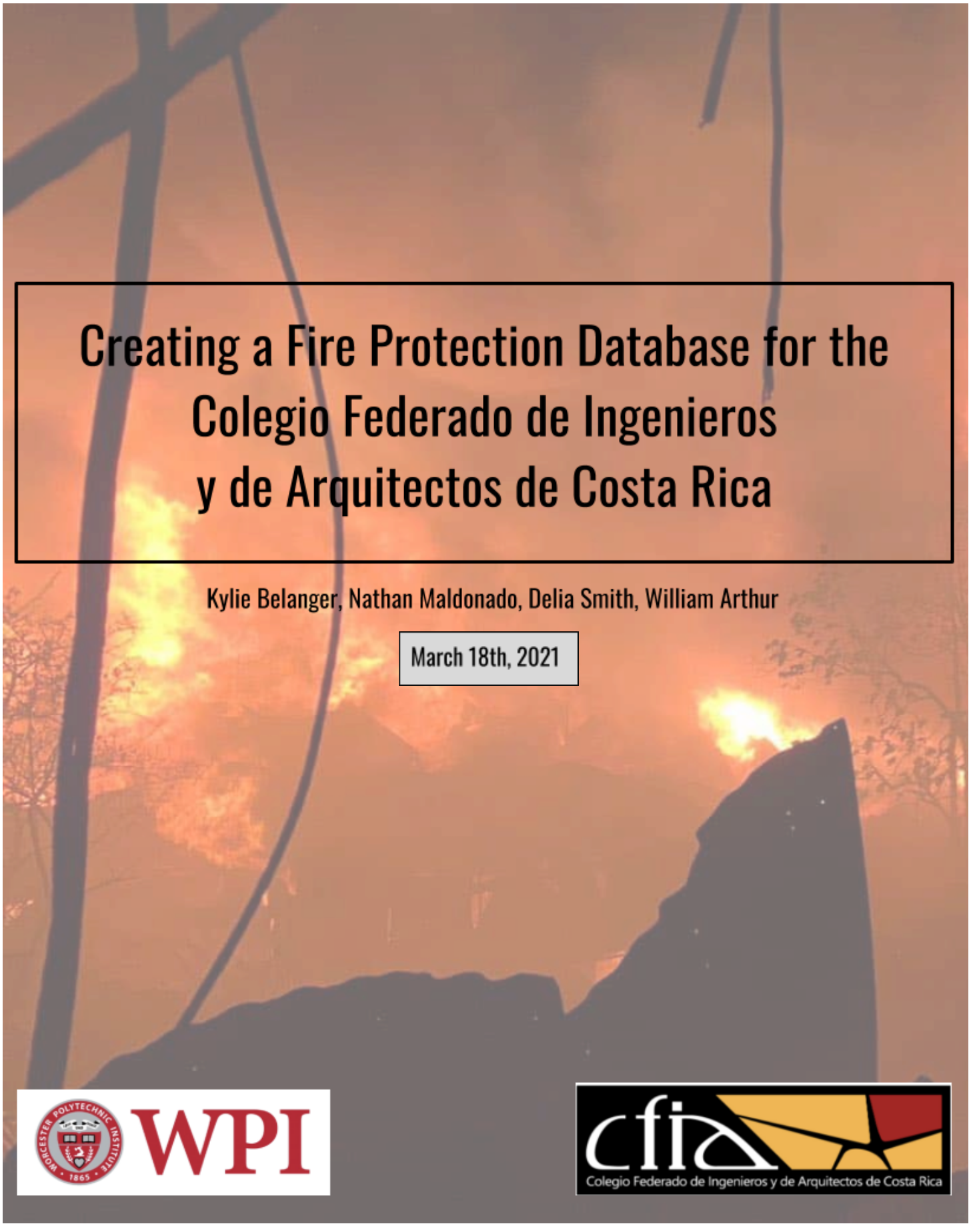

Creating a Fire Protection Database for the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica

Kylie Belanger, Nathan Maldonado, Delia Smith, William Arthur

March 18th, 2021

WPI

Colegio Federado de Ingenieros y de Arquitectos de Costa Rica

Creating a Fire Protection Database for the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica

An Interactive Qualifying Project Submitted to the Faculty of *Worcester Polytechnic Institute* in partial fulfillment of the requirements for the Degree of Bachelor of Science

Submitted By:
Kylie Belanger
Nathan Maldonado
Delia Smith
William Arthur

Date:
March 18, 2021

Report Submitted to:
Worcester Polytechnic Institute
James Chiarelli and Pratap Rao PhD, Co-Advisors
Colegio Federado de Ingenieros y de Arquitectos de Costa Rica, Sponsor
Arq. Hernan A. Hernandez, Sponsor Coordinator

Abstract

The purpose of this project was to develop a set of common construction materials for the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CFIA) of San Jose, Costa Rica to help professionals in the construction sector abide by the country's fire regulations and NFPA codes through the implementation of a database and the calculation of a cost analysis. We accomplished these by identifying both UL-compliant and non-compliant products and studying the NFPA 101 Life Safety Code. The cost analysis determined that compliant materials are 55% more expensive than non-compliant materials. This project also resulted in recommendations for making compliant materials more widely used through continued use and refinement of our database.

Acknowledgements

Our team would like to express our sincere appreciation for our sponsors, the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica, particularly Hernán Hernández and Mario Amador. They helped us from the very beginning to make sense of the project at hand, provide technical sheets and other resources as needed, as well as teach us the importance of fire codes and compliance in general. Their willingness to help, enthusiasm about fire protection, and combined technical knowledge made this project both successful and rewarding.

We also would like to thank Professor Melissa Belz for the work she put into the group and project organization, as well as for the projects she worked with the sponsors to create. Her efforts made for yet another year of successful projects, despite this reimagined format working with COVID-19 restrictions.

Additionally, we thank Professor Albert Simeoni for his willingness to answer all of our questions regarding the UL Fire Testing lab at WPI as well as compliance and fire safety standards in general. With their help, we were able to gain a more diverse and thorough understanding of what goes into the fire testing process and why the codes and specificity of material selections are important.

Thank you Boris Salas and Rodolfo Guzmán for taking the time to teach us Spanish and refresh our memory of the language. This experience allowed us to be able to utilize the language more in our meetings and emails with our sponsors. Additionally, during our NFPA 101 Life Safety Code training with Hernán, we were able to understand his slides that were in Spanish as well as interact with them.

We would like to thank our advisors, James Chiarelli and Pratap Rao. They supported us from the very beginning of this project, giving us guidance and constructive feedback which allowed us to progress with our project each week, confident that we were on the right track. Their willingness to meet with us, answer any of our questions, and flexibility allowed for a successful IQP experience.

Lastly, we would like to thank Worcester Polytechnic Institute (WPI) for providing us the opportunity to complete this Interactive Qualifying Project, and work on something new for all of us. This project provided valuable lessons and knowledge that would not have been obtained otherwise. Despite the pandemic, WPI worked hard to adapt and make this a possibility during an uncertain time.

Executive Summary

Introduction and Background

Engineers and architects in Costa Rica are required to follow construction code standards to protect against disasters and emergencies caused by natural disasters such as fires, earthquakes, winds, floods, and more. And while Costa Rica is threatened by all disasters, fire is both the most prevalent and the most preventable. The National Fire Protection Agency (NFPA) developed a system of codes and standards to implement fire protection measures in buildings and structures, which Costa Rica adopted in 2005. However, many buildings and structures are not in compliance with the NFPA codes and standards that were adopted almost 15 years ago, due to the issue of contractors not always building with fire-safe materials and oftentimes opting for non-laboratory certified materials or "fake" certified materials because they are cheaper. Our sponsor believes that a centralized list will encourage both professionals and contractors within the country to better follow the NFPA codes and regulations proposed by the Costa Rican government.

Our goal was to work with the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (Federated College of Engineers and Architects) to compile a list of fire-rated materials to be used by professionals and contractors throughout the country. This list was to be compiled in a database, and included a cost analysis of fire-rated versus non-laboratory certified materials, in order to encourage the use of compliant materials within the construction sector and give insight to engineers and architects in charge of vulnerability analysis towards fires.

Project Goals and Methodology

Before our analysis began, we made an effort to gain an in-depth understanding of the fire codes and applications set in Costa Rica. We attained this through meetings with our sponsors and learning about it first hand, in addition to NFPA 101 Life Safety Code training with our sponsors. This was necessary to determine how to distinguish between compliant and non-compliant materials as well as understand the importance of compliant materials. We managed to achieve a thorough and cohesive analysis of Underwriters Laboratories (UL) iQ database listed and unlisted materials, and through this, compiled them into a digital spreadsheet that is both beneficial and accessible to engineers and architects throughout Costa Rica. In order to accomplish our goals, the following objectives were developed:

1. Understand current NFPA code applications, infrastructure, and enforcement procedures in Costa Rica.
2. Collect technical information for listed materials for the database and determine if materials are up to code and what laboratories they were tested in.
3. Create a finalized list to hold the information on the listed materials and establish a framework for continued use and refinement.
4. Construct a cost analysis comparing listed fire-safe materials versus unlisted materials.

We focused on the list of products given to us by our sponsor that included but was not limited to cables, conduits, fire suppression equipment, piping, valves and accessories, etc. We examined the technical sheets and searched for specific model numbers in the UL iQ database to determine if they were compliant or not. In addition, we recorded the compliant materials and found the prices of the specific materials of interest our sponsors indicated in order to compute a

small-scale cost analysis. Lastly, we found comparable non-compliant materials and their prices to be able to complete the cost analysis.

Findings

The NFPA 101 Life Safety Code training was a key part in our undertaking of this project. Our training was organized by one of our sponsors, Hernan Hernandez, and took place during the second week of our project. Hernan briefed our team on all aspects of the NFPA 101 Life Safety Code, on topics including: the need for certified exit signage, updated active and passive fire protection systems, appropriate means of egress, outdoor meeting points, effective emergency protocol, and using fire-rated construction materials.

In addition, after an interview was conducted with Department Head of Fire Protection Engineering at WPI, Prof. Albert Simeoni and extensive research was conducted, we concluded that UL is the most reliable testing laboratory. UL surpasses other recognized testing laboratories, as UL sets the standards to which other laboratories (Intertek, et al.) follow. Prof. Albert Simeoni, confirmed that "UL develops the tests and Intertek only applies them." ETL (Intertek), CSA (Canadian Standards Association), and TUV (Technical Inspection Association) testing laboratories can be used to identify compliant materials as well, but do not offer a resource like the UL iQ that would allow us to identify products given the constraints created by our timeline.

Lastly, considering UL requirements and the fire testing process, we assumed that compliant materials/ UL certified materials cost more than non-UL certified materials. As we analyzed the costs of specific compliant and non-compliant materials, we confirmed this assumption. It is, however, important to note that some materials can be more expensive because

they provide another benefit than fire. In our findings, the average percent increase between compliance and non-compliance varied between different categories of materials. On average, certified materials we found were 55% more expensive than comparable non-certified materials. While these increases are significant on a smaller scale, considering these numbers on a larger scale construction budget, on the scale of millions of dollars, the increase is not overly consequential.

From a pricing perspective, it appeared that there was a consistent increase in price from compliant materials to non-compliant materials for every product category. However, it was apparent that the price increase between compliant and non-compliant materials was dependent on the product category. For products such as devices, cables, conduits, and lamps, there was a minimal difference in price (ranging from $1.21 to $31.46) between the compliant and non-compliant materials. Therefore, in those cases, the generalization could be made that buying the compliant products would be worth it. Using compliant products may cost more upfront, but will be beneficial long term because they will not need to be traded out due to code violations and are protecting the safety of everyone in the building long term. Additionally, in determining whether products were compliant or not, our team found compliant materials to be more common than expected. Not only is the price difference between certain compliant and non-compliant materials minimal, but the search to find the particular compliant materials requires minimal effort. Therefore, with the benefits of time, safety, and cost of compliant items, they should be utilized more frequently than non-compliant materials.

Conclusions and Recommendations

Our work is aimed to increase the use of compliant materials in new construction and spread the knowledge that using fire-safe materials is not detrimental to construction budgets, but may actually be beneficial in saving money in the long run. There is presently a major safety issue in Costa Rica, as the NFPA 101 Life Safety Code cannot be adequately adhered to without the use of compliant and fire-safe materials. Our team hopes that our findings and recommendations will provide a helpful foundation for the CFIA to promote life safety in new construction in the future. Additionally, our team hopes that this project will raise awareness of the accessibility of compliant materials as well as emphasize the UL standard and educate others on the matter.

Through small-scale research and communication with our sponsors, we were able to develop recommendations for the CFIA and in general in terms of the data and information that we had collected and what we suggest they accomplish in future work based on what we have learned. Our recommendations include:

1. Promote NFPA courses and training within the country, and work with the NFPA to ensure that courses are easily accessible to their members, as well as to Colegio de Ingenieros Electricistas, Mecánicos e Industriales (CIEMI) and Colegio de Arquitectos (CACR).
2. Raise awareness of the UL iQ database so architects and contractors can use it more frequently and promote the use of compliant materials.
3. Develop a database similar to that of UL iQ but for the other certification companies.
4. Integrate all global standards into one universal standard.

Authorship

***All sections were proofread and edited by each member of the team.**

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1.0 Introduction

Engineers and architects in Costa Rica are required to follow construction standards to protect against disasters and emergencies caused by fire, earthquakes, winds, floods, and more. Geography is one of the attributing factors to these disasters- as Costa Rica lies directly within the Ring of Fire, a roughly 25,000-mile seismically active region around the Pacific Ocean that contains most of the Earth's volcanoes and earthquake sites. One of the resulting effects of these events is fires, for which a growing percentage of all the fatalities in these events can be attributed to. While Costa Rica is threatened by all disasters, fire is both the most prevalent and the most preventable. Just this January, Costa Rica's Fire Department responded to several hundred serious fire emergencies, 63 of which were structural fires (The Tico Times, 2020). Every year these structural and electrical fires claim an unsettling number of lives.

In 2006, Costa Rica adopted National Fire Protection Association (NFPA) regulations to improve the fire safety of the country's infrastructure following public pressure surrounding several deadly fires that devastated the country. These regulations became supplemental to the construction standards already issued by the government in 1983 with specific requirements to protect building occupants from physical harm or potential loss of life, as well as building stakeholders from financial ruin. Every construction project in the country is intended to abide by these regulations; however, even with these in place, the number of deaths and the destruction caused by fire remains high. In 2018, the Fire Department of Costa Rica reported 1,126 structural fires that claimed the lives of 30 individuals and injured 506 more (American Expatriate, 2018). The majority of these fires took place in homes, where the rest occurred in commercial infrastructure. In January 2020, 150 homes were destroyed due to fire in Guararí, Heredia (a

district directly north of San Jose) leaving approximately 530 residents of the area homeless (The Tico Times, 2020). These devastating disasters should not be overlooked, therefore we intend to contribute in the ongoing effort to reduce the number of structural and electrical fires and their fatalities.

The Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (Federal College of Engineers and Architects) is the professional association of engineers and architects in Costa Rica and were the sponsors for this project. One of the main goals of the Colegio Federado de Ingenieros y de Arquitectos (CFIA) is to promote the progress and safe practice of engineering and architecture. To assist in and continue prioritizing and improving life safety in Costa Rica, the goal of this project was to work in cooperation with CFIA to create a database of common construction materials. We hoped this would ultimately help professionals abide by the country's fire regulations.

There were two parts to this project that ensured a thorough analysis. First, an inventory of materials that either have or do not have information detailing their resistance to factors including heat, fire or electric shock, testing laboratories, providers, contacts in the United States and Europe, etc. This specific list gave the construction sector enough information to adapt and comply with regulations by avoiding materials that are being imported without proper information or testing related to fire safety, and to choose from a list of recommended materials. These materials included but were not limited to: lights, tools, air conditioning units, fire alarms, electric power strips, ceiling panels, fire doors, and hardware. Once a list was compiled, products that did not comply with safety regulations were able to be easily identified and refused. Providing contacts and origins of materials gave the CFIA the ability to work domestically and internationally to improve and integrate better materials for safety within the construction sector.

Next, the second part of the project began where a cost comparison was compiled to show the economic feasibility of building with compliant materials.

Based on a past project that conducted a study in conjunction with the CFIA, financial viability is a key component of achieving success in Costa Rica (Ostrowski, 2019, p.8). So, it is important to be conscious of cost while still abiding by the guidelines from section one of the project. Ideally, this project will promote greater efficiency in the enforcement of NFPA regulations by allowing professionals to be completely informed about specific materials they are using related to cost and fire safety. These two parts provided an integrated approach to assisting engineers and architects to ultimately reduce the incidents of fires in buildings across Costa Rica.

2.0 Background

The Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CFIA) of San Jose, Costa Rica is one of several professional organizations responsible for regulating engineering and architectural practices in Costa Rica. The CFIA benefits greatly from the National Fire Protection Association (NFPA), an international organization whose codes and standards have influenced Costa Rica and the CFIA to work towards implementing improved fire safety. In complying with NFPA safety guidelines, the CFIA is increasingly interested in product testing for construction materials. Information published by the Occupational Safety and Health Administration (OSHA) serves as a resource for testing information on any Nationally Recognized Testing Laboratory (NRTL), including Underwriters Laboratories (UL). These organizations are each concurrently vital to understanding and implementing fire-safe materials and practices.

