Thesis Project Portfolio

Find a Replacement for Hexavalent Chromium Sacrificial Paint

(Technical Report)

An Ethical Exploration of the Canterbury Television Building Collapse

(STS Research Paper)

An Undergraduate Thesis

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

My technical work and STS research are connected through the idea of the long-term consequences engineering technologies can have for those who engage with them. However, they differ in how they explore these consequences. My technical work begins by introducing the negative health effects of hexavalent chrome (hex chrome) and concludes with the group investigating four alternatives to see if any can replace it. My STS paper examines how the flawed decision-making of a few actors caused the long-term structural failure of the Canterbury Television (CTV) Building leading to its collapse.

My technical project explores an alternative coating to hex chrome. Hex chrome is a known carcinogen that is used in dyes, plastics, and paints to protect from corrosion (OSHA, n.d). The European Union banned the use of this harmful chemical in 2024, however, the aerospace industry still heavily relies on the compound to protect turbine engines (Brennan, 2024). My capstone group set out to address this issue by creating four different two-part coating matrices from existing industry products. It would be almost impossible to truly replicate the performance of hex chrome, however, our goal was to create an alternative that could protect a substrate from thermal and corrosive conditions at 400°C. Due to time constraints, the group could only conduct initial screening tests to understand the true validity of the coatings. Therefore, we hope to recommend the best-performing coatings to our industry partners for them to conduct more thorough testing.

My STS research explores the collapse of the CTV building in Christchurch, New Zealand. My claim is that a multitude of human actors acted unethically during the lifetime of the CTV building. I argue this by first leveraging actor-network theory to identify all of the relevant human and non-human actors associated with the construction and maintenance of the

building. Then, the engineering virtues of proper competence and clear and effective communication are introduced to analyze the human actors and successfully determine if they acted unethically during their involvement with the building. The goal of my research is to showcase the importance of knowing the limits to one's knowledge and properly expressing it to ensure no outside actors get hurt and potentially lose their lives due to the building.

The research that I conducted for my STS paper truly showcased what not to do when working on a project. I would like to take the experiences of the human actors within the case and apply them to future projects. One trait I would like to apply is communication. When working on a project of great importance, I need to understand my limitations and be able to communicate those to members of my team. Another trait I would like to apply is being extremely detail-oriented. Double or triple-checking work is a necessary practice to make all calculations are correct and no number is out of place to ensure the safety of the people who have to engage with the technology.