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

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March 18th, 2021







### 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

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<u>Date:</u> March 18, 2021

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### 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 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:

- 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.
- Develop a database similar to that of UL iQ but for the other certification companies.
- 4. Integrate all global standards into one universal standard.
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## Authorship

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2.1 History of Fires in Costa Rica	William Arthur
2.2 National Fire Protection Association (NFPA)	Nathan Maldonado and Kylie Belanger
2.2.1 NFPA Codes and Standards Implementation	Nathan Maldonado
2.2.2 NFPA 101: Life Safety Code	Delia Smith
2.2.3 History of Costa Rican NFPA Involvement	Kylie Belanger
2.3 Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CFIA)	Delia Smith
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2.4.1 Nationally Recognized Testing Laboratory Program (NRTL)	Delia Smith
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3.3 Identify the Laboratories that Tested the Materials	Delia Smith and William Arthur
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<b>5.0 Conclusion and Recommendations</b> 5.1 Conclusion	Delia Smith
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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. 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.

UL Product <b>iQ</b> <sup>™</sup>			SEARCH MY SEARCHES MY TAO		
REFINE RESULTS	Dashboard / Searc	ch	<u>Help us improve!</u>		
Build or filter your results by keyword and/or adding criteria like document type, file number and country name.	> 266 Results :: Key	word: Butterfly valve			
Keyword	Action 🗸 Displa	iy: General 👻	«         1         2         3         4         5         »		
Butterfly valve Search	Document				
UL Category Control Number	Name \$	Company Name \$ Notes \$	UL CCN Description \$		
Click to view and filter values	NKPZ.E239009	POSI-FLATE BUTTERFLY VALVES	Motor Controllers, Float- and Pressure-operated		
Company Name					
Click to view and filter values	NKP27.E239009 POSI-FLATE BUTTERFLY VALVES		Pressure-operated Certified for		
Bile Number 0			Canada		
Click to view and filter values	FDNP.MH17622	HENRY PRATT CO,	Drinking Water System		
8 Location		SUB OF MUELLER	Components		
Click to view and filter values		00			
Add Filter	<u>QNVB.MH17622</u>	HENRY PRATT CO, SUB OF MUELLER CO	Lead Content Verification of Products in Contact with Potable Water		
Cancel Reset Save Search	QNVB7.MH17622	HENRY PRATT CO, SUB OF MUELLER CO	Lead Content Verification of Products in Contact with Potable Water Certified for Canada		
	GOYU.EX1368	Chemetron Fire Systems	Carbon Dioxide Extinguishing System Units, Marine		

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.

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:

- 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 Valves and Accessories	Material Name	Com	pliant Price	Nor	n-Compliant Price	% Difference	Pric	ce Difference	Average % Difference 78%	Average Price Difference \$ 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	Ś	800.00	Ś	500.00	38%	Ś	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 Carbon Dioxide	\$	256.00	\$	25.07	90%	\$	230.93		
	(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.)	Ś	6.18	Ś	6.00	3%	Ś	0.18		