2.1 History of Fires in Costa Rica

Costa Rica has experienced a long history of structural fires, most of which are caused by faulty electrical or kitchen equipment. These fires generally occur near regions of the country with lower wealth accumulation. According to the Fire Department of Costa Rica, poor workmanship and cutting corners in the construction and wiring of buildings is to blame in these areas. Substandard electrical appliances and lighting with defective wiring, loose connections, and electrical imbalances all lead to these building fires. Ing. Hector Chaves, head of the Fire Department of Costa Rica, reported that nearly 1,000 people are left homeless annually due to electrical fires (Inside Costa Rica, 2012). Several of these deadly fires have been monumental in

motivating change towards saving homes and lives. One of these is the 2016 fire that destroyed a historic building: the Black Star Line building (Arias, 2016). Another is the 2005 Calderon Guardia Hospital fire that claimed 19 lives. In situations like these, required safety measures including fire hoses, emergency lighting, and fire escape were not actively in place (NBC News, 2005).

2.2 National Fire Protection Association (NFPA)

The NFPA is a codes and standards organization that began in 1896 in Boston, Massachusetts. What started in the United States is now backed by both developed and developing countries worldwide. It provides public education, outreach and advocacy, training, and research related to fire safety. Today, the NFPA has initiatives worldwide throughout Asia, Europe and Latin America that work to assist international members to improve fire, building, and life safety. The organization works to prevent death, injury, property, and economic loss from fires or electrical hazards with over 300 codes to follow and about 50,000 members worldwide (NFPA, 2020). One of NFPA's most important codes also happens to be their first: NFPA 13. This is their standard for the installation of sprinkler systems, one that has proven to be lifesaving countless times. Since the development of this first code, other countries have adopted subsequent codes to improve their own fire safety standards.

2.2.1 NFPA Codes and Standards Implementation

Knowledge and requirements of NFPA codes varies between owners and occupants of buildings. Owners must have an updated knowledge of all codes, as their buildings have regular inspections by local authorities. In these inspections, fire exits, exit signage, functional fire extinguishers, and storage of flammable materials are assessed. Failure of a building owner to

abide by regulations can result in a notice of required action or full closure of the building until compliance with NFPA codes has been demonstrated. As for the occupants within buildings, it is their responsibility to identify and avoid any potential fire hazards in their surroundings. Fire hazards may include unattended flames, defective electrical systems, exceeding maximum occupancy, gas appliances, etc. Additionally, fire protection equipment such as fire alarms and fire extinguishers must be present alongside a stepwise evacuation plan.

2.2.2 NFPA 101: Life Safety Code

Known widely as the Life Safety Code, NFPA 101 covers safety in both new construction and existing buildings. It is most commonly used as a source to help protect people from fire and other hazards in building construction and occupancy. Specifics in preventing issues with materials, injuries from falls, and emergency communications are detailed in the code. NFPA 101 is relevant to architects, engineers, building owners, hospital administrators, and anyone with roles related to fire safety practices. To keep up with modern changes in building practices and technologies, NFPA 101 is thoroughly revised and updated every three years.

2.2.3 Costa Rican NFPA Involvement

A life safety committee within the CFIA is responsible for promoting and implementing NFPA regulations. A past project involving these CFIA and NFPA codes included research into the economic and social feasibility of building professionals in Costa Rica following NFPA regulations (Andrews, 2019, p.33). Many buildings in Costa Rica are not currently up to code and would need to be completely rebuilt to reach compliance. Randall Murillo, the executive director of the Costa Rican Chamber of Construction, noted that standards and codes for new buildings are very different from those put in place when older buildings were constructed.

Murillo expresses approval of safety measures getting stricter; however, knows that it is technically and economically impossible to meet some of the conditions. So, the general opinion of contractors and architects is that it is too expensive to implement NFPA codes.

In the case of existing or older buildings, fire inspectors from the National Insurance Institute (INS) of Costa Rica are expected to conduct routine check-ups. Unfortunately, inspections are infrequent due to understaffing and buildings are left in violation of NFPA codes. For perspective, between the years of 1994 to 2005, INS was able to inspect only 227 buildings (Andrews, et. al., 2019).

2.3 Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CFIA)

In 1971, the CFIA was created, and now operates under five sub-colleges: the Colegio de Ingenieros Civiles (CIC), the Colegio de Arquitectos (CACR), the Colegio de Ingenieros Electricistas, Mecánicos e Industriales (CIEMI), the Colegio de Ingenieros Topógrafos (CIT), and the Colegio de Ingenieros Tecnólogos (CITEC). Each group has an educational and professional focus in a specific discipline that together make up the CFIA. Within these groups the CFIA is responsible for controlling and regulating practices in engineering in Costa Rica (CFIA, 2015).

Figure 1. The CFIA Headquarters

The CFIA makes it its mission to ensure efficient, responsible, and interdisciplinary practice of engineering and architecture to promote safety and sustainable progress within the country. The organization works to promote cooperation with other professional federations and technicians to improve the country's development, and to create permanent commissions to analyze and study national problems. One major project that this organization has worked on is the development of the digital processing of construction permits and the registration of survey maps (CFIA, 2020). With the ongoing modernization of various aspects of construction throughout Costa Rica, the project contributes through the creation of a digital construction material inventory. A fire protection database promotes more user-friendly, accessible, and sustainable resources for engineers and architects to utilize in their projects through the CFIA.

2.3.1 Colegio de Ingenieros Electricistas, Mecánicos e Industriales (CIEMI)

The College of Electrical, Mechanical, and Industrial Engineers in Costa Rica is an organization with 49 years of history, whose mission is to promote excellence and professional etiquette of its members in the interdisciplinary management of sustainable engineering solutions. Its efforts are aimed at satisfying the needs of society and making Costa Rica a better country. They work in tandem with government institutions, international groups, universities, and other professional associations to educate engineers on the rules and regulations of professional practice at their training center. One of their most recent goals is to have a management model that ensures synergy between each discipline that makes up CIEMI by 2022.

2.4 Occupational Safety and Health Administration (OSHA)

In 1970, the United States government passed the Occupational Safety and Health Act, which created the Occupational Safety and Health Administration (OSHA), which now operates under the United States Department of Labor. OSHA started and continues to enforce standards that advocate for safe working conditions for employees. OSHA sponsors three committees, one being the Advisory Committee on Construction Safety and Health (ACCSH). ACCSH provides advice and assistance specific to construction standards and policy. They oversee the regulation of construction, along with the organization of outreach efforts that work to prevent workplace falls, prevent injuries, and advocate for women in construction (OSHA, 2020). ACCSH also conducts special OSHA initiatives and handles construction incident investigation engineering reports.

2.4.1 Nationally Recognized Testing Laboratory Program (NRTL)

OSHA provides a list of laboratories that they recognize as capable of performing certain product safety certifications. These laboratories all meet electrical standard requirements for construction and other industries. Under each recognized laboratory is a list of test standards they are eligible to certify for, and a unique logo that an eligible manufacturer can assign to qualified products. This logo marking informs consumers that a recognized laboratory has tested and certified a product, and that one or more safety standards have been met.

2.5 Underwriters Laboratories (UL)

UL is a not-for-profit global certification company that has expanded from the United States to more than 70 countries since 1894, with efforts centered around safety and sustainability. UL has set more than 1,500 standards necessary for manufacturers to achieve

compliance and attain UL product certification. To date, UL has performed testing to certify several billion products that meet quality and performance expectations (UL, 2020). For

Figure 2. The Official UL Certification Seal

consumers, buying UL listed products minimizes risk, and conveys a recognized level of operational safety for the product and reliability for the manufacturer.

2.5.1 UL Product iQ Database

The UL Product iQ database provides free access to certification information on products and materials where a multitude of information from UL is integrated into one public site. The Product iQ database works as a search engine and gives users access to information on any UL listed product. When a keyword or certification number is entered into the search bar, a list of products is returned based on that keyword or certification number. Users can then verify the UL certification of products or components, locate UL guide information, search for better-suited alternative products, or confirm specifications.

2.5.2 Norma Oficial Mexicana (NOM)

Norma Oficial Mexicana (NOM), or Official Mexican Standards, is a series of standards and technical regulations issued in Mexico. NOM compliances currently establish characteristics and certifications that processes or services must meet regarding general safety, as well as

guidelines related to terminology and application. Costa Rica's homologation process; however, does not accept NOM standards for materials to be imported or commercialized in Costa Rica. The standards and regulations issued by NOM, along with tests performed by laboratories in Mexico, fail to comply with the standards Costa Rica has put into place.

2.6 Fire Safety Testing

Fire safety testing involves exposure of materials or products to an ignition source and then a pass or fail criteria is established based on flame spread and heat release rate, as well as temperature. The two main categories of fire testing include "bench scale" and "real scale" fire tests. The bench scale test provides insight to overall flammability of a material and its overall reaction to fire. Real scale testing involves burning full size products - materials are placed under a hood and sensors measure the amount of heat and smoke released during ignition. Collectively, the bench scale testing develops a set of the material properties that can simulate a reaction in a larger fire and the real scale fire testing is then used to "calibrate" the larger fire model that scientists create to test the materials (Reax, 2020).

Although there are fire-rated materials accessible for use in construction in Costa Rica, they are not consistently utilized. In order for a material to be considered fire-rated, it must undergo testing by a recognized third party laboratory and ultimately receive a label for passing certain tests. In many cases, vendors will sell a mix of compliant and non-compliant materials. Typically, the non-compliant materials are less expensive. Some material providers fail to present the difference in product quality or code adherence between compliant and non-compliant products to consumers, resulting in unintentional use of non-compliant options attributed to their lower price-point (Andrews, et. al., 2019). By developing a cost analysis alongside a database

with easy access to fire-rated materials, this project should encourage use of compliant materials within the construction sector.

2.6.1 Certificate of Compliance

A Certificate of Compliance is a specific document that is issued by a Nationally Recognized Testing Laboratory (NRTL). In the case of Underwriters Laboratories (UL), a Certificate of Compliance states that a product has been both evaluated and meets certain specifications set in the regulatory documents for that specific case. Regulatory documents include rules, guidelines, characteristics of results, technical specifications, codes, and standards. Included in a product evaluation are procedures for sampling, testing (including fire testing), calibration, certification, and surveillance (UL, 2020). Each of these criteria are crucial in understanding the legitimacy and safety of a product or material. For this project, a Certificate of Compliance determined whether or not certain materials were included in the final database.

3.0 Methodology

The goal of our project was to work in conjunction with our sponsors at the CFIA to develop a database of common construction products that could provide necessary information to help professionals abide by the country's fire regulations. To construction professionals, materials are mainly divided into two segments; listed and unlisted. These terms correspond to whether or not building materials can be found in the database of a certified testing laboratory. The chosen laboratory for our project is the Underwriters Laboratory and their database for finding listed materials is the UL iQ.

Before our analysis began, we made an effort to get an in-depth understanding of the fire codes and applications set in Costa Rica. This was necessary to determine how to distinguish between compliant and non-compliant materials. We managed to achieve a thorough and cohesive analysis of UL iQ listed materials and comparable unlisted materials. Through this, we compiled them into a digital spreadsheet that is both beneficial and accessible to engineers and architects throughout Costa Rica through placement on the CFIA's website. In order to accomplish our goals, the following objectives were developed:

1. Understand current NFPA code applications, infrastructure, and enforcement procedures in Costa Rica.
2. Collect certification information for listed materials for the database and determine if materials are up to code and what laboratories they were tested in.
3. Construct a cost analysis comparing listed fire-safe materials versus unlisted materials.
4. Create a finalized database containing the information on the listed materials and establish a framework for continued use and refinement.

Our CFIA sponsors informed us of the issue of contractors not always building with fire-safe materials and oftentimes opting for non-laboratory certified materials or “fake” certified materials because they are cheaper, and easier to obtain. We researched what materials are compliant and input them into an accessible database as our first step in promoting the use of certain compliant materials. In addition, we included the corresponding testing laboratory and manufacturer information to make it easy for contractors to know which materials to buy, and where they are available for purchase. Lastly, we completed a comparative cost analysis that we hoped will give insight into the difference between compliant and non-compliant materials. This was achieved through finding low-cost compliant materials for the cost analysis. As a whole, this project will help promote the widespread use of fire-tested materials in construction throughout Costa Rica. The steps we took that permitted our objectives to be achieved are outlined in the subsequent sections.

3.1 Understand Current NFPA Code Application and UL Certification Requirements

In order to create a suitable list of materials, our team first examined current building safety codes in Costa Rica. The extensive research that we conducted in addition to the background knowledge obtained was critical in correctly interpreting the NFPA codes and their various applications.

Our team underwent training by our sponsors in order to fully understand the NFPA 101 Life Safety code, which is just one of the over 300 codes that Costa Rica requires all building designs and construction plans to follow. In the training, we were guided through each step of the application, infrastructure, and enforcement procedures taken by the NFPA. Additionally, we corresponded via email with Fire Protection and Electrical Engineers at WPI in order to gain

more information on procedures followed by UL to set nationally recognized safety and sustainability standards to lower consumer risk of fire.

3.2 Examine Technical Sheets for Listed Materials and Determine Compliance with the Fire Safety Codes

Using a list of technical sheets of starter materials given by our sponsor, Mario Amador (Director General of CIEMI), our team addressed both electrical and mechanical type products. These include but are not limited to:

- Electrical boxes
- Electrical conduits
- Electrical cables
- Telecommunications cables
- Lighting equipment (luminaries, bulbs, etc.)
- Power outlets and devices
- Communication devices
- Electrical power distribution equipment (load centers, breakers, meter bases, etc.)
- Electrical cable joint terminations (tape, lugs, connectors, etc.)
- Fire detection devices
- Fire suppression equipment
- General and special equipment (cameras, appliances, motors, etc.)

Subsequently, our team conducted further research using the given categories of common construction materials and added our findings to our initial list. Each new addition was scrutinized whether or not they are compliant with UL codes.

To gather information on these specific materials, we used the UL iQ database to search for codes listed under each specific material that is either imported to or manufactured in Costa Rica. By looking at the technical sheets for each material, we found the name of the material to search in UL iQ. We then looked for the company that produced the material and use this to identify the material in the UL iQ database. Lastly, if the product appeared in the UL iQ

database, we cross-checked the specific model numbers present on the technical sheet with the model numbers that are UL certified. If all the information is consistent, the material name, model numbers, and company information were recorded in our database. Along with this information, the UL file numbers and parent category numbers (CCN) were recorded and can be used to locate the materials in the UL iQ database more quickly in the future. The aim of this process was to sort listed and unlisted products from the technical sheets given to us.

3.3 Identify the Laboratories that Tested the Materials

For each product or material our group gathered information on, we identified the laboratory that had performed tests on said product or material by viewing technical sheets. We must ensure that testing laboratories meet the standards Costa Rica is enforcing through their adoption of NFPA regulations. There are many agencies around the world that certify the fire safety of products. There is the Intertek company as well as the CE marking. However, after consulting with our sponsors, we decided as a group to narrow our search window to products certified by UL. We learned that the UL certified products for use in the United States and Canada, and this certification was also acceptable in Costa Rica. The reason CE was not acceptable was that it was certification as per European standards which were not compliant with Costa Rican standards. Our sponsors also informed us about the fact that products with CE marking are sometimes fake and have not been tested. On this basis we chose the UL as our preferred testing laboratory.

3.4 Compare the Cost of the Listed and Unlisted Items

As a group, we understood that engineering projects must always be economically conscious, and thus conducted a cost analysis when executing the project. Currently, in Costa Rica, contractors opt to use less expensive unlisted products to complete their buildings. We anticipated the materials that comply with NFPA codes would be more expensive than those that did not. This expectation stemmed from claims that contractors were cutting costs and using unlisted materials - a theory that has been confirmed by our sponsors at the CFIA.

First, in looking to do a small-scale cost analysis that the allotted time would permit, we asked our sponsors to select a few products from each category to focus on. We then found the prices of listed construction materials by first identifying the suppliers of respective items, with information available on the technical sheets of each individual product. After obtaining manufacturer information, we searched for listed product prices. Our sponsors assisted us in finding the prices of listed materials as well by providing us with price sheets from manufacturers as well.

In addition, we researched Chinese and/or European websites for materials because those would most likely be CE marked and not up to the standards of the US and Costa Rica. We focused on non-compliant materials that were physically comparable to the compliant materials. Once those materials were found, we examined their technical sheets and/or product information on the website to determine if the product was CE/NOM or potentially not certified at all. These were then included in the database as their costs were implemented into the cost analysis. After the select compliant and non-compliant materials were found and recorded, their prices were compared, focusing on the difference between the compliant and non-compliant products, specifically within each category.

4.0 Findings

Upon beginning our work on this project, we focused primarily on the relationship between the NFPA 101 Life Safety Code and UL requirements for product certification. Learning about the Life Safety Code and UL standards allowed us to find a focus for our project, where we identified specific UL certified products using the UL iQ database and found their costs. Additionally, we researched comparable non-compliant/ non-UL certified products and their costs. Our final deliverables are a database of compliant and non-compliant materials, and a completed cost analysis concluded with findings and impacts that we have detailed below. An unfortunate consequence of the COVID-19 pandemic is the missed opportunity for our team to conduct this project in person, as experiencing and interacting with the community in San Jose, Costa Rica would undoubtedly have strengthened these outcomes. Despite completing the entirety of our work on this project remotely, our team was able to experience a presentation by our sponsor, Hernan Hernandez, on the NFPA 101 Life Safety Code and its applications in Costa Rica. Additionally, we were successful in compiling a database of compliant and non-compliant products, and creating a cost analysis that highlights monetary differences between comparable compliant and non-compliant products in 14 separate Mechanical and Electrical categories. Several of our findings have direct social and economic impacts which we have discussed in-detail below.

4.1 Significance of NFPA 101 Life Safety Code

NFPA 101 Life Safety Code training was a key part in our undertaking of this project. Our training was organized by one of our sponsors, Hernan Hernandez, and took place during the

second week of our project. Hernan briefed our team on all aspects of the NFPA 101 Life Safety Code, on topics including: the need for certified exit signage, updated active and passive fire protection systems, appropriate means of egress, outdoor meeting points, effective emergency protocol, and using fire-rated construction materials.

