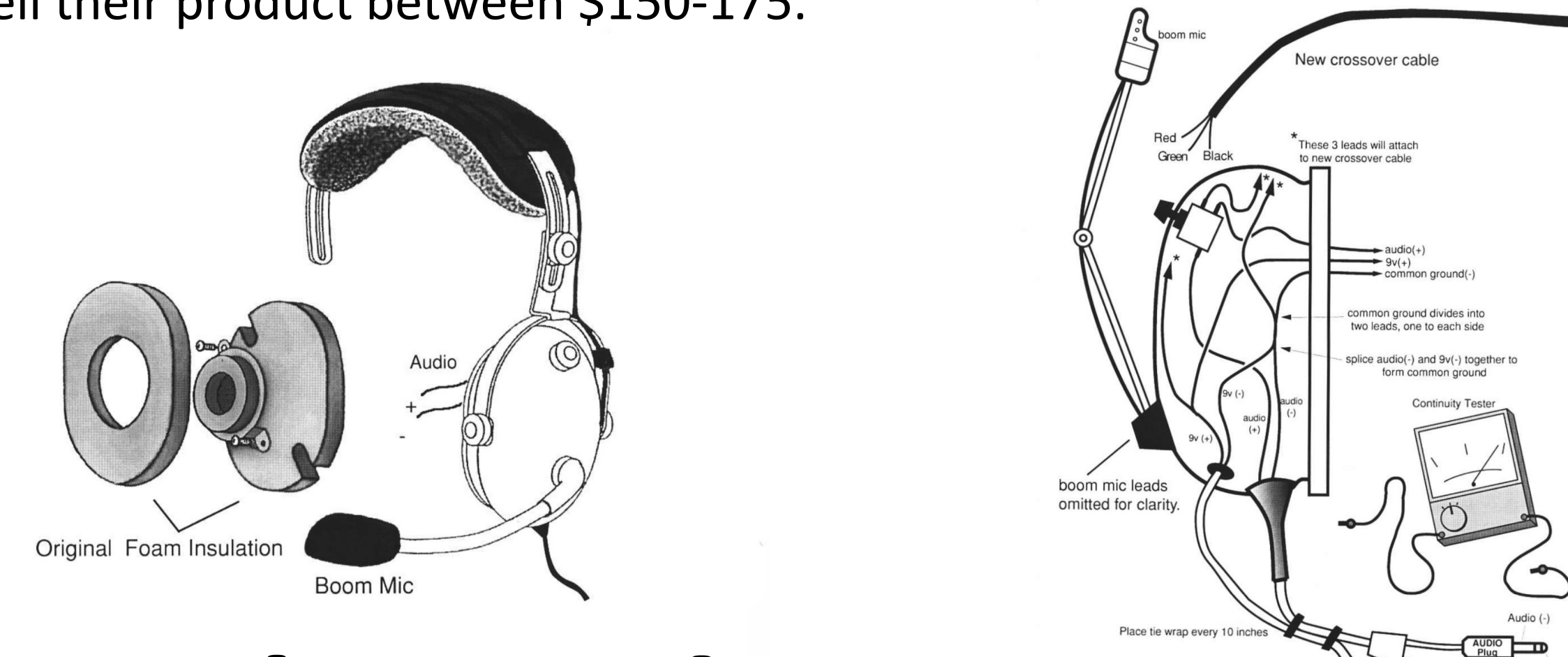
- S/R: Shipping/Receiving
- RMS/T: Raw Material Storage/Tracking
- RM: Removal of parts
- W: Wiring
- S/I: Soldering/Insulation
- F/A: Final Assembly
- P: Painting
- FI/PA: Final Inspection/Packaging
- FGS: Finished Goods Storage
- WC and offices

The proposed facility design was made with the intention to give Harpa space for growth in the future, as well as maximize the flow of goods.

Cost Budget

Table with System Design Bill of Materials (BOM) & Price and Utility Cost Budget Analysis. Includes items like Battery, Raspberry Pi Zero 2 W, Headphone, capacitors, resistors, and LEDs, along with utility costs for soldering and power drilling.

From our research and calculations, the total cost of material to create one unit is \$76.60. The cost of utilities is \$94.50 (one time purchase). We used the average American cost of labor for manufacture workers, which is \$20/hour.



Quick Facts!

Three colored boxes containing quick facts: 'The proposed manufacturing process produces a unit every 5:14 minutes!', 'The proposed facility layout is designed to help maximize production and efficiency!', and 'Our calculated cost of material to build Harpa's product is only \$76.60!'.

Conclusion

We believe that through the research and analysis we have done in IE 43100 this semester we have found an adept and complete production process for HARPA to follow through their early years of foundation.

References

Active noise reduction module™ installation instructions. (n.d.). Retrieved November 30, 2022, from https://www.aircraftspruce.com/catalog/pdf/11-12165.pdf