Medical Gases							Ť		50%	\$ 955.00
	Multiple Alarm Valve Combo Unit	Ś	2.645.00	Ś	750.00	72%	Ś	1.895.00		
	Chemetron Wall Outlet	ś	65.00	Ś	50.00	23%	Ś	15.00		
Lamps									52%	\$ 23.52
	LED Surface Mounted Luminaire	Ś	39.29	Ś	11.45	71%	Ś	27.84		
	LED Recessed Luminaire	ś	58.18	ŝ	38.99	33%	ŝ	19.19		
Conduits			00110	Ť	00100	0070	Ť	20120	67%	\$ 1.21
	EMT Connectors and Couplings, Compression Type									
	Coupling - Steel	Ś	0.46	Ś	0.20	57%	Ś	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	Ś	4.62	Ś	2.75	40%	Ś	1.87		
	Octagon Boxes	Ś	2.98	Ś	0.09	97%	Ś	2.89		
	Outlet Boxes	\$	1.27	\$	0.09	93%	\$	1.18		
	Rectangle Boxes	ś	0.92	Ś	0.06	93%	Ś	0.86		
Cables									56%	\$ 31.46
	Thermoplastic-Insulated Wire	\$	690.00	\$	685.80	1%	\$	4.20		
	Metal-Clad Cable	Ś	108.71	Ś	50.00	54%	Ś	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					SYSTEM SENSOR UNINCORPORATED, DIV OF HONEYWELL	
Valves and Accessories	WFDN Series Waterflow Detector	WFD20N WFD25N WFD30N WFD40N WFD50N WFD60N WFD80N	\$739	SYKJ	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	). 5739	SYKI	SYSTEM SENSOR UNINCORPORATED, DIV OF HONEYWELL INTERNATIONAL INC 3825 Ohio Ave Saint Charles, IL 60174 5467 USA	
varves and Accessories	Treasure Switches	Model 546-8000. Model 546-7000. Model	5,55	5115	SYSTEM SENSOR UNINCORPORATED, DIV OF HONEYWELL INTERNATIONAL INC 3825 Obio Ave Saint Charles, IL 60174	
Valves and Accessories	Cover Tamper Swtich	546-9000 T-104-0, F-607-0TS, F-697-0, F-607RW, F-	\$739	SYKJ	5467 USA	UL
	175 PSI WWP Bronze Gate	607RW, F-607-RWS, G607RW, FG607RW, M- 609, F-609, F-609-RW, F-609-RWS, FM-609-			NIBCO INC 1516 MIDDLEBURY ST	
Valves and Accessories	300 lb. WWP UL/FM Butterfly Valves, Lugged	RW5_G009WW LD35104 LD35104 LD35104WP LD35104GP LD35104GP LD35104GP LD35104GP LD35104GP ED35104GP ELD35104GP ELD35104HP ELD35104HP ELD35104WP ELD35104WP ELD35104	EX2586	HLQT7	NIBCO INC 1316 MIDOL (BURY ST	UL
Valves and Accessories	Wafer	ELD-3510-8-GP WD-3510-4	EX3184	HLQT	ELKHART, IN 46515 USA	UL
	300 Ib. WWP UL/FM	WD 3510-4-WP           WD 3510-4-WP           WD 3510-8           WD 3510-8           WD 3510-8           WD 3510-6           WD 3510-8			NIBCO INC	
Valves and Accessories	Butterfly Valves, Non-Lugged Wafer	EWD-3510-8-WP EWD-3510-8-GP	EX3185	HLQT	1516 MIDDLEBURY ST ELKHART, IN 46515 USA	UL
					RELIABLE AUTOMATIC SPRINKLER CO INC 1470 Smith Grove Rd	
valve and Accessories	wodd G Swing Check Valves	u 2112-201 22132-116-300 22132-116-300 22132-116-300 22132-116-200 22132-116-200 22532-116-300 22532-116-300 22532-116-300 22132-116-200 22132-116-200 22132-116-200 22132-116-200 22132-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 22532-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2353-116-200 2355-116-200 2355-116-200 2355-116-200 2355-116-200 2355-116-200 2355-116-2	2.3100	ntQI	JINAN MEIDE CASTING CO LTD Midd Stance and Technology Park Pinggin Industria	
Valves and Accessories	Valve	Z51X-250 DH77XSR-300	EX15973	HLQT	JINAN, SHANDONG 250400 CHINA	UL
	MARIA Check Marine - V	DH77XSR-250 DH77XSR-200 DH77XSR-200			JINAN MEIDE CASTING CO LTD Meide Science and Technology Park	
Valves and Accessories	Capper	DH77358-PH10 H4422-363 H4422-363 H4422-300 H422-300 H42	B(16203	нцат	JINAN, SHARDONG 250400 CHINA JINAN MEIDE CASTING CO LTD Meide Sience and Technology Jack	UL.
Valves and Accessories	AWWA Check Valve: Swing	H24X-363	EX16203	HLQT	JINAN, SHANDONG 250400 CHINA GIACOMINI S.P.A. Via per Alzo, 39	UL
Valves and Accessories	Test and Drain Valve	A61	36Y7		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.