Most crucial to our project is what Hernan taught us about using fire-rated construction materials. It was made clear to us in our NFPA training that buildings in Costa Rica, especially those constructed before 2005 (pre-adoption of NFPA guidelines), have not integrated or properly utilized fire-safe and laboratory certified materials. In training, our team observed a number of instances where non-compliant materials were being used, or where compliant materials were being used improperly. Essentially, if proper use or installation of products is not followed per the guidelines of the manufacturer, safe materials become unsafe.

Although sixteen years have passed since the adoption of NFPA guidelines by Costa Rica and fire-safe, certified materials are even more widely available than non-certified materials, some engineers and architects still utilize unsafe practices. While more certainly needs to be done in preventing misuse of certified materials, our findings focus primarily on encouraging their use over materials which are not certified.

This training compounded our own awareness surrounding the importance of NFPA codes, and showed our team exactly what happens when codes are not followed. Small details in construction practices that may seem tedious to abide often make the biggest difference in preventing fires.

4.1.1 Social & Economic Impacts

There are a number of social and economic impacts given by implementing and following the NFPA 101 Life Safety Code in Costa Rica - the first and most obvious being the potential to save lives. When contractors and professionals abide by the code, fires are less likely to occur, and in turn, lives are saved. From the perspective of those people who do not have a stake in the construction sector, knowledge about Life Safety would better equip them to spot and avoid dangers that may otherwise be overlooked. To better enforce the NFPA 101; however, older construction would need to be renovated and brought up to standard. Doing this not only involves cooperation from the public, but imposes a certain financial barrier as well. The costs of new construction and renovations are more expensive when abiding by the codes, which has definite impacts on the economy. For the list of products included in our cost analysis, the price of fire safe materials is always higher than the less safe alternatives. This claim is explored further by the cost analysis we conducted and is detailed below.

4.2 Understanding of UL Requirements and the Fire Testing Process

After considering an array of compliant and non-compliant materials, we concluded that UL is the most reliable testing laboratory. UL surpasses other recognized testing laboratories, as UL sets the standards to which other laboratories (Intertek, et al.) follow. Professor and Department Head of Fire Protection Engineering at WPI, Prof. Albert Simeoni, confirmed that "UL develops the tests and Intertek only applies them." ETL (Intertek), CSA (Canadian Standards Association), and TUV (Technical Inspection Association) testing laboratories can be used to identify compliant materials as well, but do not offer a resource like the UL iQ that would allow us to identify products given the constraints created by our timeline.

As for the fire testing process, we learned that specific materials require specific testing. According to Simeoni, “you have a pass/ fail criterion and you usually expose the material to external heat. If the material ignites below a certain time and/ or releases an amount of energy higher than a certain threshold, it will fail the test.” While this general process applies to the majority of testing, we know that individual products are assigned different testing criteria. For example, we divided materials into “Mechanical” and “Electrical” categories. Within these two groupings, “extinguishers” and “lamps” require different testing protocols in order to prove their safety and receive UL certification. Because these materials undergo rigorous testing and some are even exposed to fire, UL certification means NFPA compliance.

4.2.1 Social & Economic Impacts

Certain fire-safe products are more expensive because of the testing they undergo. For a product to withstand fire testing and pass, the manufacturing of that product must go through extensive measures to ensure certification. Products which are not certified are not subjected to these testing measures, which means they may be offered for a lower price. Without undergoing safety testing, the behavior of these products in the case of fire is entirely unknown and is likely unsafe.

4.3 Identification of Products

When our sponsor, Mario Amador, delivered technical sheets for select materials, we found that there were more compliant products than non-compliant ones in the group. When searching for our own technical sheets and new products to include in our database, compliant

products were frequently found and widely available, especially through UL. The UL iQ database was incredibly user friendly, and simplified the process of searching for products and their specific models listed on technical sheets to determine certification status. This finding can be extended to contractors and architects, as this tool provides an easy shortcut to determining if a product or model is safe to use. It is important to note that in some instances, when using the database, we found products that are specifically UL certified in Canada. Our sponsors confirmed that in these cases, products are compliant, because Canada has standards consistent with those across the entire UL system.

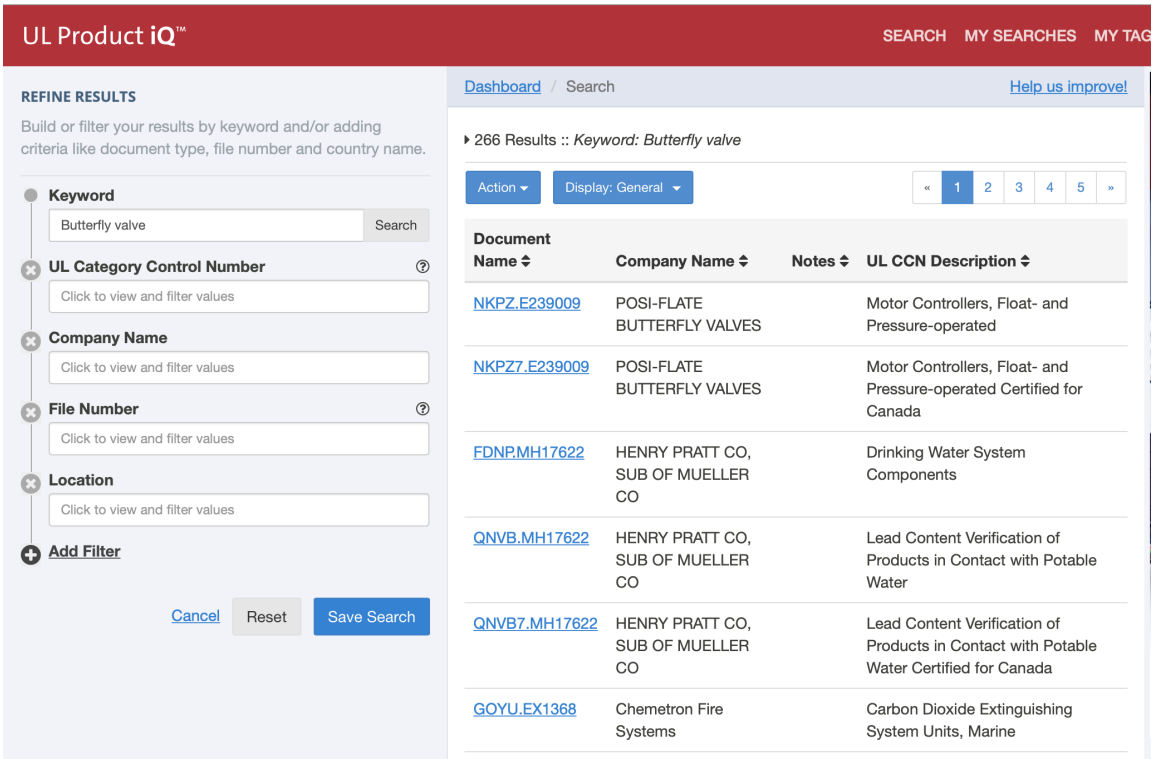

Figure 3. The UL iQ Search Interface

There were several cases of our team looking to check the certification of a certain material found on a specific technical sheet where a product with a matching name could be found in the database, but not the specific product matching the company information/ model number on the technical sheet in question. This situation indicates that the specific product given by the technical sheet was non-compliant, however, a compliant version of the product could easily be substituted from results returned by the UL iQ search. We also found that in some cases, certain products that are offered in multiple models may have some compliant and some non-compliant model versions, as not every model number was present in the UL iQ search, only some. This emphasizes the importance of the user to pay close attention to the specific model in question, not just the material name and company information as some products are sold in both certified and non-certified versions.

4.4 Finding and Comparing the Cost of Compliant and Non-Compliant Materials

Our team created a small-scale cost analysis with the help of our sponsor, Mario Amador. Mario assisted our team in choosing a few products from our list of compliant ones that would best encompass each category we covered. We found prices for each compliant material, and did the same for comparable, non-compliant alternatives.

Considering UL certification requirements and the fire testing process, we assumed that compliant materials/ UL certified materials cost more than non-UL certified materials. As we analyzed costs of specific compliant and non-compliant materials, we confirmed this suspicion. In our findings, the average percent increase between compliance and non-compliance vary between different categories of materials. For example, compliant products in the “Conduits” category were not dramatically more expensive than comparable non-compliant ones, but the

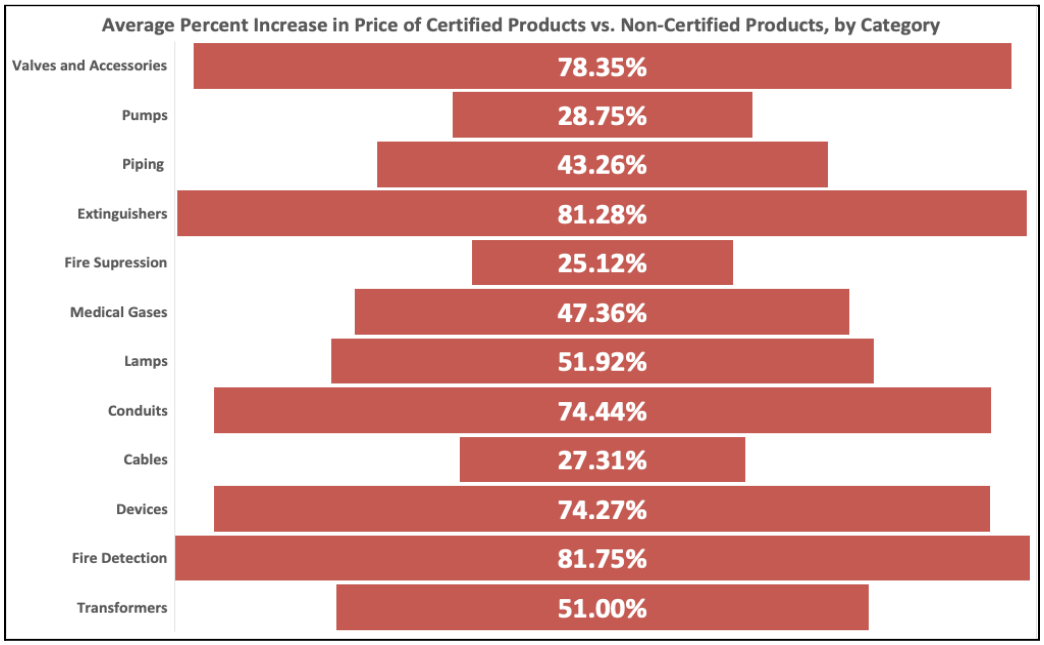

Figure 4. Average Percent Increase in Price of Certified Products vs. Non-Certified Products

same is not true for materials in the "Fire Detection" category. The UL certified materials we found were, on average, 55% more expensive than comparable non-certified materials (Figure 5). Some limitations in our ability to find accurate prices should be noted, as the prices of our non-certified materials do not take into account the cost of importing from China. As the prices of importing these products is considered, the percent increase in certified materials becomes smaller - providing added motivation for these to be implemented and used as they are already more widely available.

Another way we approached these findings was in examining the price increase by the dollar amount. It was apparent; however, that the price increase between compliant and non-compliant materials was dependent on the product category. For products such as "Devices," "Cables," "Conduits," and "Lamps," there was a minimal average difference in price - ranging from $1.21 to $31.46 - between the compliant and non-compliant materials. The same was not

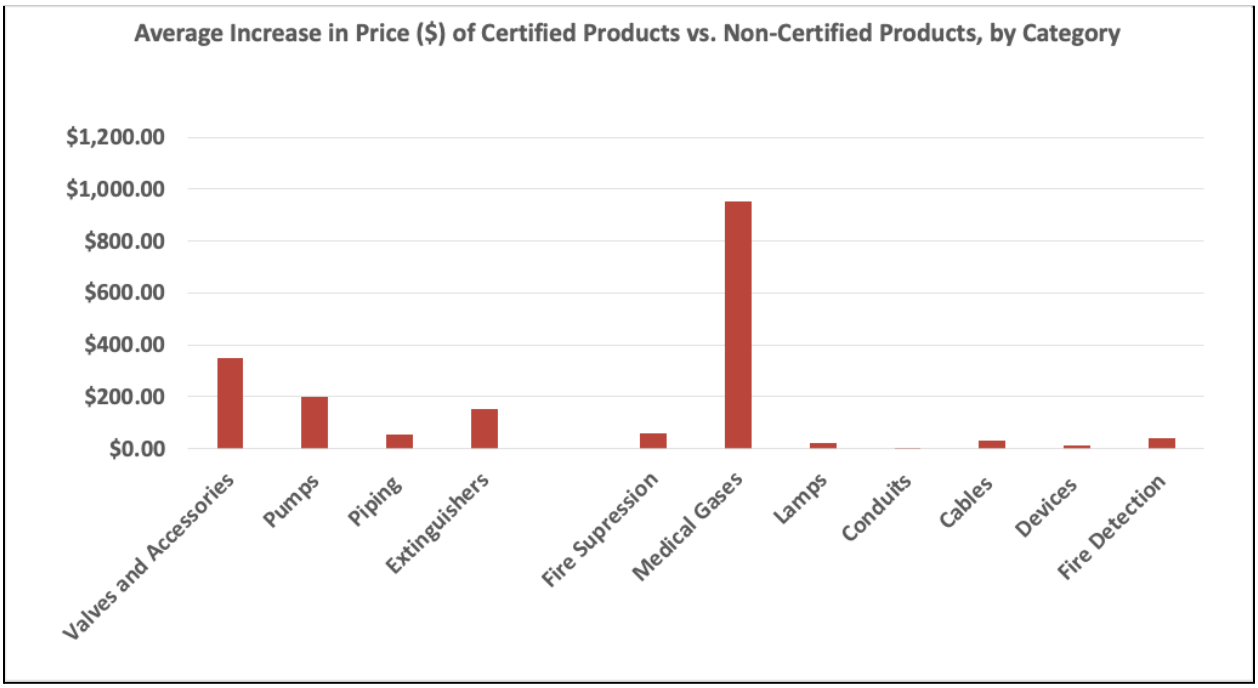

Figure 6. Average Increase in Price of Certified Products vs. Non-Certified Products

true for the categories of "Medical Gases" and "Valves and Accessories," where we observed a much more dramatic increase.

In any case, using compliant products will cost more up front. While these price increases seem significant on a smaller scale, they are not overly consequential on the scale of a large construction budget priced in the millions of dollars - especially with safety in mind.

4.4.1 Social & Economic Impacts

The most significant social impact is the one that incited us to take on this project: the idea that construction costs are significantly greater when certified materials are used. Putting a tangible average percentage on the increase in certified prices may help stop misconceptions that lead to unsafe products being used in Costa Rica, as price differences may not be as substantial as contractors currently perceive. Additionally, if compliant products are used more frequently,

new buildings will be greater protected against incidents of fire, improving the safety of those individuals who occupy the buildings.

While we acknowledge that building with compliant products does increase costs up front, we do not believe that this is economically detrimental in Costa Rica. Proactivity and following codes in new construction eliminates the need for redesigns later on, and can prevent the possibility of building fires that may result in loss of money and insurance battles.

5.0 Conclusions and Recommendations

The following provides a summary of our findings determined through our work, and details our recommendations for continued use and refinement in remedying the issues that Costa Rica is facing with encouraging and regulating the use of fire-safe products in construction.

5.1 Conclusions

The goal of this project was to work with the Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (Federated College of Engineers and Architects) to compile a database of fire-rated materials to be used by professionals and contractors in the construction sector throughout the country. Our database was compiled in an Excel spreadsheet and integrated into a cost analysis of certified/ fire rated versus non-certified/ non-fire rated products. This was completed with the goals of encouraging the use of compliant products by engineers and architects. Our team has developed recommendations aimed to increase use of compliant materials in new construction and spread the knowledge that using fire-safe materials is not detrimental to construction budgets, but may actually be beneficial in saving money in the long run.

In communicating with our sponsors, Mario Amador and Hernan Hernandez, our team was informed of a disproportionate use of non-compliant products considering how widely available and prominently accessible compliant materials are. This is a major safety issue in Costa Rica, as the NFPA 101 Life Safety Code cannot be adequately adhered to without the use of compliant and fire safe materials. Our team hopes that our findings and recommendations will

provide a helpful foundation for the CFIA to promote life safety and prevent fires in Costa Rica. Additionally, our team hopes that this project will raise awareness of the accessibility of compliant materials as well as emphasize the UL standard and educate others on the matter.

5.2 Recommendations

Given the time allotted for this project, our team was able to compile a database with an accompanying small-scale cost analysis. Had time not been a constraint, our cost analysis could have been expanded to include each product listed in our database, which may have refined the accuracy of our findings and conclusions. If we were able to travel to Costa Rica, we could have worked more directly with contractors who have access to company pricing sheets that may also have assisted us in expanding our cost analysis. Additionally, we could have worked more closely with our sponsors, as well as other engineers and architects within the San Jose community. These individuals may have helped our team to further investigate the reasons why compliant products are not always being chosen over non-compliant ones. Despite the obstacles our team faced in completing this project remotely, we were able to develop recommendations for the CFIA through communicating with our sponsors and conducting some additional research. Our recommendations include:

1. Promote NFPA courses and training within the country, and work with the NFPA to ensure that courses are easily accessible to their members, as well as to CIEMI and CACR.
2. Raise awareness towards the UL iQ database so architects and contractors can use it more routinely to promote use of compliant materials.
3. Develop a database similar to that of UL iQ but for the other certification companies.

4. Integrate all global standards into one universal standard.

First, promotion of NFPA courses and training is both necessary and beneficial for proper fire safety and building construction. The CFIA, as well as CIEMI (College of Electrical, Mechanical and Industrial Engineers) and CACR (Costa Rican Association of Architects), should strongly encourage all of its members to take advantage of the resources that are presented to them by the CFIA. Widespread education and encouragement of obedience to these codes will ultimately reduce fires caused by faults in the infrastructure that could have been avoided.

Secondly, we found the UL iQ database to be extremely user friendly and a quick and efficient way to determine the compliance of a certain product. At the beginning of the project; however, we were completely unaware of its existence - the same being true for many contractors and architects. Increased awareness of this database is crucial in avoiding the use of non-compliant materials due to a lack of knowledge and resources. We recommend that the CFIA implement courses, such as the webinar offered on the UL website, in the training and professional development on the UL iQ database. This will inform all professionals of the services that allow them to search for UL certified materials and components, as well as to review relevant safety certification documents and material performance data.

In addition to a course on the use of UL iQ, it would be beneficial to include courses explaining the difference in the certifications as our sponsors explained to our team. These courses could include information about ETL (Intertek), CSA (Canadian Standards Association), and TUV (Technical Inspection Association) testing laboratories that all are OSHA recognized, and are qualified to certify materials as compliant. As a result, there would be an understanding of the different certifications that exist, and encourage further use of materials certified by those

laboratories. Our team recommends there also be courses describing the CE marking and NOM (Mexico certification). These certifications are considered not up to the standards of the U.S. or Costa Rica; therefore, materials marked by CE and NOM are considered noncompliant. It is important for contractors and architects to understand the differences among the standards, and that a marked material does not necessarily deem it compliant.

Third, when conducting research, there were very few challenges in determining if a product was UL certified because there was a database that could be searched for specific products. When examining other certification laboratories; however, such as ETL (Intertek), CSA (Canadian Standards Association), and TUV (Technical Inspection Association) testing laboratories, there was no such database in existence. This made it difficult to determine if materials were certified by these specific laboratories. The creation of a database similar to that of UL iQ for these other recognized laboratories would contribute to the ongoing effort of improving accessibility to compliant materials.

Lastly, we recommend a future project that a capable laboratory such as UL could take on in the future: creating a universal global standard. If compliant materials could all be found in one place, or share the same identifying marking, compliant materials would be more widely integrated globally. By currently having materials certified by various different laboratories, materials are difficult to identify and it is difficult to determine compliance or non-compliance because such alternative certifications are not as well-known or reputable as UL.

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Appendix A: Cost Analysis

Complete cost analysis (below) comparing compliant and non-compliant product pricing.

Category	Material Name	Compliant Price	Non-Compliant Price	% Difference	Price Difference	Average % Difference	Average Price Difference
Valves and Accessories						**78%**	**$ 348.99**
	Waterflow Detector	$ 184.34	$ 150.00	19%	$ 34.34		
	Butterfly Valves, Lugged Wafer	$ 762.40	$ 50.00	93%	$ 712.40		
	Model G Swing Check Valves	$ 600.00	$ 57.00	91%	$ 543.00		
	Check Valve: Swing	$ 345.24	$ 25.00	93%	$ 320.24		
	Test and Drain Valve	$ 139.99	$ 5.00	96%	$ 134.99		
Pumps						**41%**	**$ 200.00**
	Centrifugal Fire Pumps, Vertical Turbine	$ 800.00	$ 500.00	38%	$ 300.00		
	Centrifugal Fire Pumps, Horizontal Split Case	$ 500.00	$ 400.00	20%	$ 100.00		
Piping						**43%**	**$ 54.87**
	Grooved and Plain End Fittings	$ 137.96	$ 78.00	43%	$ 59.96		
	Rigid Coupling	$ 202.98	$ 77.34	62%	$ 125.64		
	Flexible Coupling	$ 33.98	$ 20.00	41%	$ 13.98		
	Grooved Flange	$ 74.88	$ 55.00	27%	$ 19.88		
Extinguishers						**79%**	**$ 152.63**
	Water & Foam	$ 256.00	$ 25.07	90%	$ 230.93		
	Carbon Dioxide (CO2)	$ 206.00	$ 37.00	82%	$ 169.00		
	ABC Dry Chemical	$ 80.96	$ 23.00	72%	$ 57.96		
Fire Supression						**37%**	**$ 60.60**
	Cabinets	$ 248.46	$ 66.79	73%	$ 181.67		
	SL)	$ 5.96	$ 6.00	-1%	$ (0.04)		
	Sprinklers, Automatic and Open (Reliabke Automatic Sprinkler Co., Inc.)	$ 6.18	$ 6.00	3%	$ 0.18		
Medical Gases						**50%**	**$ 955.00**
	Multiple Alarm Valve Combo Unit	$ 2,645.00	$ 750.00	72%	$ 1,895.00		
	Chemetron Wall Outlet	$ 65.00	$ 50.00	23%	$ 15.00		
Lamps						**52%**	**$ 23.52**
	LED Surface Mounted Luminaire	$ 39.29	$ 11.45	71%	$ 27.84		
	LED Recessed Luminaire	$ 58.18	$ 38.99	33%	$ 19.19		
Conduits						**67%**	**$ 1.21**
	EMT Connectors and Couplings, Compression Type Coupling - Steel	$ 0.46	$ 0.20	57%	$ 0.26		
	Connectors	$ 0.84	$ 0.43	49%	$ 0.41		
	4" Drawn Square Boxes	$ 1.11	$ 0.09	92%	$ 1.02		
	Conduit Bodies for Electrical Metallic Tubing	$ 4.62	$ 2.75	40%	$ 1.87		
	Octagon Boxes	$ 2.98	$ 0.09	97%	$ 2.89		
	Outlet Boxes	$ 1.27	$ 0.09	93%	$ 1.18		
	Rectangle Boxes	$ 0.92	$ 0.06	93%	$ 0.86		
Cables						**56%**	**$ 31.46**
	Thermoplastic-Insulated Wire	$ 690.00	$ 685.80	1%	$ 4.20		
	Metal-Clad Cable	$ 108.71	$ 50.00	54%	$ 58.71		
Devices						**71%**	**$ 11.40**
	Receptacles: Hospital Grade	$ 27.50	$ 3.45	87%	$ 24.05		
	Receptacles: Tamper Resistant	$ 3.47	$ 0.65	81%	$ 2.82		
	Receptacles: General Grade, Tamper Resistant, Duplex Receptacles	$ 7.89	$ 0.81	90%	$ 7.08		
	Type 3 Application, Hospital Grade, Tamper Resistant	$ 30.82	$ 0.90	97%	$ 29.92		
	Nonmetallic Cover Plates with Receptacles	$ 0.40	$ 0.40	0%	$ -		
	Receptacles	$ 5.03	$ 0.50	90%	$ 4.53		
Fire Detection						**82%**	**$ 42.16**
	Smoke / Heat/ Carbon Monoxide Detector	$ 54.00	$ 10.00	81%	$ 44.00		
	Indoor Horn Strobes	$ 50.49	$ 7.90	84%	$ 42.59		
	Indoor Strobes	$ 35.00	$ 3.70	89%	$ 31.30		
	Dual Action Addressable Manual Pull Station	$ 70.75	$ 20.00	72%	$ 50.75		
Transformers						**51%**	**$ 1,020.00**
	Liquid Filled Distribution Transformer	$ 2,000.00	$ 980.00	51%	$ 1,020.00		

Appendix B: Valves and Accessories

Complete list of compliant materials (below) listed in the Mechanical: Valves and Accessories section of our database.

Category	Material Name	Model Number	UL File Number	UL CCN	Company Information	Type of Certification
Valves and Accessories						
Valves and Accessories	WFDN Series Waterflow Detector	WFD20N WFD25N WFD30N WFD40N WFD50N WFD60N WFD80N	S739	SYKJ	SYSTEM SENSOR UNINCORPORATED, DIV OF HONEYWELL INTERNATIONAL INC 3825 Ohio Ave Saint Charles, IL 60174-5467 USA	UL
Valves and Accessories	Pressure Switches	EPS10-1, EPS10-2, EPS10-2V, EPS40-1, EPS40-2, EPS45-2V, EPS45-2R, EPS120-1, EPS120-2	S739	SYKJ	SYSTEM SENSOR UNINCORPORATED, DIV OF HONEYWELL INTERNATIONAL INC 3825 Ohio Ave Saint Charles, IL 60174-5467 USA	UL
Valves and Accessories	Cover Tamper Swtich	Model 546-8000, Model 546-7000, Model 546-9000	S739	SYKJ	SYSTEM SENSOR UNINCORPORATED, DIV OF HONEYWELL INTERNATIONAL INC 3825 Ohio Ave Saint Charles, IL 60174-5467 USA	UL
Valves and Accessories	175 PSI WWP Bronze Gate Valves	T-104-O, F-607-OTS,F-697-O,F-607RW,F-607RW, F-607-RWS, G607RW,FG607RW, M-609, F-609, F-609-RW,F-609-RWS, FM-609-RWS, G609RW	EX2586	HLQT7	NIBCO INC 1516 MIDDLEBURY ST ELKHART, IN 46515 USA	UL
Valves and Accessories	300 lb. WWP UL/FM Butterfly Valves, Lugged Wafer	LD-3510-4 LD-3510-4-WP LD-3510-4-GP LD-3510-8 LD-3510-8-WP LD-3510-8-GP LD-3510-C-8 LD-3510-C-8-WP LD-3510-C-8-GP ELD-3510-4 ELD-3510-4-WP ELD-3510-4-GP ELD-3510-8 ELD-3510-8-WP ELD-3510-8-GP	EX3184	HLQT	NIBCO INC 1516 MIDDLEBURY ST ELKHART, IN 46515 USA	UL
Valves and Accessories	300 lb. WWP UL/FM Butterfly Valves, Non-Lugged Wafer	WD-3510-4 WD-3510-4-WP WD-3510-4-GP WD-3510-8 WD-3510-8-WP WD-3510-8-GP WD-3510-C-8 WD-3510-C-8-WP WD-3510-C-8-GP EWD-3510-4EWD-3510-4-WP EWD-3510-4-GP EWD-3510-8 EWD-3510-8-WP EWD-3510-8-GP WD-3510-4-WP WD-3510-4-GP WD-3510-8 WD-3510-8-WP WD-3510-8-GP WD-3510-C-8 WD-3510-C-8-WP WD-3510-C-8-GP EWD-3510-4 EWD-3510-4-WP EWD-3510-4-GP EWD-3510-8 EWD-3510-8-WP EWD-3510-8-GP	EX3185	HLQT	NIBCO INC 1516 MIDDLEBURY ST ELKHART, IN 46515 USA	UL
Valves and Accessories	Model G Swing Check Valves	G	EX3160	HLQT	RELIABLE AUTOMATIC SPRINKLER CO INC 1470 Smith Grove Rd Liberty, SC 29657 USA	
Valves and Accessories	AWWA Resilient Wedge Gate Valve	Z41X-200 Z41X-PN16-300 Z41X-PN16-250 Z41X-PN16-200 Z45X-363 Z45X83R-363 Z45X-300 Z45X-250 Z45X-200 Z45X-175 Z45X-PN16-300 Z45X-PN16-250 Z45X-PN16-200 Z81X-300 Z81X-250 Z81X-200 Z81X-PN16-300 Z81X-PN16-250 Z81X-PN16-200 Z85X-300 Z85X-250 Z85X-200 Z85X-PN16-300 Z85X-PN16-250 Z85X-PN16-200 Z51X-300 Z51X-250	EX15973	HLQT	JINAN MEIDE CASTING CO LTD Meide Science and Technology Park Pingyin Industrial Park JINAN, SHANDONG 250400 CHINA	UL
Valves and Accessories	AWWA Check Valve: Split Clapper	DH77XSR-300 DH77XSR-250 DH77XSR-200 DH77XSR-PN16 DH77XSR-PN10	EX16203	HLQT	JINAN MEIDE CASTING CO LTD Meide Science and Technology Park Pingyin Industrial Park JINAN, SHANDONG 250400 CHINA	UL
Valves and Accessories	AWWA Check Valve: Swing	H44X2-363 H44X2 H44X2-16 H44X2-300 H44X2-200 H44X2A-363 H44X2A-300 H44X2A-250 H44X2A-200 H44X2A-PN16 H44X2A-PN10 H84X-363 H84X-300 H84X-250 H84X-200 H84X-PN16 H84X-PN10 H84XF4-363 H84XF4-300 H84XF4-250 H84XF4-200 H84XF4-PN16 H84XF4-PN10 H24X-363	EX16203	HLQT	JINAN MEIDE CASTING CO LTD Meide Science and Technology Park Pingyin Industrial Park JINAN, SHANDONG 250400 CHINA	UL
Valves and Accessories	Test and Drain Valve	A61	36Y7		GIACOMINI S.P.A. Via per Alzo, 39 28017 San Maurizio d'Opaglio (NO) ITALY	UL

Appendix C: Pumps

Complete list of compliant materials (below) listed in the Mechanical: Pumps section of our database.

Pumps						
Pumps	Centrifugal Fire Pumps, Vertical Turbine	FP10WALC-250 FP11CHC-500 FP11CLC-500 FP12CHC-750 FP12CHC-750 FP12CHC-750 FP14RJHC-1000 FP12CHC-1000 FP12CHC-1000 FP14RHHC-1500 FP14RJHC-1500 FP14RHHC-2000 FP16DMC-2500 FP16DMC-2500 FP18DMC-3000 FP18DMC-3000 FP18DMC-3500 FP18DMC-3500	EX27946	QWWQ	XYLEM MANUFACTURING MIDDLE EAST REGION FZCO PLOT NO S20120 JEBEL ALI FREE ZONE (SOUTH) DUBAI, UNITED ARAB EMIRATES	UL
Pumps	Centrifugal Fire Pumps, End Suction	2.5-384-13.5 2.5-384-13.5 2-384-11 2-384-11 2-384-11 2-384-11 2-384-11 2-384-11 2-384-11 2.5-384-7 2.5-384-7 2.5-384-7 2.5-384-13.5 2.5-384-13.5 2.5-384-13.5 2.5-384-13.5 2-384-11 2-384-11 2-384-11 2-384-11 2-384-11 2-384-11 2-384-11 3-384-11 2.5-384-7 2.5-384-7 2.5-384-7	EX15598	QWWQ	Aurora Pump 800 Airport Road North Aurora, IL 60542 USA	UL
Pumps	Centrifugal Fire Pumps, Vertical Inline	3-383-9B 2-383-9C 3-383-7A 3-383-9A 3-383-9B 3-383-7A 3-383-9A 3-383-9A 3-383-7C 3-383-9B 3-383-9B 3-383-7A 3-383-9A 3-383-9 3-383-7C 3-383-9B 3-383-9B 3-383-7B 3-383-9 3-383-7C 3-383-9B 3-383-9B 4-383-9 4-383-7B 4-383-9 4-383-9 4-383-9B	EX4017	QWWQ	Aurora Pump 800 Airport Road North Aurora, IL 60542 USA	UL
Pumps	Centrifugal Fire Pumps, Horizontal Split Case	5-485-15 5-485-12 5-485-12 5-485-12 6-485-16 6-485-16 6-485-16 6-485-16 6-485-12 6-485-12 6-485-12 6-485-12 6-485-17A 6-485-17A 6-485-17A-DI 6-485-16 6-485-16 6-485-16 6-485-16 6-485-16 6-485-16 6-485-16 6-485-16 6-485-16B 6-485-16B 6-485-16B 6-485-16B	EX2638	QWWQ	Aurora Pump 800 Airport Road North Aurora, IL 60542 USA	UL
Pumps	Centrifugal Fire Pumps, Vertical Split Case	2-1/2-483-10B 2-1/2-481-10B 2-1/2-483-10B 3-481-10 3-483-10 3-481-10 3-481-10 3-481-10DI 3-483-10 2-491-8A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A 5-481-15A	EX2638	QWWQ	Aurora Pump 800 Airport Road North Aurora, IL 60542 USA	UL

Appendix D: Piping

Complete list of compliant materials (below) listed in the Mechanical: Piping section of our database.

Piping						
Piping	Rubber Gasketed Fittings	PGQT5 XGQT1 XGQT1-M1 GKS XGQT2 PGQT1 PGQT1H PHQT2 PHQT2H PGQT4 XGQT09 L991 XGQT3 PGQT6 XGQT04 XGQT04G XGQT041 041 L922 PGQT3	EX26438	VIZM	Titan Fire Ltd.Room 2004, 20F, Center Point 181-185 Gloucester Road, Wanchai Hong Kong Tel / Fax: 00852/3678 9956 info@profittings.com	UL
Piping	Grooved and Plain End Fittings	L01 XGQT01 XGQT03 XGQT05 XGQT07 XGQT06 XGQT061 XGQT08 XGQT11 XGQT12 XGQT13 XGQT14 L981 XGQT07S XGQT03S PGQT01 PGQT01D PGQT01R PGQT01S PGQT02 PGQT021 PGQT022 PGQT03 PGQT003 PGQT04 PGQT004 PGQT05 PGQT05S PGQT06 PGQT06S PGQT07 PGQT07S PGQT08 PGQT08S PGQT09 PGQT10 PGQT10C PGQT11 PGQT11S PGQT12	EX26470	VIYW	Titan Fire Ltd., Room 2004, 20F, Center Point, 181-185 Gloucester Road, Wanchai, Hong Kong	UL
Piping	Rigid Coupling	1G	MH62101	QNVB	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park Jinan, Shandong 250400 China	UL
Piping	Flexible Coupling	1N	MH62102	QNVB	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park Jinan, Shandong 250400 China	UL
Piping	Mechanical Tee Threaded Outlet	3J	MH62103	QNVB	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park Jinan, Shandong 250400 China	UL
Piping	Mechanical Tee Grooved Outlet	3G	MH62104	QNVB	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park Jinan, Shandong 250400 China	UL
Piping	Small Mechanical Tee U-Bolt	3L	MH62105	QNVB	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park Jinan, Shandong 250400 China	UL
Piping	Grooved Flange	321	MH62106	QNVB	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park Jinan, Shandong 250400 China	UL

Appendix E: Anchors and Accessories

Complete list of compliant materials (below) listed in the Mechanical: Anchors and Accessories section of our database.