## **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 PGQT PGQT1H PHQT2 PHQT2H PGQT4 XGQT09 L991 XGQT3 PGQT6 XGQT04 XGQT04G XGQT041 041 L922 PGQT3	1 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 XGQT1 XGQT13 XGQT14 L981 XGQT11 XGQT1 YGQT01 PGQT01 PGQT018 PGQT015 PGQT02 PGQT021 PGQT022 PGQT03 PGQT003 PGQT04 PGQT062 PGQT07 PGQT055 PGQT06 PGQT05 PGQT09 PGQT10 PGQT10C PGQT11 PGQT115 PGQT125	2 EX26470	VIYW	Titan Fire Ltd., Room 2004, 20F, Center Point, 181-185 Gloucester Road, Wanchai, Hong Kong	UL
Pining	Pigid Coupling	16	MH62101	ONVR	Jinan Meide Casting Co. LTD. Meide Science and Technology Park Pingyin Industrial Park	10
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	32	21 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 Pine	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, 212, 25, 4- STD, 4A-STD, 4B, 4-STD, 4PVC-STD, 51, 55, 58, 59, 6, 61, 65-1/2, 65-3/8, 6SXT-3/8, 66- 1/2, 66-3/8, 67-1/2-67-3/8, 67WM-1/2, 67WM-3/8, 685, 68W, 69, 691, 698, 6F, 67VC, 75, 76, 78-1, 78-2, 78-3, 825, 825A 830372, 830-54, 83100, 83104, 83140, 83170NFC, 83170NFF, 83174, 83174A, 83180, 83188, 83188C, 83203, 150 Wing4t, 83373, 83373, 83537, 83551, 83600, 150 Wing4t, 830374, 83052, 8351, 83600, 150 Wing4t, 83014, 109 109A 109AE 109F, 82501	EX2145	VDGT	COOPER B-LINE INC. EX2145 509 W. Monroe Street Highland II. 62749 USA	UL
Conduit Fittings	DF-100, DF-125, DF-150, DF-200, DF-250, DF 300, DF-320, DF-400, DF-50, DF- 600, DF-75, PB-100, PB-350, PB-400, PB- 200, PB-520, PB-300, PB-350, PB-400, PB- 50, PB-500, PB-600, PB-75, PB-100, AF- 350, AF-400, AF-50, AF-500, AF-300, AF- 350, AF-400, AF-50, AF-500, EF-300, AF- 350, EF-400, AF-500, EF-500, EF-600, EF-75, EF-100, EFB-300, EFB-300, EFB-200, EFB- 350, EFB-300, EFB-350, EFB-400, FB-830, EFB- 350, EFB-300, EFB-350, EFB-400, FB-830, EFB- 350, EFB-300, EFB-350, EFB-400, PBW-350, FBB- 300, FB-300, PBW-250, PBW-300, PBW-350, PBW-350, PBW-400, PBW-50, PBW-600, PBW-350, PBW-400, PBW-500, PBW-600, PBW-750, PBW-400, PBW-500, PBW-600, PBW-750, PBW-400, PBW-500, PBW-600, PBW-750, PBW-700, PBW-750, PBW-600, PBW-750, PBW-700, PBW-750,	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						
Extinguistiers						
		A384 B385				
		B386				
		B394				
		397				
		673			AMEREX CORP	
		B673			7595 Gadsden Hwy	
	Uslatas I	674,675	575.035	514527	P.O. Box 81	
	Halotron I	8674, 8675	EX5U35	FWF27	AMEREY CORD	UL
					7595 Gadsden Hwy	
					P.O. Box 81	
	Water & Foam (Espuma)		240 EX2765	FWFZ7	Trussville, AL 35173 USA	UL
		250/250CG			AMEREX CORP 7595 Gadiden Hww	
		254			P.O. Box 81	
	Water & Foam (Espuma)	630	EX3076	GEEZ	Trussville, AL 35173 USA	UL
		318				
		321				
		322				
		331			AMEREX CORP	
		332			7595 Gadsden Hwy	
	Carbon Dioxide	333	F¥2835	EW/EZ	P.O. Box 81 Trussville AI 351731154	
	(602)	554	LAZOJJ		in addition of the source of t	
		Aluminum Valve: B417/B417T				
		B500/B500T				
		B402/B402T				
		B443				
		A411 Brass Valve				
		B424			AMEREX CORP	
		B461			7595 Gadsden Hwy	
	ABC Dry Chemical	B441	EV2764	EVA/E7	P.O. Box 81 Truesville, AL 25172 USA	
	Abe bry chemical	423	LX2704	TWIL	11 ussvine, AL 35175 USA	0L
		E7763-101				
		E7763-102 E7763-103				
		E7763-104				
		E7763-105				
		E7763-105				
		E7763-108			KIDDE FIRE PROTECTION	
		E7763-109			1st Floor, Stokenchurch House	
	Closp-agent Extinguishing	E7763-110			Oxford Road	
	System Units (ABC Dry	E7763-112			Stokenchurch, Buckinghamshire HP14 3SX UNITED	
	Chemical)	E7763-113	EX5054	FWFZ	KINGDOM	UL
		Ammonium Phosphate:				
		FE1A10G				
		FEIAI0G15 FEIAI0G15WY80				
		FE1A10G15WY90				
		FE1A10GR				
		FE1A10GR195				
		FE1A10GNR				
		FE2A10GR				
		FE3A40GR				
		FE3A40B				
		FE4A60B				
		FE4A60BC				
		FE4A60BCA				
		Sodium Bicarbonate:				
		FES5				
		FESA5				
		BF5				
		FESR				
		FE5GR				
	Dry-chemical Extinguishers	FE10GR			BKK BKANDS, INC. 3901 Liberty Street	
	Hand and Wheeled	FE10GRWY	EX3622	FWFZ	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

Recurse interling applic Version         No.200         PASSA         VICE         D00013-100 000013-100 000013-100         ULL 00000000000000000000000000000000000	F	ire Supression						
Nome     USB NO     NAME     NAME     NAME     NAME     NAME       Angel Yoak     RAME     RAME     RAME     RAME     RAME     RAME       Angel Yoak     RAME     RAME     RAME     RAME     RAME     RAME       Set Nine Answerten     RAME     RAME     RAME     RAME     RAME       Set Nine Answerten							GIACOMMI SPA	