Anchors and Accessories						
Hangers, Pipe	1-NFPA, 1-STD, 120RWA, 130-1, 130-2, 130-3, 130-4, 130-5, 130-6, 2-STD, 2-WON, 200, 200H, 200M, 200R, 200WON, 22L2, 25, 4-STD, 4A-STD, 4B, 4F-STD, 4PVC-STD, 51, 56, 58, 59, 6, 61T, 65-1/2, 65-3/8, 65XT-3/8, 66-1/2, 66-3/8, 67-1/2- 67-3/8, 67WM-1/2, 67WM-3/8, 68S, 68W, 69, 69L, 69R, 6F, 6PVC, 75, 76, 78-1, 78-2, 78-3, 825, 825A, B2400, B3031, B3033, B3034, B3036L, B3037Z, B3054, B3100, B3104, B3140, B3170NFC, B3170NFF, B3174, B3174A, B3180, B3188, B3188C, B3203, B3222, B3373, B3373C, B351L, B3690, 150 Wing-It, B2500, B2505, B2506, B2507, B2508, B3014, 109, 109A, 109AF, 109F, B2501	EX2145	VDGT	COOPER B-LINE INC.EX2145 509 W. Monroe Street Highland, IL 62249 USA	UL
Conduit Fittings	DF-100, DF-125, DF-150, DF-200, DF-250, DF-300, DF-350, DF-400, DF-50, DF-500, DF-600, DF-75, PB-100, PB-125, PB-150, PB-200, PB-250, PB-300, PB-350, PB-400, PB-50, PB-500, PB-600, PB-75, PBW-50, AF-100, AF-125, AF-150, AF-200, AF-250, AF-300, AF-350, AF-400, AF-50, AF-500, AF-75, EF-100, EF-125, EF-150, EF-200, EF-250, EF-300, EF-350, EF-400, EF-50, EF-500, EF-600, EF-75, EFB-100, EFB-125, EFB-150, EFB-200, EFB-250, EFB-300, EFB-350, EFB-400, EFB-50, EFB-500, EFB-600, EFB-75, PBW-100, PBW-125, PBW-150, PBW-200, PBW-250, PBW-300, PBW-350, PBW-400, PBW-500, PBW-600, PBW-75	E31413	DWFV	GAFCO INDUSTRIES LLC. 7128 Reynolds Drive PO Box 460 Sedalia, CO 80135 USA	UL

Appendix F: Extinguishers

Complete list of compliant materials (below) listed in the Mechanical: Extinguishers section of our database.

Extinguishers							
	Halotron I	A384 B385 B386 B394 397 398 673 B673 674, 675 B674, B675		EX5035	FWF27	AMEREX CORP 7595 Gadsden Hwy P.O. Box 81 Trussville, AL 35173 USA	UL
	Water & Foam (Espuma)		240	EX2765	FWFZ7	AMEREX CORP 7595 Gadsden Hwy P.O. Box 81 Trussville, AL 35173 USA	UL
	Water & Foam (Espuma)	250/ 250CG 252 254 630		EX3076	GEEZ	AMEREX CORP 7595 Gadsden Hwy P.O. Box 81 Trussville, AL 35173 USA	UL
	Carbon Dioxide (CO2)	318 321 322 330 331 332 333 334		EX2835	FWFZ	AMEREX CORP 7595 Gadsden Hwy P.O. Box 81 Trussville, AL 35173 USA	UL
	ABC Dry Chemical	Aluminum Valve: B417/ B417T B500/ B500T B402/ B402T B443 A411 Brass Valve: B424 B461 B441 423		EX2764	FWFZ	AMEREX CORP 7595 Gadsden Hwy P.O. Box 81 Trussville, AL 35173 USA	UL
	Clean-agent Extinguishing System Units (ABC Dry Chemical)	E7763-101 E7763-102 E7763-103 E7763-104 E7763-105 E7763-106 E7763-107 E7763-108 E7763-109 E7763-110 E7763-111 E7763-112 E7763-113		EX5054	FWFZ	KIDDE FIRE PROTECTION 1st Floor, Stokenchurch House Oxford Road High Wycombe Stokenchurch, Buckinghamshire HP14 3SX UNITED KINGDOM	UL
	Dry-chemical Extinguishers, Hand and Wheeled	Ammonium Phosphate: FE1A10G FE1A10G15 FE1A10G15WY80 FE1A10G15WY90 FE1A10GR FE1A10GR195 FE1A10GR195A FE1A10GNR FE2A10GR FE3A40GR FE2A10B FE3A40B FE4A60B FE4A60BC FE4A60BCA FE4A80B Sodium Bicarbonate: FES5 FESA5 KFE2S5 BF5 FE5R FE5GR FE5GRWY FE10GR FE10GRWY		EX3622	FWFZ	BRK BRANDS, INC. 3901 Liberty Street Aurora, IL 60504-8122 USA	UL

Appendix G: Fire Suppression

Complete list of compliant materials (below) listed in the Mechanical: Fire Suppression section of our database

Fire Supression						
	Pressure Restricting Angle Valve	A155	EX3504	VROZ	GIACOMMI SPA Via Per Alzo 39 28017 S.. Maurizio D'Opaglio, No. Italy	UL
	Angle Valve	A56Y005	EX2964	VROZ7	GIACOMMI SPA Via Per Alzo 39 28017 S.. Maurizio D'Opaglio, No. Italy	UL
	Sprinklers, Automatic and Open	AG1425 AG1435 AG1485	EX15331	VDGT	AG FIRE SPRINKLER SL C/Alfoz de Bricia N. 4 Pol. Ind. Villalonquejar 09001 Burgos, Spain	UL
	Cabinets	1402 1404 1406 1412 1414 1416 1432 1434 1436 1452 1454 1456	R15411	N/A	POTTER-ROEMER LLC. 17451 Hurley Street Po. Box 3527 City of Industry, CA 91744-0527 USA	UL
	Sprinklers, Automatic and Open	RA1410 RA1411 RA1413 RA1414 RA1421 RA1425 RA1423 RA1435 RA1485	EX454	VDGT	RELIABLE AUTOMATIC SPRINKLER CO. INC. 1470 Smith Grove Road Liberty, SC 29657 USA	UL
	Sprinklers, Automatic and Open	VK120, VK122, VK124, VK130, VK132, VK150, VK152, VK154, VK156, VK158, VK160, VK162, VK163, VK164, VK166, VK172, VK173, VK174, VK176, VK177, VK178, VK180, VK181, VK182, VK184, VK186, VK188, VK190, VK192, VK194, VK196 , VK200, VK202, VK2503, VK2523, VK2543, VK2753, VK2773, VK2793, VK300, VK301, VK302, VK303, VK305, VK310, VK312, VK315, VK317, VK319, VK325, VK327, VK329, VK331, VK333, VK338, VK339, VK340, VK342, VK344, VK350, VK352, VK354, VK360, VK377, VK461, VK4611, VK462, VK4621, VK463, VK464, VK465, VK4651, VK492, VK4921, VK530, VK531, VK532, VK534, VK536 , VK538, VK540, VK550, VK552, VK556, VK558, VK560, VK562, VK566, VK570 , VK572, VK580, VK600, VK602, VK604, VK605, VK606, VK608, VK610, VK612, VK614, VK616, VK618, VK630, VK632, VK634, VK638, VK660, VK693, VK694, VK695, VK696, VK697, VK681, VK682, VK683, VK684, VK685, VK686, VK690, VK900, VK1001, VK1021, VK1181, VK1201, VK1202, VK2001, VK2002, VK2021, VK2022, VK3001, VK3021, VK3101,	EX643	VDGT	VIKING CORP. 210 Industrial Park Drive Hastings, MI 49058-9706 USA	UL
	Sprinklers, Automatic and Open	TY1382, TY3101, TY3103, TY3121, TY3123, TY3210, TY3221, TY3281, TY3282, TY3290, TY3301, TY3321, TY3322, TY3381, TY3382, TY3390, TY4101, TY4103, TY4121, TY4123, TY4210, TY4321, TY4322, TY4801, TY4910, TY9128, TY313, TY315, TY323, TY325, TY363, TY365, TY1131, TY1151, TY1231, TY1251, TY1331, TY2131, TY2231, TY3104, TY3131, TY3133, TY3151, TY3153, TY3187, TY3191, TY3201, TY3230, TY3231, TY3250, TY3251, TY3291,TY3296, TY3331, TY3332, TY3351, TY3391, TY3431, TY3451, TY3530, TY3535, TY3539, TY3532, TY3537, TY3550, TY3555, TY3631, TY3651, TY4131, TY4133, TY4151, TY4153, TY4191, TY4231, TY4251, TY4292, TY4232, TY4282, TY4332, TY4631, TY4651, TY4831, TY4851, TY4931, TY4951, TY5131, TY5137, TY5151, TY5153, TY5231, TY5237, TY5251, TY5332, TY5337, TY5339, TY5831, TY5851, TY6137, TY6237, TY7103, TY7153, TY8131, TY8151, TY8181, TY8191, TY8231, TY8151, TY8281, TY8291, TY8331, TY8351, TY9131, TY9151, TY9181, TY9191, TY9231, TY9251, TY9281, TY9291, TY3111, TY3113, TY3211, TY3311, TY4113, TY4211, TY4811, TY4911, TY3135, TY3155, TY3230, TY3235, TY3250, TY3255, TY3335, TY3337, TY3339,	EX5985	VDGT	TYCO FIRE & BUILDING PRODUCTS 1400 Pennbrook Pkwy. Lansdale, PA 19446-3840 USA	UL

Appendix H: Medical Gases

Complete list of compliant materials (below) listed in the Mechanical: Medical Gases section of our database.

Medical Gases						
	Multiple Alarm Valve Combo Unit	AVL-XGXGXGXGXGXGXG	E156074	N/A	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	UL
	Chemetron Wall Outlet	O-CHWAL-*-OXY O-CHWAL-*-AIR O-CHWAL-*-VAC O-CHWAL-*-N20 O-CHWAL-*-DIR O-CHWAL-*-#	SA9819	N/A	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	UL

Appendix I: Transformers

Complete list of compliant materials (below) listed in the Mechanical: Transformers section of our database.

Category	Material Name	Model Number	UL File Number	UL CCN	Company Information	Type of Certification
Transformers						
	Liquid-Filled Distribution Transformer (Over 600 Volts)	Magnetron Series	E342364	XNWX7	INDUSTRIAS ELECTROMECANICAS MAGNETRON S.A.S, KM 9 VIA PEREIRA CARTAGO, 993 PEREIRA, RISARALDA COLOMBIA	UL
	Transformers, Distribution, Liquid-Filled Type - Over 750 Volts	A, B, or C, followed by another letter, followed by 5 numbers	E518952	XNWX7	ABB Inc 101 Kuhlman Dr	UL
	Transformers, Liquid-Filled, Distribution, Over 600 Volts	WINDFARM TRANSFORMER	E330953	XNWX7	SUNBELT TRANSFORMER INC 1922 S Martin Luther King Jr Dr	UL
	Transformers, Liquid-Filled, Pad Mounted, Over 600 Volts	HCTN-PT	E330953	XNWX7	SUNBELT TRANSFORMER INC, 1922 S Martin Luther King Jr Dr Temple, TX 76504	UL
	Energy-Monitoring Current Transformers	US2:SEM3SCCT50, US2:SEM3SCCT125, US2:SEM3SCCT250, US2:SEM3SCCT400, US2:SEM3SCCT600, US2:SEM3SCCT800, US2:SEM3SCCT1200, US2:SEM3SCCT1600, US2:SEM3SCCT2000, 7KT1280-5MA00, 7KT1280-5MA01, 7KT1280-5MA02, 7KT1280-5MA03, 7KT1280-5MA04, 7KT1280-5MA05, 7KT1280-5MA06, 7KT1280-5MA07, 7KT1280-5MA08	E492531	XNWX7	Siemens Industry Inc 3617 Parkway Lane Peachtree Corners, GA 30092 United States	UL
	Transformers, Distribution, Liquid-Filled Type, Over 750 Volts	1LFI170210610P1, 1LFI170210611P1	E514798	XNWX7	Siemens Industry Inc 3617 Parkway Lane	UL
	Power Transformers, Rated Over 10 kVA	44YV03, 44YV11, 44YV12, 44YV18, 44YV22, 44YV25	E488922	XNWX7	DAYTON ELECTRIC MFG CO	UL
	Dry Type Power Transformers	44YU98, 44YV01, 44YV05, 44YV08	E488922	XNWX7	DAYTON ELECTRIC MFG CO	UL
	Industrial Control Type	1141, 636-001-1142-600, 636-001-1151, 636-001-1161, 636-001-1171, 636-001-1181, 636-001-1191, 636-001-1201, 636-001-1211, 636-001-2411, 636-001-2421, 636-001-2431, 636-001-2441, 636-001-2451, 636-001-2461, 636-001-2471, 636-001-2481, 636-001-2491, 636-001-2501, 636-001-2511, 636-001-2521, 636-001-264, 637-003-495, 637-003-778, 637-1003-399, 637-1003-400, 637-1003-401, 637-1003-520, 637-1003-521, 637-1003-522, 637-201 (f), 637-206 (f), 637-208 (f), 637-209 (f), 637-211 (f), 637-216 (f), 637-218 (f), 637-219 (f), 637-221 (f), 637-221-028, 637-226 (f), 637-228 (f), 637-229 (f), 637-231 (f), 637-231-011, 637-236 (f), 637-238 (f), 637-239 (f), 637-261 (f), 637-26600, 637-268 (f), 637-269 (f), 637-271 (f), 637-276 (f), 637-278 (f), 637-279 (f), 637-281 (f), 637-286 (f), 637-288 (f), 637-289 (f), 637-291 (f), 637-296 (f), 637-298 (f), 637-299 (f), 637-361 (f), 637-366 (f), 637-369 (f), 637-371 (f), 637-376 (f), 637-379 (f), 637-381 (f), 637-386 (f), 637-389 (f), 637-391 (f), 637-396 (f), 637-399 (f), 637-401 (f), 637-406 (f), 637-409 (f), 637-411 (f), 637-421 (f), 637-431 (f), 637-441 (f), 637-451 (f), 637-461 (f), 637-466 (f), 637-469 (f), 637-471 (f), 637-476 (f), 637-479 (f), 637-481 (f) (h), 637-486 (f), 637-489 (f), 637-491 (f), 637-496 (f), 637-499 (f), 637-531 (f), 637-536 (f), 637-539 (f), 637-551 (f), 637-556 (f), 637-559 (f), 637-561 (f), 637-566 (f), 637-569 (f), 637-571 (f), 637-576 (f), 637-	E4466	XNWX	JEFFERSON ELECTRIC INC 9650 S FRANKLIN DR FRANKLIN, WI 53132-8847 United States	UL
	General Purpose Transformers Rated 10 KVA or Less	211-001-487, 211-001-488, 211-001-573,213, followed by -10, -12 or -14, followed by 2, 4, 7, 8 or 9, followed by 000, 001, 002, 055, 080, 085, 120, 125, 600 thru 999, 800, 855, 880 or 885	E4466	XNWX	JEFFERSON ELECTRIC INC 9650 S FRANKLIN DR FRANKLIN, WI 53132-8847 United States	UL

Appendix J: Panelboards

Complete list of compliant materials (below) listed in the Mechanical: Panelboards section of our database.

Panelboards						
QU Dual Function Circuit Breakers	QO115DF, QO120DF, QO115PDF, QO120PDF, QO115VHDF, QO120VHDF, QO115VPDF, QO120VPDF	N/A	N/A	Schneider Electric Costa Rica, Centro CorporativoEl Cedral, Torre 4, Piso 1 y 2, Escazu, San Jose.	UL
Main lugs	NF442L2C, NF430L1C	N/A	N/A	Schneider Electric Costa Rica, Centro CorporativoEl Cedral, Torre 4,	UL
Panelboard Accessories, Interiors for Mounting Circuit Breakers	40553-440-50, HOM24L80ICU, HOM612L125I, HOM612L125ICU, US11220018, US12420018, US13620018, US1482001 8, US16020018, US21215018, US22420018, US23620 018, US24820018, US26020018, US31210018, US324 20018, US33620018, US34820018, US36020018	E6294	QEUY2	SCHNEIDER ELECTRIC USA INC LOW VOLTAGE ASSEMBLED PRODUCTS 330 WEAKLEY LN SMYRNA, TN 37167-2024 United States	UL
Panelboard Accessories, Mono-Flat Covers	NQC20FWG, NQC30FWG, NQC54F, NQC54FW, QOCMF3 0UC, QOCMF30UCW, QOCMF42UC, QOCMF42UCW, QO CMF54UC, QOCMF54UCW, QOCMF60UC, QOCMF60UC W	E6294	QEUY2	SCHNEIDER ELECTRIC USA INC LOW VOLTAGE ASSEMBLED PRODUCTS 330 WEAKLEY LN SMYRNA, TN 37167-2024 United States	UL
Panelboards and Enclosed Panelboards, Type QO, Single Phase with Plug on Branch Neutral Ready Interior Construction	Q0122X, QO130, QO142, QOW142, QO154 and QO160, followed by L200, L225, M150 or M200, followed by P, may be followed by Q, G, C, RB, WG, TT, QG or MR.	E6294	QEUY3	SCHNEIDER ELECTRIC USA INC LOW VOLTAGE ASSEMBLED PRODUCTS 330 WEAKLEY LN SMYRNA, TN 37167-2024 United States	UL
Panelboard Interiors	122950146, 122950147, 122950148, 122950149, 122950150, 122950151, 122950155, 20-1207-903, 20-1207-904, 96-5786, 96-5787, 96-5788, 96-5789, CPL1B, SL1B, SL2B, UR1B or UR2B, P14A42CL, P24A42CL, PDU Panelboard, PL1A, PL2A, SL1A, SL2A, UR1A or UR2A, PL1C or PL2C, SL3A, UR3A or PL3A, SL4, PL4 or UR4	E2544	N/A	Eaton, 845 Corporate Cir Sumter, SC 29154-8193 United States	
Circuit Breaker Panelboard	PRL4	E2544	N/A	Eaton, 845 Corporate Cir Sumter, SC 29154-8193 United States	
Panelboard	POW-R-LINE 4D (PRL4D), Pow-R-Line 4DX (PRL4DX)	E2544	N/A	Eaton, 845 Corporate Cir Sumter, SC 29154-8193 United States	
Panelboards and Enclosed Panelboards	PRL1A(b), PRL1a-LX, PRL1X-LX, PRL2A(b), PRL2a-LX, PRL2X-LX, PRL3A(a), POW-R-LINE-4, PRL1(W10B, W10P), PRL2(W22B, W22P), PRL3E	E2544	N/A	Eaton, 845 Corporate Cir Sumter, SC 29154-8193 United States	
Enclosed Panelboards	1MMSURGE1, 1MMSURGE2, 1MMSURGE3, 3MMSURGE1, 3MMSURGE2, 3MMSURGE2D, 3MMSURGE3	E8741	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Panelboards	20679+#, 301760+#, 304129+#, 304130+#, 304422+#, 31578+#, 37573+#, 38661+#, 39780+#, 3BR3L100, BR1020B100&, BR1020H100, BR24L100CB#, BR24L125, BR24L70, BR2B100, BR2B40RPGF1S, BR2B50RPGFJS, BR2L125, BR40SPAS, BR48L125, BR48SL124, BR50SPAS, BR612L125, BR816L125, BRC48L125RP, CH250SPA+, CH260SPA+, CH2L125, CH2L40, CH2L70, CH30SPA+, CH40SPA+, CH4L125, CH50SPA+, CH60SPA+, CH6L125, CH6L3125, CH816L125, CH8L125, ChSPA30+, ChSPA40+, ChSPA50+, ChSPA60+, RWCH series, RXCH series	E8741	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Barrier Kits	M37BK, W37BK	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Bonding Kits	MHBK	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Conversion Kits	MBBB225, MBBB2257	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Equipment Grounding Bars	GB and GBK	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Main Circuit Breaker Kits	QFP-2125T (b), QFP-2150T (b), QFP-2175T (b), QFP-2200T (b), QFP-LCB (b), VQFP-2125T (b), VQFP-2150T (b), VQFP-2200T (b)	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Main Lug Kits	NLK-2/0, TL20-2 (b)	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Main Lug or Sub-Feed Plug-In Blocks	TL12-2 (b), TL12-3 (b)	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Main Lug or Sub-Feed Terminal Kits	AMLK3225 (Cutler-Hammer 3BRS225 or Challenger CSK3225), MLK2125 (Culter-Hammer BRS125 or Challenger CSK125), MLK2150 (Culter-Hammer BRS150 or Challenger CSK150), MLK2225 (Cutler-Hammer BRS225 or Challenger CSK225), MLK3150 (Culter-Hammer 3BRS150 or Challenger CSK3150), WTL12-2, WTL12-2C	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Mounting Bracket Kits	35B15 (a), 35B20 (a), 35B22 (42-42)INT, 35B22 (a), 35L15 (a), 35L20 (30-42)INT, 35L20 (a), 35L22 (a), 35LB10 (a), 35LB12 (a), 612ML1125, 612ML1125C, 816ML1125, 816ML1125C, FLAHP, FLAHPB3, SB10 (a), SB12 (a), SB15 (a), SB20 (a), SB22 (a), SL12 (a), SL15 (a), SL20 (a), SL22 (a), SLB12 (a), SLB20 (a)	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Neutral Assemblies	18N100, 9N100, CHNEU/NEU, D10406-G16, D10406-G17, D10406-G18, D10406-G19, D10406-G20, D10406-G24, D10406-G27, D10406-G28, N22-34-925, N6-24	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Panelboard Accessories, Service Entrance Barrier Kits	TICMBERCSR, TIHPCCSR, TIHPDK, TIMBERCSR	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Panelboard Interiors, "INT Series"	48, 816, 1020, 1212, 1220, 1224, 1620, 1624, 1630, 1632, 1836, 2020, 2024, 2030, 2040, 2430, 2440, 2442, 3030, 3040, 3042, 4040, 4024 followed by INT, followed by 100, 125, 150, 200, 225, 300, 400, 600, 3100, 3125, 3150, 3200, 3225, 3300, 3400, 3600 followed by M, N, RF, MRF, NRF, NLRF may be followed by B, 1, C, D, SR, SRQV1 through V99	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	
Panelboard Interiors	1224INT200B, 1224INT3125B, 1224INT3200B, 12DML1125, 12DML1200, 12DML1200C, 1624INT12CB, 1836INT3150B, 18DML3150, 2024INT125B, 2024INT3150B, 20DML1125, 20DML3150, 2424INT125B, 2442INT3150B, 24DML1125, 2DMK3400, 3040INT200B, 3040INT3150B, 3042INT3200B, 30DML1125C, 30DML1200, 30DML3150, 30DML3200, 3CL12(12-24)INT, 3CL12(18-36)INT, 3CL12(24-36)INT, 3CL20(12-24)INT, 3CL20(18-36)INT, 3CL20(24-42)INT, 4-8ML1125, 4242INT225B, 4242INT3225B, 42DML1225, 42DML1400, 42DML3225, 42DMT1400, 42DMT3400, 45ML1125, 6SML1125, 81-19844-7MX, 81-19848-2MX, 81-19848-4MX, 81-19855-2MX, 81-19855-4MX, 81-26158-2MX, 81-26158MX, 816INT200B, 8DML1200, 8SML1125, 8SML1125BH, 8SML3125, D10420-G01, D10420-G02, D10420-G03, D10420-G04, D10420-G05, D10420-G06, D10420-G07, D10420-G08, D10420-G09, D10420-G10, D10420-G11, D10420-G12, D10420-G13, D10420-G14, D10420-G15, D10420-G16, D10420-G17, D10420-G18, D10428-G01, D10428-G02, D10428-G03, D10428-G04, D10428-G05, D10428-G06, D10428-G07, D10428-G08, D10428-G09, D10428-G10, D10428-G11, D10428-G12, D10428-G13, D10428-G17, D10429-G01, D10429-G02, D10429-G03, D10429-G04, D10429-G05, D10429-G06, D10429-	E52977	N/A	Eaton Corporation, 1725 1200TH AVE Lincoln, IL 62656 United States	

Appendix K: Fire Detection

Complete list of compliant materials (below) listed in the Mechanical: Fire Detection section of our database.

Fire Detection						
	Smoke Detector	FSP-851, FSP-851T, FSP-851R	S1115	UPLVC	NOTIFIER, 12 Clintonville Rd	UL
	Dual Action Addressable Manual Pull Station	NBG-12LX	S692	UMGX	NOTIFIER 12 Clintonville Rd	UL
	Indoor Horns	HR, HW	S4011	SYKJC	System Sensor Unincorporated, DIVISION OF HONEYWELL	UL
	Indoor Strobes	SR,SR-P, SR-SP, SRH, SRH-P, SRH-SP, SW, SW-P, SWH, SWH-P	S5512	SYKJC	System sensor unincorporated, DIVISION OF HONEYWELL INTERNATIONAL INC. 3825 Ohio Ave, St. Charles, IL 60174	UL
	Indoor Horn Strobes	P2R,P2R-P,P2R-SP, P2RH, P2RH-P, P2W, P2W-P, P2WH, P2WH-P, P4R, P4R-P, P4RH, P4W, P2WL-LF, P2RL-LF	S4011	SYKJC	System Sensor Unincorporated, DIVISION OF HONEYWELL INTERNATIONAL INC. 3825 Ohio Ave, St. Charles, IL 60175	UL
	Heat Automatic Fire Detectors	FWD-200ACCLIMATE, FSP-951T(b)(d), FSP-951T-IV(d), FCO-951 (d)(e), FCO-951-IV (d)(e), FCO-951-ISO (d)(e), FPTI-951 (d), FPTI-951-IV (d) FSP-951T-ISO (b)(d), NP-200T (b)(d), NP-200T-IV(d), FSP-951T-SELFT(d), FSP-951T-ISO-SELFT(d)	S1115	UPLV	NOTIFIER 12 Clintonville Rd Northford, CT 06472-1610 USA	UL
	Smoke / Carbon monoxide detector	FPC-951, NP-200C, FCO-851	S1115	FSVW	NOTIFIER	UL
	Smoke / Heat/ Carbon Monoxide Detector	FCO-951, FCO-951-IV, FCO-951-ISO	S1115	SFVW	NOTIFIER 12 Clintonville Rd	UL

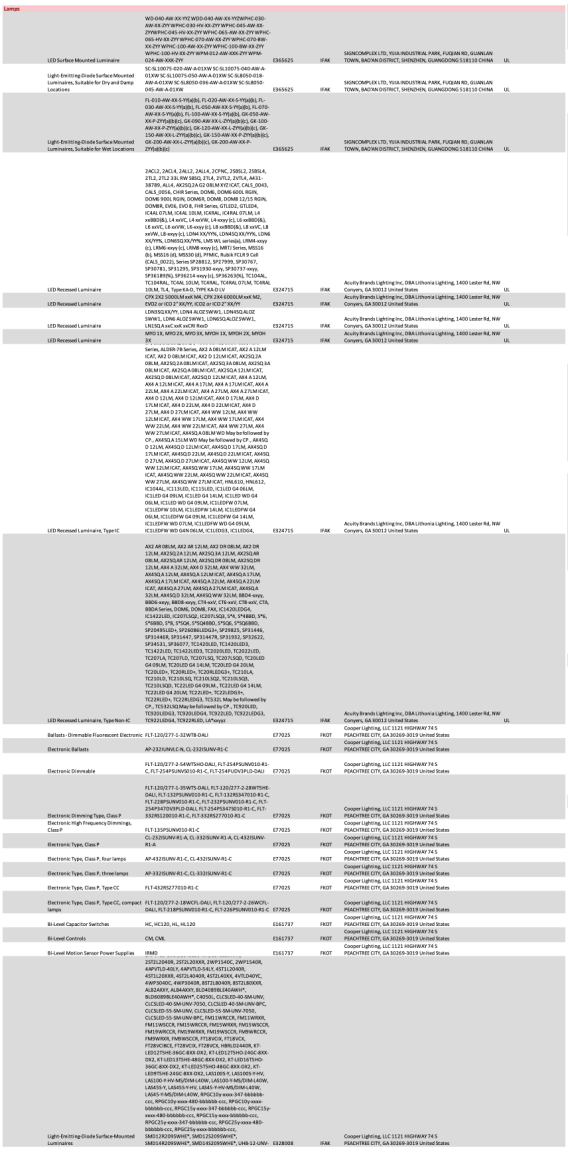
Appendix L: Devices

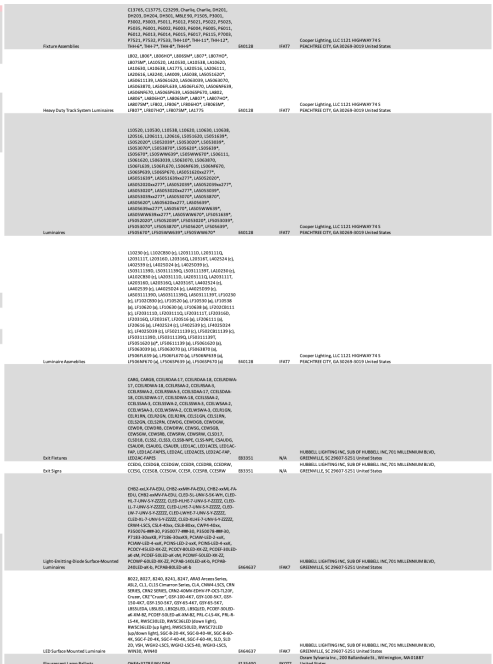
Complete list of compliant materials (below) listed in the Mechanical: Devices section of our database.