No.         No.         No.         No.         No.         No.           ingerinde         MATSCI         D0.004         WD2         WH2 Park 2013         No.           ingerinde         MATSCI         D0.014         WD2         WH2 Park 2013         No.           ingerinde         MATSCI         D0.014         WD2         WH2 Park 2013         No.           ingerinde         MATSCI         D0.014         WD2         WD2         WD2         WD2           ingerinde         MATSCI         D0.014         WD2			Pressure Restricting Angle	4155	E¥3504	VPO7	Via Per Alzo 39 28017 S. Maurizio D'Opaglio. No. Italy	
Angle Vision         MODES         VACUE	1		Valve	A133	223304	VIIOZ	GIACOMMI SPA	
Arge - Value         Address         D2184         WD27         2013 1. Marcin DP Spating in the part of the part o							Via Per Alzo 39	
Add 23 Open         Description (2013) (2013)         Description (2013)         Descrip	÷.		Angle Valve	A56Y005	EX2964	VROZ7	28017 S. Maurizio D'Opaglio, No. Italy	UL
Somither, Monthmeter, M. 2014         2014         Monthmeter, M. 2014         Monthmeter, M. 2014           Open         4014         10011         10011         10011         10011           1001         4014         10011         10011         10011         10011           1001         4014         10011         10011         10011         10011         10011           1001         10011				AG1425			AG FIRE SPRINKLER SL C/Alfoz de Bricia N. 4	
Deem         Add B0         D0 50         WD T         MD Reput, Same         DL           1002			Sprinklers, Automatic and	AG1435			Pol. Ind. Villalonquejar	
Spinker, Ausmin       Sign Jung Jung Jung Jung Jung Jung Jung Ju			Open	AG1485	EX15331	VDGT	09001 Burgos, Spain	UL
Calonds       NARD       NUME				1402				
ising       ising <td< td=""><td></td><td></td><td></td><td>1404</td><td></td><td></td><td></td><td></td></td<>				1404				
1414       1414         1414				1412				
Control       143       143       143       143       143         144       145       154       144       144       144         145       <				1414				
- Doiner:				1416				
145         150 <td></td> <td></td> <td></td> <td>1434</td> <td></td> <td></td> <td></td> <td></td>				1434				
isid         Pb Bai 320 <sup>10</sup> Pb Bai 320 <sup>10</sup> isid         Pb Bai 320 <sup>10</sup> Pb Bai 320 <sup>10</sup> isid         Pb Bai 320 <sup>10</sup> Pb Bai 320 <sup>10</sup> isid         Pb Bai 30 <sup>10</sup> Pb Bai 30 <sup>10</sup> Pb Bai 30 <sup>10</sup> isid         Pb Bai 30 <sup>10</sup> Pb Bai 30 <sup>10</sup> Pb Bai 30 <sup>10</sup>				1436			POTTER-ROEMER LLC.	
Colinets         169         P1511         N/A         Opper designer, CAS2744-0327.05A         UL           Septisher, Automatication         Add.10				1452			Po. Box 3527	
Spiribler, Automatical Market 1       Nation 1         Nation 1       Nation 1			Cabinets	1456	R15411	N/A	City of Industry, CA 91744-0527 USA	UL
Spinker, Atomic and Maria 1         NUME         NUME         NUME           Spinker, Atomic and Maria 1         NUME         NUME         NUME           Open         NUME         NUME         NUME         NUME           VID         NUME         NUME         NUME         NUME         NUME           VID         NUME         NUME         NUME         NUME         NUME         NUME           VID         NUME				RA1410				
Spinisking Attornational A4323         Bitself Attornational A4323         Bitself Attornational A4323         Bitself Attornational A4325         Bitself Attornational Attornational A4325         Bitself Attornational Attornation Attornatin Attornational Attornational Attornational Attornatete				RA1411				
April 1         NA121         NA122         NA122         NA123         <				RA1413				
MA423         MULUI Component         MA423         MULUI Component         MULUI Component           Gen         VIL20, VIL2				RA1421				
Spinuker, kunstander         14125         14125         14125           Open         K4126         K426         VGT         Luberty, 52:3657 UAA         U           V120, V122, V122, V121, V130, V132, V130, V132, V120, V130, V130, V120,				RA1425 RA1423			RELIABLE ALITOMATIC SPRINKLER CO. INC.	
Open         RL445         UK04         VUG7         Liberty, S22987/USA         UL           VE100, WE122, WE124, WE134, WE154, WE158, WE158, WE158, WE158, WE159, WE1			Sprinklers, Automatic and	RA1435			1470 Smith Grove Road	
<ul> <li>VE10, VE12, VE12, VE13, VE13,</li></ul>			Open	RA1485	EX454	VDGT	Liberty, SC 29657 USA	UL
Viile,				VK120, VK122, VK124, VK130, VK132,				
V1272, V1274, V1274, V1274, V1274, V1275, V1277,         V1272, V1274, V1274, V1274, V1274, V1274, V1280, V1281, V1284,				VK150, VK152, VK154, VK156, VK156, VK156, VK166,				
Vi12, Vi18,				VK172, VK173, VK174, VK176, VK177,				
V159, V200, V202, V2303, V2				VK178, VK180, VK181, VK182, VK184, VK186, VK188, VK190, VK192, VK194,				
W1254, W2253, W2277, W229, W300, W300, W301, W312, W313, W314, W330, W440, W34, W454, W453, W530, W53				VK196 , VK200, VK202, VK2503, VK2523,				
Vision,				VK2543, VK2753, VK2773, VK2793, VK300,				
V1227, V1233, V1233, V1233, V1233, V1233, V1233, V1233, V1243, V1230, V1244, V1230, V1243, V1251,				VK301, VK302, VK303, VK305, VK310, VK312, VK315, VK317, VK319, VK325,				
V139, V130, V130, V132, V135,				VK327, VK329, VK331, VK333, VK338,				
vixis11, vixis2, vixis2, vixis2, vixis3, vixis3, vixis31, vixis2, vixis2, vixis3, vixis3, vixis3, vixis2, vixis4, vixis5, vixis3, vixis6, vixis2, vixis6, vixis2, vixis4, vixis6, vixis2, vixis6, vixis2, vixis4, vixis8, vixis6, vixis2, vixis4, vixis4, vixis8, vixis6, vixis2, vixis4, vixis2, vixis4, vixis4, vixis4, vixis4, vixis4, vixis7, vixis4, vixis4, vixis5, vixis4, vixis4, vixis7, vixis4, vixis4, vixis4, vixis4, vixis7, vixis4, vixis4, vixis4, vixis4, vixis7, vixis4, vixis4, vixis4, vixis7, vixis7, vixis7, vixis7, vixis7, vixis7, vixis7, vixis				VK339, VK340, VK342, VK344, VK350,				
V465, V453, V453, V453, V453, V535,				VK4611, VK462, VK4621, VK463, VK464,				
VK31, VK32, VK35, VK35, VK35, VK35, VK35, VK35, VK56,				VK465, VK4651, VK492, VK4921, VK530,				
VISE0, VSE2, VSE6, VSE2, VSE6, VSE2, VSE6, VSE03, VSE03, VSE02, VSE05,				VK531, VK532, VK534, VK536 , VK538, VK540, VK550, VK552, VK556, VK558.				
VK560, VK600, VK602, VK604, VK605, VK644, VK665, VK654,				VK560, VK562, VK566, VK570 , VK572,				
WEDD, VADUE, V				VK580, VK600, VK602, VK604, VK605,				
visi8, vis60, vis69, vis64, vis68, vis60, vis00, vis00, vis01, vis02, vis18, vis68, vis68, vis69, vis00, vis02, vis101, vis102, vis118, vis10, vis101, vis101, vis111, vis10, vis111, vis10, vis111, vis10, vis111, vis10, vis111, vis10, vis111, vis10, vis111, vis111, vis11, v				VK616, VK618, VK630, VK632, VK634,				
VK645, VK659, VK650, VK690, VK900, VK900, VK600, VK600, VK600, VK600, VK600, VK602, VK1001, VK1021, VK1181, VK1201, XK1201, XK1				VK638, VK660, VK693, VK694, VK695,				
Notes         Notes         Notes         Notes           Sprinklers, Automatic and         VK1202, VK2101, VK2102, VK2101,         EK643         VDGT         L210 Industrial Park Drive           Open         VK1202, VK2001, VK2012, VK2101,         EK643         VDGT         Hastings, ML49058-9706 USA         UL           N1302, N17321, N1321, N1321, N1322, N1323, N1421, N1412, N1414, N1422, N1442, N1442, N1442, N1442, N1442, N1442, N1442, N1442,				VK696, VK697, VK681, VK682, VK683,				
Sprinklers, Automatic and VK1202, VK2001, VK2002, VK2021, VK2001, VK2002, VK2021, VK2004, VK2002, VK2020, VK2002, VK2020, VK2004, VK2004, VK2004, VK2004, VK204,				VK1001, VK1021, VK1181, VK1201,			VIKING CORP.	