Devices					
Flanged Outlets	L520FO, L530FOL620FO, L630FO, L720FO, L730FO, L820FO, L830FO, L920FO, L930FO, L1020FO, L1030FO, F1120FO, L1130FO, L1220FO, L1230FO, L1330FO, L1420FO, L1430FO, L1520FO, L1530FO, L1620FO, L1630FO, L1730FO, L1820FO, F1830FO, L1920FO, L1930FO, L2020FO, L2030FO, L2120FO, L2130FO, L2220FO, L2230FO, L2320FO, L2330FO, 3335SS, 3435SS, 4715SS, 5279SS, 5379SS, 5479SS, 5679SS, 7409SS, 7487, 7596	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Lighted Receptacles	TM8HWL, TM8HWLE, TM8HWLTR, PS8HWL and NTL81TR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Plug Tail Connectors	PT6SOL, PT6STR, PTRA6SOL, PTRA6STR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles	CR6200, CR6207#FS %, CR6300, CR6307#FS %, CRB5262#FS %, CRB5262S, CRL5262, CRB5362#FS %, 32330-Z43-A310-M1, CRB5362S, CRL5362, CRL520R#FS, CRL530R#FS, B5642, GCR15, GCR20, GCRB15, GCRB20, GE0510, GE0520*, GE0524, GE4124, GE4139, GE4243, GE5242*, GE5342, GE7502, GL0517-SS, 614, L0714, GL1130, GL1134, IG1254, IG4560, IG4700, IG4710, IG4760, IG5261#FS, IG5361, IG26362#FS, IGL5-20R#FS*, IGL5-30R#FS*, IGL6-20R#FS*, IGL6-30R#FS*, IGL7-20R#FS*, IGL8-20R#FS*, IGL14-20R#FS*, IGL14-30R#FS*, IGL15-20R#FS*, IGL15-30R#FS*, IGL16-20R#FS*, IGL21-30R#FS*, IGL22-20R#FS*, IGL22-30R#FS*, IGL2320R#FS*, IGL2330R#FS*, L5-20R#FS*, L5-30R#FS*, 32332-Z43-A410-M1, L6-20R#FS*, L6-30R#FS*, L7-20R#FS*, L7-30R#FS*, L8-20R#FS*, L8-30R#FS*, L9-20R#FS*, L9-30R#FS*, L10-20R#FS*, L10-30R#FS*, L11-20R#FS*, L11-30R#FS*, L12-20R#FS*, L12-30R*, L13-30R#FS*, L14-20R#FS*, L14-30R#FS*, L15-20R#FS*, L15-30R#FS*, L16-20R#FS*, L16-30R#FS*, L17-30R#FS*, L18-20R#FS*, L18-30R#FS*, L19-20R#FS*, L19-30R#FS*, L2020R#FS, L20-30R#FS*, L21-20R#FS*, L21-30R#FS*, L22-20R#FS*, L22-30R#FS*, L23-20R#FS*, L23-30R#FS*, L37-20R #FS*, ML114, ML214, ML314, S3713, S3733, TR62#FS, 880, 880D, 885CN(+), 885(+), TM885(+), 125415/28/92, 1532, 1533, 1542DR, 3232(+), 3232CN(+), MDR24(+), 3330, 3430, 3474, 3801(d), 3802(d), 3804(d), 3820,	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Hospital Grade	8200MRI, 8300MRI, IG8301, SG63H#FS, TR62H#FS, PS8200HS, PS8300HS, TR63H#FS, 8200#FS, 8200H#FS %, H201, 8284, 8292H, 8300#FS %, 8300H#FS, 8301, 8384, 8392H, 8600#FS, 8800#FS, 8801, 23000HG#FS, PT8200, PT8300, IG5262H, IG5362H, 26322HG, 26362HG#FS, 26222HG, 26262HG ,TR26362HG, TR26262HG, PTTR15HACUSB*(c), PTTR20HACUSB*(c), PT26262HG, PT26362HG, PT26262HGSC, PT26362HGSC, PT8200H, PT8300H, PT8200HSC, PT8300HSC, IG-3804(d)	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant, Hospital Grade	TR8200PI, TR8300PI, TR8200HPI, TR8300HPI, TR26262HGPI, TR26362HGPI, TR20, TR15, TR8300H, TR8200H, PTTR62H, PTTR63H, TR8201, TR8301, TR26261HG, TR26361HG	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Interchangeable or Modular Type	1332, 1333, 1432, 1433	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Modular 2 Type Receptacles	ARTR152, ARCD152, ARCH152, A004100AA, ARTR202, ARCD202, ARCH202	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Modular 3 Type Receptacles	ARTR153, ARLTR153, 981607, 981608, 981609, 981641	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Isolated Ground	PTIG5262, PTIG5362, PTIG26262, PTIG26362, PTIG8200, PTIG8300, PTIG5262SC, PTIG5362SC, PTIG26262SC, PTIG26362SC, PTIG8200SC, PTIG8300SC, PT26252SC, PT26352SC, IG5262, IG5362, IG5662, IG5862, IG26262, IG26362	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Isolated Ground, Hospital Grade	8210-IG, TRIG8200#FS, TRIG8300#FS, TRIG26262HG#FS, TRIG26362HG#FS, IG8200, IG8300, IG8800, IG26262HG, IG26362HG	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Self Contained	SC014, SC821, SC830, SC085, SC80, SC080	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Surface	385, 388, 3852, 3854, 3884	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant	PTTR62, PTTR63, H*4188A15US, H*4188A20US, 885TR(+), 3232TR(+), 885TRXX(a)(+), TM885TR(+), TR15, TR20, TR5262, TR5362, 880TR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant, Isolated Ground	TRIG5262, TRIG5362, TRIG26262, TRIG26362	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant, Single Receptacles	TR5251, 5251FBR, 5251FBTR, TR5351, TR26361, TR26261	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: General Grade, Tamper Resistant, Duplex Receptacles	TR5352, TR5252, TR26352, TR26252, TR15, TR20, TR26342, TR26242	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
General Grade, Weather Resistant, Tamper Resistant, Duplex Receptacles	WR5352TR, WR5252TR, WR26352TR, WR26252TR, WR15TR, WR20TR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacle, Display, Tamper Resistant	1542TRDR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant/ Weather Resistant	885TRWR(+), 3232TRWR(+), WR5262TR, WR15TR-FS, WR5362TR, WR20TR-FS	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant - Plug Tail	PTTR5262, PTTR5362, PTTR26262, PTTR26362	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Tamper Resistant - Plug Tail - Split Circuit	PTTR5262SC, PTTR5362SC, PTTR26262SC, PTTR26362SC, PTTR5262SCSOL, PTTR5362SCSOL, PTTR26262SCSOL, PTTR26362SCSOL	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Recessed Duplex Outlet, Tamper Resistant	R885TR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Hospital Grade - Tamper Resistant USB	TM826USB, TR5262USB, TR5362USB, TR8200HUSB, TR8300HUSB, ARTRUSB153, RWC826USB , and RWC5362USB, TR8284USB (b), TR8384USB (b), TR8201USB (b), TR8301USB (b)	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles - Tamper Resistant USB	TM826USB, R26USBAC, R26USBCC, TR5262USB, TR5362USB, TR15USBAC, TR20USBAC, TR15USBCC, TR20USBCC, TR15HUSBAC, TR15HUSBCC, TR8200HUSB, TR8300HUSB, TR20HUSBAC, TR20HUSBCC, R26USBAC6, TR15USBAC6, TR20USBAC6, ARTRUSB206AC, ARTRUSB206CC, TR15HUSBAC6, TR20HUSBAC6, R26USBCC6, TR15USBCC6, TR20USBCC6, TR15HUSBCC6, TR20HUSBCC6, WRTM826USB, WRTR5262USB, WRTR5362USB, WRR26USBAC, WRR26USBCC, WRTR15USBAC, WRTR20USBAC, WRTR15USBCC, WRTR20USBCC, WRR26USBAC6, WRTR15USBAC6, WRTR20USBAC6, WRR26USBCC6, WRTR15USBCC6, WRTR20USBCC6, ARTRUSB156AC, ARTRUSB156CC, TM88USB (b), TR5251USB (b), TR5351USB (b), TM8USB (b), TR5261USB (b), TR5361USB (b)	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Hospital Grade - Tamper Resistant - Plug Tail	PTTR5262HG, PTTR8200, PT8200TR, PT8300TR, PTTR5362HG, PTTR8300, PTTR26262HG, PTTR26362HG, PTTR5262HGSCSOL, PTTR8200SCSOL, PTTR5362HGSCSOL, PTTR8300SCSOL, PTTR26262HGSCSOL, PTTR26362HGSCSOL	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Hospital Grade - Tamper Resistant - Plug Tail - Split Circuit	PTTR5262HGSC, PTTR8200SC, PTTR5362HGSC, PTTR8300SC, PTTR26262HGSC, PTTR26362HGSC	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Weather Resistant	WR15, WR20, WR5262, WR5362, WR5662, WR5862, WR5652, WR5852, WR5642, WR5842	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles: Weather Resistant, Hospital Grade	WR8200-H, WR8300-H	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices, Type 3 Application	5252*SP, 5262*SP, 5352*SP, 5362*SP, IG5262*SP, IG5362*SP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices, Type 3 Application, Hospital Grade	8200XSP, 8300XSP, IG8200XSP, IG8300XSP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices, Type 3 Application, Tamper Resistant	TR5252XSP, TR5262XSP, TR5352XSP, TR5362XSP, TRIG5262XSP, TRIG5362XSP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices, Type 3 Application, Hospital Grade, Tamper Resistant	TRIG8200XSP, TRIG8300XSP, TR8200XSP, TR8300XSP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices/ Plug Tail, Type 3 Application	PT5262XSP, PT5362XSP, PTIG5262XSP, PTIG5362XSP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices/ Plug Tail, Type 3 Application, Hospital Grade	PT8200*SP, PT8300*SP, PTIG8200*SP, PTIG8300*SP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices/ Plug Tail, Type 3 Application, Tamper Resistant	PTTR5262*SP, PTTR5362*SP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Receptacles/ Surge Protective Devices/ Plug Tail, Type 3 Application, Hospital Grade, Tamper Resistant	PTTR8200XSP, PTTR8300XSP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Pop-Out Tamper Resistant Receptacles	ARPTR15XGYZ and ARPTR20XGYZ	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Nonmetallic Cover Plates with Receptacles	60W47DPLX, 60W33DPLX, 60W49DPLX, 60W48DPLX, 65W47DPLX, 65W49DPLX, 65W34DPLX	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Clock Hanger Receptacle, Tamper-Resistant	S3713TR	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
Industrial Control Switch	HKRL10, HKRL20, WTRL10, WTRL20, WWRL10, WZ3RL10, ASTP155RM, ASTPRF2, ASWR155RM, ASTP1532, ASTH1532, ASWV1532, ASTH155RM, ASTHRR, ASWRRR, LC2201, LC2203.	E350248	NIMX	PASS & SEYMOUR INC 50 Boyd Ave Syracuse, NY 13209 United States	UL
Industrial Control, Switches, Relay, and Socket	RXG11F7 (#), RXG11FD (#), RXG11JD (#), RXG11K7 (#), RXG11KD (#), RXG11L7 (#), RXG11M7 (#), RXG11ND (#), RXG11P7 (#), RXG11RD (#), RXG12B7 (#), RXG12BD (#), RXG12E7 (#), RXG12ED (#), RXG12F7 (#), RXG12FD (#), RXG12JD (#), RXG12K7 (#), RXG12KD (#), RXG12L7 (#), RXG12M7 (#), RXG12ND (#), RXG12P7 (#), RXG12RD (#), RXG13B7 (#), RXG13BD (#), RXG13E7 (#), RXG13ED (#), RXG13F7 (#), RXG13FD (#), RXG13JD (#), RXG13K7 (#), RXG13KD (#), RXG13L7 (#), RXG13M7 (#), RXG13ND (#), RXG13P7 (#), RXG13RD (#), RXG15B7 (#), RXG15BD (#), RXG15E7 (#), RXG15ED (#), RXG15F7 (#), RXG15FD (#), RXG15JD (#), RXG15K7 (#), RXG15KD (#), RXG15L7 (#), RXG15M7 (#), RXG15ND (#), RXG15P7 (#), RXG15RD (#), RXG21B7 (#), RXG21BD (#), RXG21E7 (#), RXG21ED (#), RXG21F7 (#), RXG21FD (#), RXG21JD (#), RXG21K7 (#), RXG21KD (#), RXG21L7 (#), RXG21M7 (#), RXG21ND (#), RXG21P7 (#), RXG21RD (#), RXG22B7 (#), RXG22BD (#), RXG22E7 (#), RXG22ED (#), RXG22F7 (#), RXG22FD (#), RXG22JD (#), RXG22K7 (#), RXG22KD (#), RXG22L7 (#), RXG22M7 (#), RXG22ND (#), RXG22P7 (#), RXG22RD (#), RXG23B7 (#), RXG23BD (#), RXG23E7 (#), RXG23ED (#), RXG23F7 (#), RXG23FD (#), RXG23JD (#), RXG23K7 (#), RXG23KD (#), RXG23L7 (#), RXG23M7 (#), RXG23ND (#), RXG23P7 (#), RXG23RD (#), RXG25B7 (#), RXG25BD (#), RXG25E7 (#), RXG25ED (#), RXG25F7 (#), RXG25FD (#), RXG25JD (#), RXG25K7 (#), RXG25KD (#), RXG25L7 (#), RXG25M7 (#), RXG25ND (#), RXG25P7 (#), RXG25RD (#)	E173076	NIMX	Schneider Electric Industries S A, DBA Telemecanique 8001 Knightdale Blvd Knightdale, NC 27545 United States	UL
Electronic Timers	RE22R1ACMR, RE22R1AKMR, RE22R1AMR, RE22R1CMR , RE22R1DMR, RE22R1HMR, RE22R1KMR, RE22R1MAMR, RE22R1MKMR, RE22R1MLMR, RE22R1MYMR, RE22R1QCMU, RE22R1QMQ, RE22R1QMU, RE22R2ACMR, RE22R2AMR, RE22R2AMU, RE22R2CMR, RE22R2DMR, RE22R2HMR, RE22R2KMR, RE22R2MIU, RE22R2MMU, RE22R2MMW, RE22R2MWMR, RE22R2MXMU, RE22R2MYMR, RE22R2QEMR, RE22R2QEMT, RE22R2QGMR, RE22R2QTMR, RE88865265, RENF22R2MMW	E173076	NIMX	Schneider Electric Industries S A, DBA Telemecanique 8001 Knightdale Blvd Knightdale, NC 27545 United States	UL
Open Type, Electronic Timers	RE17LAMW, RE17LAMWS, RE17LCBM, RE17LCBMS, RE17LHBM, RE17LHBMS, RE17LLBM, RE17LLBMS, RE17LMBM, RE17LMBMS, RE17RAMU, RE17RAMUS, RE17RBMU, RE17RBMUS, RE17RCMU, RE17RCMUS, RE17RHMU, RE17RHMUS, RE17RLJU, RE17RLJUS, RE17RLMU, RE17RLMUS, RE17RMEMU, RE17RMEMUS, RE17RMJU, RE17RMJUS, RE17RMMU, RE17RMMUS, RE17RMMW, RE17RMMWS, RE17RMXMU, RE17RMXMUS	E173076	NIMX	Schneider Electric Industries S A, DBA Telemecanique 8001 Knightdale Blvd Knightdale, NC 27545 United States	UL
Voltage Control Relay	RMNF22TB30	E173076	NIMX	Schneider Electric Industries S A, DBA Telemecanique	UL
Control Relays	RC8761024, RE8889803, RE88899803, RM17JC00MW, RM17TA00, RM17TE00, RM17TG00, RM17TG20, RM17TT00, RM17TU00, RM17UAS14, RM17UAS15, RM17UAS15315M, RM17UAS16, RM17UB310, RM17UBE15, RM17UBE16, RM35ATL0MW, RM35ATR5MW, RM35ATW5MW, RM35BA10, RM35HZ21FM, RM35JA31MW, RM35JA32MW, RM35LM33MW, RM35LV14MW, RM35S0MW, RM35TF30, RM35TF30SP01, RM35TM250MW, RM35TM50MW, RM35UA11MW, RM35UA12MW, RM35UA13MW, RM35UB330, RM35UB3N30	E173076	NIMX	Schneider Electric Industries S A, DBA Telemecanique 8001 Knightdale Blvd Knightdale, NC 27545 United States	UL
Open Type Industrial Control Switches	EMD-BL-3V-400, EMD-BL-3V-400-PT, EMD-BL-C-10, EMD-BL-C-10-PT, EMD-BL-PH-480, EMD-BL-PH-480-PT, EMD-BL-V-230, EMD-BL-V-230-PT, ETD-BL-1T-230, ETD-BL-1T-230-PT, ETD-BL-2T-I-230, ETD-BL-2T-I-230-PT	E172140	NIMX	PHOENIX CONTACT GmbH & Co. KG Flachsmarktstrasse 8 Blomberg, 32825 Germany	UL
Industrial Control Switches	EMD-FL-3V-115, EMD-FL-3V-230, EMD-FL-3V-400, EMD-FL-3V-500, EMD-FL-3V-690, EMD-FL-C-10, EMD-FL-PF-400, EMD-FL-V-300, EMD-SL-3V-400, EMD-SL-3V-400-N, EMD-SL-C-OC-10, EMD-SL-C-UC-10, EMD-SL-LL-110, EMD-SL-LL-230, EMD-SL-PH-400, EMD-SL-PH-690, EMD-SL-PTC, EMD-SL-V-UV-300, ETD*, PLC-TR-1T-MUL-300M, PLC-TR-1T-MUL-300M-PT	E172140	NIMX	PHOENIX CONTACT GmbH & Co. KG Flachsmarktstrasse 8 Blomberg, 32825 Germany	UL
Magnetically Operated Switches, Open or Enclosed	40, CLM0C02277, CLM0C02480, CLM0C02600, CLM0C03024, CLM0C03120, CLM0C03208, CLM0C03240, CLM0C03277, CLM0C03480, CLM0C03600, CLM0C04024, CLM0C04120, CLM0C04208, CLM0C04240, CLM0C04277, CLM0C04480, CLM0C04600, CLM0C05024, CLM0C05120, CLM0C05208, CLM0C05240, CLM0C05277, CLM0C05480, CLM0C05600, CLM0D02024, CLM0D02120, CLM0D02208, CLM0D02240, CLM0D02277, CLM0D02480, CLM0D02600, CLM0D03024, CLM0D03120, CLM0D03208, CLM0D03240, CLM0D03277, CLM0D03480, CLM0D03600, CLM0D04024, CLM0D04120, CLM0D04208, CLM0D04240, CLM0D04277, CLM0D04480, CLM0D04600, CLM0D05024, CLM0D05120, CLM0D05208, CLM0D05240, CLM0D05277, CLM0D05480, CLM0D05600, CLM0E02024, CLM0E02120, CLM0E02208, CLM0E02240, CLM0E02277, CLM0E02480, CLM0E02600, CLM0E03024, CLM0E03120, CLM0E03208, CLM0E03240, CLM0E03277, CLM0E03480, CLM0E03600, CLM0E04024, CLM0E04120, CLM0E04208, CLM0E04240, CLM0E04277, CLM0E04480, CLM0E04600, CLM0E05024, CLM0E05120, CLM0E05208, CLM0E05240, CLM0E05277, CLM0E05480, CLM0E05600, CLM0F02024, CLM0F02120, CLM0F02208, CLM0F02240, CLM0F02277, CLM0F02480, CLM0F02600, CLM0F03024, CLM0F03120, CLM0F03208, CLM0F03240, CLM0F03277, CLM0F03480, CLM0F03600, CLM0F04024, CLM0F04120, CLM0F04208, CLM0F04240, CLM0F04277, CLM0F04480, CLM0F0	E27683	NIMX	Siemens Industry Inc 3617 Parkway Lane Peachtree Corners, GA 30092 United States	UL

Appendix M: Lamps

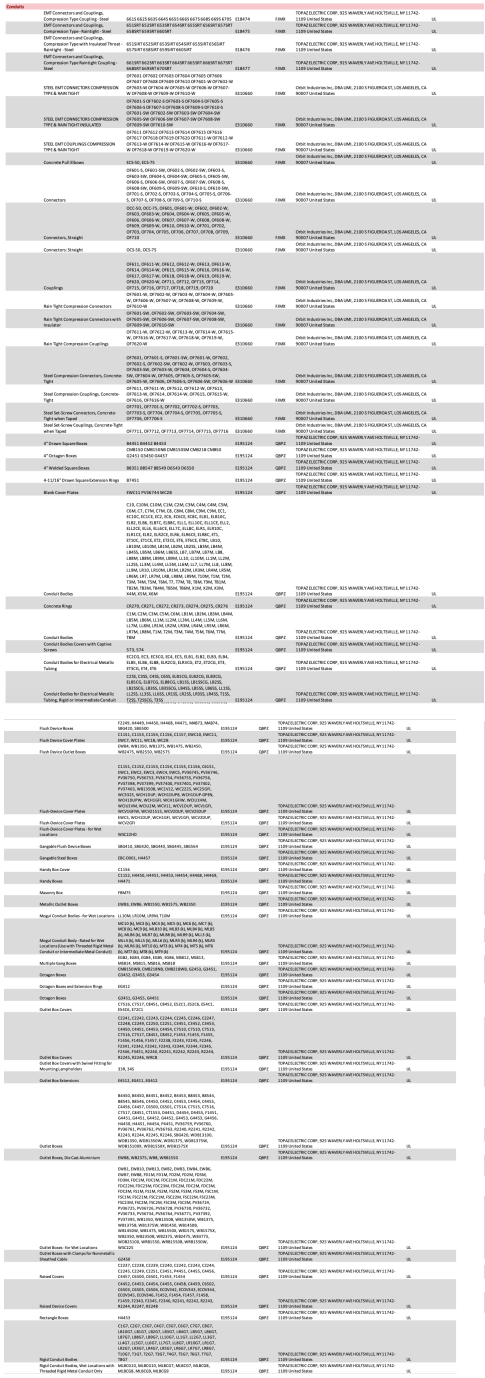
Complete list of compliant materials (below) listed in the Mechanical: Lamps section of our database.





Appendix N: Conduits

Complete list of compliant materials (below) listed in the Mechanical: Conduits section of our database.



Appendix O: Cables

Complete list of compliant materials (below) listed in the Mechanical: Cables section of our database.