Open         VK.202, VK.301, VK.3121, VK.3123,         Void Nation Results, MI 49058-9706 USA         UL           N3301, VK.302, VK.301, VK.3121, VK.3123,         NY320, NY3211, VK.322, NY328, NY328,         NY320,         NY3301, NY3121, VK.322, NY381, NY382,           NY3301, VK.302, VK.301, VK.302, NY321, VK.322, NY381, NY382,         NY3300, NY4101, YK.4123, YK.4123,         NY4101, YK.4123, YK.4123,         NY4101, YK.4123, YK.4123,           NY420, YK.410, YK.412, YK.4123, YK.412, YK.413, YK.4123, YK.412, YK.413, YK.414, YK			Sprinklers, Automatic and	VK1202, VK2001, VK2002, VK2021,			210 Industrial Park Drive	
11122, 11322, 11322, 11322, 11322, 113220,         11323, 11321, 11322, 11322, 11322, 11323,         11323, 11321, 1133, 1123, 1123,         11424, 1131, 1131, 1121, 1123,         11424, 1131, 1131, 1131, 1131, 1131, 1131,         11424, 1131, 1131, 1131, 1131, 1131,         11434, 1131, 1131, 1131, 1131, 1131, 1131,         11434, 1131,	j,		open	VK2U22, VK3UU1, VK3U21, VK3U01, TV1382 TV3101 TV3103 TV3121 TV3123	EA043	VUGI	nastings, MI 49058-9706 USA	UL
Pr3301, Pr321, Pr332, Pr3381, Pr3382,         Pr3300, Pr4101, Pr4103, Pr4123,         Pr4210, Pr4321, Pr432, Pr480, Pr4910,         Pr328, Pr313, Pr313, Pr313, Pr323, Pr323,         Pr328, Pr313, Pr313, Pr313, Pr223, Pr325,         Pr328, Pr313, Pr313, Pr313, Pr3131,         Pr330, Pr411, Pr2231, Pr3250, Pr3251,         Pr320, Pr3231, Pr3250, Pr3251,         Pr329, Pr329, Pr329, Pr3250, Pr3351,         Pr329, Pr329, Pr329, Pr3250, Pr3351,         Pr329, Pr329, Pr329, Pr3250, Pr3351,         Pr329, Pr329, Pr329, Pr329, Pr3251,         Pr329, Pr329, Pr329, Pr329, Pr3250, Pr3355,         Pr359, Pr331, Pr341, Pr451,         Pr423, Pr421, Pr421, Pr421, Pr421, Pr421,         Pr4232, Pr422, Pr4232, Pr4251, Pr4292,         Pr4232, Pr4232, Pr4231, Pr4251, Pr4292,         Pr4232, Pr4232, Pr4231, Pr4231, Pr4251, Pr4292,         Pr4232, Pr4232, Pr4231, Pr4231, Pr4251, Pr4292,         Pr4232, Pr4232, Pr4232, Pr4231, Pr4231, Pr4231, Pr4231,         Pr5137, Pr5131, Pr5141, Pr5141, Pr5141, Pr5141,         Pr514, Pr532, Pr533, Pr5331, Pr5331,         Pr5137, Pr511, Pr5131, Pr5141, Pr5141, Pr5141, Pr5141, Pr5141, Pr5141, Pr5141,         Pr5137, Pr5141, Pr5141, Pr5141, Pr5141, Pr5141,         Pr514, Pr514, Pr5141, Pr5141, Pr5141, Pr5141,         Pr514, Pr514, Pr5141, Pr5141, Pr5141, Pr5141,         Pr514, Pr514, Pr514, Pr5141, Pr5141, P				TY3210, TY3221, TY3281, TY3282, TY3290,				