Cables						
	Thermoplastic-Insulated Wire	Deep-well Submersible Water Pump Cable, FEP, FEPB, TBS, THHN, THHW, THW, THW-2, THWN, THWN-2, THWN75, TW, Z	E23919	ZGZX	Southwire CO, One Southwire Dr, Carrollton, GA, 30119-4400 United States	UL
	Thermoset-Insulated Wire	Deep-well Submersible Water Pump Cable, RH, RHH, RHW, RHW-2, SA, SIS, XHH, XHHW, XHHW-2, XHHW-2-HF, XHHW-HF	E30117	ZGZX	Southwire CO, One Southwire Dr, Carrollton, GA, 30119-4400 United States	UL
	Metal-Clad Cable	MC, MC-HL	E96627		Southwire CO, One Southwire Dr, Carrollton, GA, 30119-4400 United	UL
	Single-Conductor, Thermoplastic Insulation	11117, 11470	E96539	N/A	PRYSMIAN CABLES AND SYSTEMS USA, LLC, 4 TESSENEER DR, HIGHLAND HEIGHTS, KY 41076-9167 US	UL
	Multiple-Conductor, Thermoplastic Insulation	2570, 20626, 21047	E96539	N/A	PRYSMIAN CABLES AND SYSTEMS USA, LLC, 4 TESSENEER DR, HIGHLAND HEIGHTS, KY 41076-9167 US	UL
	Single-Conductor, Thermoset Insulation	3192, 3193	E96539	N/A	PRYSMIAN CABLES AND SYSTEMS USA, LLC, 4 TESSENEER DR, HIGHLAND HEIGHTS, KY 41076-9167 US	UL
	Communications Cable	CM, CM-LS, CMG, CMG-LS, CMP, CMP-LP(0.5A)(105C), CMP-LP(0.5A)(75C), CMP-LP(0.5A)(90C), CMP-LP(0.6A)(105C), CMP-LP(0.6A)(90C), CMP-LP(0.7A)(105C), CMP-LP(0.7A)(90C), CMP-LP(0.8A)(125C), CMR, CMR-LP(0.5A)(75C), CMR-LP(0.5A)(90C), CMR-LP(0.6A)(75C), CMR-LP(0.6A)(90C), CMR-LP(0.7A)(75C), CMR-LP(0.7A)(90C), CMR-LS, CMX, CMX Outdoor, CMX Outdoor-CM, CMX Outdoor-CMG, CMX Outdoor-CMR, Cross-connect	E105765	DUZX	PRYSMIAN CABLES AND SYSTEMS USA, LLC, 4 TESSENEER DR, HIGHLAND HEIGHTS, KY 41076-9167 US	UL
	Fixture Wire - Thermoplastic-Insulated Wire	TF, TFF, TFFN, TFN	E55121	ZGZX	SERVICIOS CONDUMEX S A DE C V, PARQUE INDUSTRIAL JURICA, CARR CONSTITUCION A S L P KM 9.6, 76127 QUERETARO, MEXICO	UL
	Thermoset-Insulted Wire	RW75, RW90, RWU75, RWU	E88510	ZGZX7	SERVICIOS CONDUMEX S A DE C V, PARQUE INDUSTRIAL JURICA, CARR CONSTITUCION A S L P KM 9.6, 76127 QUERETARO, MEXICO	UL
	Thermoplastic-Insulated Wire	THHN, THWN-2	E477599	ZGZX	CONDUCEN S R L, Interseccion A San Antonio De Belen, Autopista General Canas Km 11.5, H, Po Box 10274, San Jose, Heredia 10274 COSTA RICA	UL
	Thermoplastic-Insulated Wire	T-90 Nylon, TW , TW-75 , TWN75 , TWU , TWU-75	E66903	ZGZX7	CONDUCEN S R L, Interseccion A San Antonio De Belen, Autopista General Canas Km 11.5, H, Po Box 10274, San Jose, Heredia 10274 COSTA RICA	UL

Appendix P: Mechanical Non-Compliant

Complete list of Non-Compliant Materials from the Mechanical section of our database.

Category	Material Name	Model Name	Company Information	Type of Certification	Price	Source
Valves and Accessories						
	WFDN Series Waterflow Detector	Macsensor Electromagnetic Pulse Flow Measuring Instruments Flow Sensors Water	MacSensor Shenzhen, China	CE	$150.00	https://macsensor.en.made-in-china.com/product/tOJmAarTFWVD/China-Macsensor-Electromagnetic-Pulse-Flow-Measuring-Instruments-Flow-Sensors-Water.html
	300 lb. WWP UL/FM Butterfly Valves, Lugged Wafer	WZLD Stainless Steel Gear Triple Offset Wafer Butterfly Valve	WZLD Zhejiang, China	None	$50.00	https://www.alibaba.com/product-detail/WZLD-Stainless-Steel-Gear-Triple-Offset_62145816530.html?spm=a2700.galleryofferlist.normal_offer.d_title.51503f86dgGV63&s=p&fullFirstScreen=true
	Model G Swing Check Valves	Superior Quality Stop Price ANSI Swing Check Valve Stainless Steel Non Return Valve	TKYCO Jiangsu, China	OHSAS 18001, ISO 9001, ISO 14001	$57.00	https://www.alibaba.com/product-detail/Swing-Check-Valve-Check-Swing-Check_1600121041844.html?spm=a2700.galleryofferlist.normal_offer.d_title.187e5affooRzBb&s=p
	AWWA Check Valve: Swing	Cast Iron Flange Type pressure Price non slam slow closing swing check valve	IMGV Tianjin, China	CE	$25.00	https://www.alibaba.com/product-detail/Cast-Iron-Flange-Type-pressure-Price_62515078173.html?spm=a2700.galleryofferlist.normal_offer.d_title.3db45aflVz9xA&s=p&fullFirstScreen=true
	Test and Drain Valve	Grosna High Quality Strainer Test And Drain Valve Filter Water 1 /2 Inch Brass Screwed Check Valve	Grosna Xinjiang, China	CE	$5.00	https://www.alibaba.com/product-detail/Grosna-High-Quality-Strainer-Test-And_62013236785.html?spm=a2700.galleryofferlist.normal_offer.d_title.16482e6dLmKPCH
Pumps						
	Centrifugal Fire Pumps, Vertical Turbine	High-grade Fire Pump-long shaft turbine pump fire pump vertical turbine	yeschamp Zhejiang, China	CE	$500.00	https://www.alibaba.com/product-detail/High-grade-Fire-Pump-long-shaft_1600087314457.html?spm=a2700.details.0.0.4a455997WFMZAQ
	Centrifugal Fire Pumps, Horizontal Split Case	LEO Water Horizontal Split Case Centrifugal Fire Fighting Pump	LEO Zhejiang, China	CE	$400	https://www.alibaba.com/product-detail/LEO-Water-Horizontal-Split-Case-Centrifugal_60745058564.html?spm=a2700.galleryofferlist.normal_offer.d_title.1974328eaXbomr&s=p&fullFirstScreen=true
Piping						
	Grooved and Plain End Fittings	Stainless Steel Grooved 90 Degree Elbow	SHURJOINT	Only NSF/ANSI 372 which does not override state or govenment compliance	$78.00	https://getpvf.com/ss-10-90-degree-elbow/?sku=SS-10-30-21&gclid=Cj0KCQiAhP2BBhDdARIsAJEzXlHaZrYchgoKo0FUonOvdEXwcpwhrISOK7uXp1-b_jdrlY0yAPFXEYBaAv6xEALw_wcB
	Rigid Coupling	Ruland CLC-10-10-F, 5/8" x 5/8" Rigid Coupling, Black Oxide Steel, One-Piece Clamp Style with Keyway, 1 5/16" OD, 2" Length	Ruland Manufacturing Co., Inc. 6 Hayes Memorial Drive Marlborough, MA 01752	CE	$77.34	https://www.ruland.com/checkout/cart/
	Flexible Coupling	Rigid flexible Couplings Spacer brass Fluid Flange HRC Jaw Gear MH PIN Chain Coupling Catalog shaft Universal Steel trailer	Ever-Power Zhejiang, China	CE	$20.00	https://www.alibaba.com/product-detail/Rigid-flexible-Couplings-Spacer-brass-Fluid_60739075081.html?spm=a2700.themePage.feed.2.6567233d4bRo8b
	Grooved Flange	Standard DIN stainless steel groove flange 8 hole steel gasket	BDavaVula Hebei, China	None	$55.00	https://www.alibaba.com/product-detail/Standard-DIN-stainless-steel-groove-flange_60492555441.html?spm=a2700.galleryofferlist.normal_offer.d_title.29133dab7LY8Ub
Anchors & Accessories						
	SK Single Piece Strut Clamp for Conduit					
	115 Standard Duty Loop Hanger					
Extinguishers						
	ABC Fire Extinguisher	2Kg ABC Dry Powder Fire Extinguisher	FireGuard UK	BS EN3 CE	$25	https://www.firesafetystore.co.uk/fire-extinguishers/dry-powder-fire-extinguishers/fireguard-3kg-abc-dry-powder-fire-extinguisher/
	CO2 Fire Extinguisher	2Kg Co2 Fire Extinguisher	FireGuard UK	BS EN3 CE	$37	https://www.firesafetystore.co.uk/fire-extinguishers/co2-fire-extinguishers/fireguard-2kg-co2-fire-extinguisher/
	Water and Foam Fire Extinguisher	2Ltr AFFF Foam Fire Extinguisher	FireGuard UK	BS EN3 CE	$23	https://www.firesafetystore.co.uk/fire-extinguishers/afff-foam-fire-extinguishers/fireguard-2ltr-afff-foam-fire-extinguisher/
Fire Supression						
	Connections (Inlet Connections)	5761 5762 5763 5764 5771 5773 5775 5776 5780 5781 5785 5786 5791 5792	POTTER-ROEMER LLC. 17451 Hurley Street Po. Box 3527 City of Industry, CA 91744-0527 USA	CE		
	Connections (Test Connections and Variations)	5866 5867 5868 5869	POTTER-ROEMER LLC. 17451 Hurley Street Po. Box 3527 City of Industry, CA 91744-0527 USA	CE		
	Model AG66-QR Series Quick Response Standard Spray	AG1414 AG1425 AG1435 AG1475 AG1485	AG FIRE SPRINKLER SL. C/De Le Invencion P.I. Los Olivos 28906 Getafe, Madrid Spain	CE		
	Free-Standing Fire Dept. Inlet Connections (6200 Series)	6202 6214 6224 6226 6236 6242 6244 6264	GUARDIAN FIRE EQUIPMENT, INC. 3430 NW 38TH Street Miami, Fl 33142-5034 USA	CE		
	Hose/Extinguisher/Valve Cabinets (1500 Series)	1510 1520 1530 1540 1550	GUARDIAN FIRE EQUIPMENT, INC. 3430 NW 38TH Street Miami, Fl 33142-5034 USA	CE		
	1 1/2" Fire Hose Rack Assemblies (3000 Series)	3005 3007 3010	GUARDIAN FIRE EQUIPMENT, INC. 3430 NW 38TH Street Miami, Fl 33142-5034 USA	CE		
	Hose Valves (5000 Series)	5010 5015 5020 5025	GUARDIAN FIRE EQUIPMENT, INC. 3430 NW 38TH Street Miami, Fl 33142-5034 USA	CE		
	Cabinets	Large Single Fire Extinguisher Cabinet	FireChief UK	CE	$66.79	https://www.fireprotectionshop.co.uk/fire-extinguisher-cabinets-boxes-and-covers/fire-extinguisher-cabinets/firechief-large-single-fire-extinguisher-cabinet.html
	Sprinklers, Automatic and Open	V2704 Size 1/2inch quick response sprinkler head with 79C/175F sprinkler with K Factor 5.6 upright fire sprinkler	Shanghai Hao Yu Trade Co., Inc.		$6.00	https://www.alibaba.com/product-detail/V2704-Size-1-2inch-quick-response_62560337377.html?spm=a2700.pc_countrysearch.main07.80.3ab073259Eon2m
Medical Gases						
	LCD Alarm	A3AR-L-XXXXXXXX	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	CE		
	LCD Ethernet Master Alarm	A4M-X-XX	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	CE		
	Ball Valve with Extensions	W-ISO-G-05 W-ISO-G-07 W-ISO-G-10 W-ISO-G-12 W-ISO-G-15 W-ISO-G-20 W-ISO-G-25	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	CE		
	Wall Outlet Quick Disconnect	O-CHWAL-L-XXX	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	CE		
	Flowmeter	FMX-XXY-XX(YY)*	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	CE		
	Vacuum Regulator	SRX-XXXX-XX(X)*	AMICO CORP. 85 Fulton Way Richmond Hill, ON L4B 2N4 Canada	CE		
	Wall Outlet	Medical Gas Outlet Bed Head	Hunan Eter Medical Co., Ltd.	CE/ISO	$50	https://www.alibaba.com/product-detail/China-Medical-Gas-Outlet-Bed-Head_60783888949.html?spm=a2700.galleryofferlist.normal_offer.d_title.7b433b62bHNqLR&s=p&fullFirstScreen=true
	Medical Gas Alarm System	LED Area Alarm Panel Hospital Alarm Sys	Amcaremed Technology Co., Ltd	CE	$750	https://www.alibaba.com/product-detail/Medical-Gas-Alarm-System-LED-Area_1600073388299.html?spm=a2700.pc_countrysearch.main07.38.52a678b6nHLcMX

Appendix Q: Electrical Non-Compliant

Complete list of Non-Compliant Materials from the Electrical section of our database.

Category	Material Name	Model Number	Company Information	Type of Certification	Price	Source
Lamps						
	OBALS Ceiling Recessed Mounted Downlight	YS-DL05M-S	Obals Lighting	CCC, CE, RoHS		https://www.alibaba.com/product-detail/Led-Downlight-Led-Led-Downlight-15w_1600190913017.html?spm=a2700.galleryofferlist.normal_offer.d_title.27c41ca5IrsQsI&sg
	Dimmable LED Flat Panel Light	AF29-A2		CE		https://www.alibaba.com/product-detail/Led-Flat-Panels-Panel-Light-Led_1600192574029.html?spm=a2700.galleryofferlist.normal_offer.d_title.2d1b5b054nuhww&sp
Conduits						
	Steel EMT Compression Coupling					https://www.alibaba.com/product-detail/Steel-EMT-compression-Couplings-by-china_62178825687.html?spm=a2700.details.0.0.3cdd236fqp7FMt
	Galvanized Steel EMT Conduit Box	54151				https://www.alibaba.com/product-detail/4x4x1-1-2-depth-galvanized-steel_1600106538096.html?spm=a2700.galleryofferlist.normal_offer.d_title.29df3119ZWabWc
	1/2" Electrical Rigid Conduit Bodies		Hangzhou MQ Electric Co, Ltd.			https://www.alibaba.com/product-detail/1-2-electrical-rigid-conduit-bodies_62042013860.html?spm=a2700.galleryofferlist.normal_offer.d_title.7c1e27affgepUl
Cables						
	Electrical Wire Copper THHN Wire	6 8 10 12 AWG		CE		
	Metal Clad Cable MC/BX Armored	YJLHVB2	Shanglin Shanghai Yongjin Cable Group Co., LTD.	CCC		https://www.alibaba.com/product-detail/Competitive-price-cable-cost-Metal-Clad_60603244279.html?spm=a2700.galleryofferlist.normal_offer.d_title.7637f013fhSeGw
Devices						
	Hospital Grade Receptacles	YQ15R-HG	Yueqing Hongji Trade Co., Ltd.			https://www.alibaba.com/product-detail/Hospital-Grade-Receptacle-Hospital-Receptacle-Socket_1600190225094.html?spm=a2700.galleryofferlist.normal_offer.d_title.1c8f2d9759pvg8&sp
	Tamper resistant Receptacles	KGM-15T	Shenzhen Keygma Electrical Mi	ETL/UL		https://www.alibaba.com/product-detail/Receptacle-Tamper-Resistant-American-125V-15A_60752340276.html?spm=a2700.galleryofferlist.normal_offer.d_title.424b71c7f9320T&sp
	Surge protective receptacles	LA-102S	Ningbo Litesun Electric Co.,	ETL/CETL		https://www.alibaba.com/product-detail/LA-1025-6-outlets-surge-protected_60425082096.html?spm=a2700.galleryofferlist.normal_offer.d_title.14777106dUCL24&sp
	Nonmetallic cover plates with r	DQ-2420AA	Shenzhen S-Lord Electronic Co., Ltd.			https://www.alibaba.com/product-detail/US-White-Duplex-Receptacle-Outlet-Wall_62322235197.html?spm=a2700.galleryofferlist.normal_offer.d_title.7f715e5122bhC8
	receptacles	G120209	Hangzhou Jukings Tech Co.,	CUL ETL		https://www.alibaba.com/product-detail/15A-125V-WR-TR-Household-outdoor_1600093718120.html?spm=a2700.galleryofferlist.normal_offer.d_title.6ec7579bX0BUZ7
Fire detction						
	smoke/ heat/ carbon monoxide	CST503	Shenzhen L&L Technology Co.,	CE/ROHS/FCC		https://www.alibaba.com/product-detail/Wireless-433Mhz-315Mhz-Temperature-Heat-Smoke_1600054775634.html?spm=a2700.galleryofferlist.normal_offer.d_title.2d9868edOLYwz
	indoor horn strobes	AW-CSS2166-2	Zhongshan Guta Fire Equipment Technology Co., Ltd.			https://www.alibaba.com/product-detail/Indoor-Fire-Strobe-Sounder-Horn-Strobe_1600190958705.html?spm=a2700.galleryofferlist.normal_offer.d_title.5d7fa0bdd6P2id
	indoor strobes	TS-776	THUNDEROUS SOUNDERS ELECTRONIC LTD.			https://www.alibaba.com/product-detail/Flash-yellow-indoor-red-strobe-light_1700001119848.html?spm=a2700.galleryofferlist.normal_offer.d_title.18c1c43bv0fXkO
	Dual Action Addressable Manual Pull Station	MLXB	Ningbo Meilin Machine Co., Ltd.			https://www.alibaba.com/product-detail/Outdoor-Explosion-Proof-Addressable-Non-Coded_60621415619.html?spm=a2700.galleryofferlist.normal_offer.d_title.2be4799aA1pek8