In 19390, 114101, 114105, 114124, 1141145,         In 19390, 114101, 11432, 11401,         In 19390, 114101, 11431, 11411, 11411,         In 19390, 114101, 11413, 11413, 11411,         In 19390, 114101, 11413, 11413, 11413, 114131,         In 19390, 114101, 11413, 11413, 11413, 114131,         In 19390, 114101, 11413, 11413, 11413, 11413,         In 19390, 114101, 11413, 11413, 11413,         In 19390, 114101, 11413, 11413, 11413,         In 19390, 114101, 11413, 11413, 11413,         In 19390, 11411, 11413, 11413, 11413,         In 19390, 11413, 11413, 11413, 11413, 11413,         In 19390, 11413, 11413, 11413, 11413, 11413,         In 19390, 11413, 11413, 11413, 11413, 11413,         In 19310, 11413, 11413, 11413, 11413, 11413,         In 19311, 11413, 114141, 11414, 11414, 11414, 11414, 11414, 11414, 11414, 11414, 11414				TY3301, TY3321, TY3322, TY3381, TY3382,				
W1228, W131, W1251, W1223, W1253, W1263,         W1928, W131, W1151, W1231, W1251,         W1313, W1213, W1213, W1251,         W1313, W1213, W1213, W1251,         W1313, W1213, W1213, W1231,         W1310, W1230, W1231,         W1310, W1230, W1231,         W1311, W1213, W1231,         W1311, W1231, W1231,         W1311, W1231, W1231,         W1311, W1313, W1313,         W1311, W1313, W1313,         W1311, W1313, W1313,         W1311, W1313, W1311,         W1311, W1313, W1313,         W1311, W1313, W1311,         W1311, W1313, W1311,         W1311, W1313, W1311,         W1311, W1313, W1311,         W1311, W1311, W1313,         W1311, W1311, W1313,         W1311, W1311, W1311,         W131, W1311, W13113,         W131, W1313, W1313,				TY3390, TY4101, TY4103, TY4121, TY4123, TY4210, TY4321, TY4322, TY4801, TY4910				
TY365, TY1131, TY1231, TY1231, TY1231, TY1313,         TY3133, TY1131, TY1231, TY3133, TY3131,         TY3133, TY3131, TY3133, TY3132, TY3133,         TY3201, TY320, TY3231, TY3323, TY3351,         TY3201, TY3230, TY3231, TY3323, TY3351,         TY3201, TY3230, TY3323, TY3352, TY3535,         TY3391, TY3431, TY3451, TY3153, TY3153,         TY3391, TY3431, TY4451, TY4331, TY4151,         TY3391, TY4317, TY4133, TY4151,         TY4153, TY4151, TY4153, TY4151,         TY4482, TY4931, TY4951, TY451,         TY483, TY4951, TY5131, TY5131,         TY5137, TY5151, TY5132, TY5337, TY5339, TY5831,         TY5851, TY6137, TY6237, TY7103, TY7153,         TY8131, TY8151,				TY9128, TY313, TY315, TY323, TY325, TY363,				
11331, 11213, 11213, 11310, 113133, 11333, 11333, 11333, 11333, 11333, 11333, 11333, 11333, 11333				TY365, TY1131, TY1151, TY1231, TY1251,				
m3201, m3231, m3250, m3251,         m3291, m3296, m3231, m3351, m3353,         m3291, m3296, m3231, m3532, m3353,         m3539, m3532, m3532, m3535,         m3539, m3532, m3533, m3535,         m3539, m3532, m3533, m3535,         m3539, m3532, m3531, m351, m4151,         m4153, m4191, m4231, m4151, m4131, m4131, m4151,         m4153, m4191, m4231, m4251, m4292,         m4232, m4282, m4332, m4531, m4551,         m4232, m4282, m423, m4531, m4551,         m5137, m5131, m51				TY3133, TY3151, TY3153, TY3187, TY3191.				
Tr 3291, Tr 3292, Tr 3231, Tr 3332, Tr 3351, Tr 3391, Tr 3451, Tr 330, Tr 3550, Tr 3555, Tr 3539, Tr 3537, Tr 3550, Tr 3555, Tr 3539, Tr 3537, Tr 3550, Tr 3555, Tr 3531, Tr 4231, Tr 4231, Tr 4231, Tr 4232, Tr 4232, Tr 4232, Tr 4231, Tr 4231, Tr 4231, Tr 4232, Tr 4232, Tr 4231, Tr 4231, Tr 4231, Tr 4232, Tr 4232, Tr 4231, Tr 4231, Tr 4231, Tr 4331, Tr 4351, Tr 4311, Tr 4311, Tr 5351, Tr 537, Tr 5337, Tr 5339, Tr 5331, Tr 5351, Tr 537, Tr 5337, Tr 5339, Tr 5331, Tr 5351, Tr 537, Tr 5337, Tr 5339, Tr 5331, Tr 5351, Tr 537, Tr 5337, Tr 5339, Tr 5331, Tr 5351, Tr 537, Tr 5337, Tr 5339, Tr 5331, Tr 5351, Tr 537, Tr 537, Tr 537, Tr 537, Tr 5331, Tr 5311, Tr 5311, Tr 531, Tr 537, Tr 537, Tr 5311, Tr 5311, Tr 5311, Tr 531, Tr 531, Tr 537, Tr 5311, Tr 5311, Tr 5311, Tr 5311, Tr 531, Tr 537, Tr 5311, Tr 5311, Tr 5311, Tr 5311, Tr 531, Tr 5337, Tr 5339, Tr 5311, Tr 5311, Tr 5311, Tr 5311, Tr 531, Tr 5337, Tr 5339, Tr 5331, Tr 5311, Tr 5311, Tr 5311, Tr 5311, Tr 5311, Tr 531, Tr 5337, Tr 5				TY3201, TY3230, TY3231, TY3250, TY3251,				
Tr3353, Tr3351, Tr3537, Tr3550, Tr3555,         Tr3631, Tr3651, Tr4131, Tr4131, Tr4131, Tr4151,         Tr4351, Tr4131, Tr4231, Tr4222,         Tr4322, Tr4282, Tr4282, Tr4282,         Tr4331, Tr4851, Tr4931, Tr4931, Tr4213,         Tr4331, Tr4851, Tr4337, Tr4531,         Tr4331, Tr4851, Tr4337, Tr5337, Tr5337,         Tr4337, Tr5337, Tr5337, Tr5337, Tr5337,         Tr5251, Tr5337, Tr5337, Tr5337, Tr5337, Tr5337,         Tr5351, Tr6137, Tr5337, Tr5337, Tr5337, Tr3357,         Tr5351, Tr6137, Tr537, Tr5377, Tr53377, Tr5377, Tr5377, Tr5377, Tr5377, Tr5377, Tr5377, T				TY3291,TY3296, TY3331, TY3332, TY3351, TY3391, TY3431, TY3451, TY3530, TY3535				
TY3631, TY3651, TY4131, TY4131, TY4151,         TY4133, TY4131, TY4131, TY4151,         TY4132, TY4221, TY4222,         TY4232, TY4232, TY4651,         TY4831, TY451, TY433, TY4513,         TY4831, TY451, TY432, TY4651,         TY4831, TY5151, TY5237,         TY5251, TY5327, TY5237, TY5237,         TY5251, TY5332, TY5339, TY5331,         TY5851, TY6137, TY6137, TY6137, TY6237,         TY5851, TY6137, TY6137, TY6237, TY6137,         TY5851, TY6137, TY6181, TY8181, TY8231,         TY8131, TY8151, TY8181, TY8181, TY8231,         TY9131, TY9151, TY9181, TY9191, TY8231,         TY9131, TY9151, TY9181, TY9191, TY9231,         TY9131, TY9151, TY9231, TY9111, TY3137,         TY3211, TY3311, TY4113, TY4211, TY4811,         TY20FIRE & BUILDING PRODUCTS         Sprinklers, Automatic ad       TY4911, TY3135, TY3357, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3357, TY				TY3539, TY3532, TY3537, TY3550, TY3555,				
TY4153, TY4291, TY429, TY429, TY4232, TY428, TY433, TY4651, TY4831, TY4851, TY4931, TY4951, TY5131, TY5137, TY5151, TY5131, TY5131, TY5137, TY5151, TY5131, TY5137, TY5337, TY5337, TY5551, TY5232, TY5337, TY5337, TY5337, TY8151, TY8151, TY8181, TY8191, TY8231, TY8151, TY8151, TY8181, TY8191, TY8231, TY9131, TY9151, TY9181, TY8191, TY8231, TY9131, TY9151, TY9181, TY9191, TY9131, TY9131, TY9151, TY9291, TY3111, TY9131, TY9151, TY9291, TY3111, TY921, TY311, TY411, TY411, TY20FIRE & BUILDING PRODUCTS Sprinklers, Automatic and TY4911, TY3135, TY3357, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3337, TY3357, TY337, TY3357, TY357, TY577, TY3				TY3631, TY3651, TY4131, TY4133, TY4151,				
TV4831, TV4851, TV4951, TV5131,         TV5137, TV5151, TV5131, TV5131, TV5131,         TV5137, TV5151, TV5337, TV5337, TV5337, TV5337,         TV5851, TV6137, TV6237, TV7103, TV7153,         TV8131, TV8151, TV8151, TV8151, TV8151,         TV8131, TV8151, TV8211, TV8131,         TV9131, TV9151, TV9211, TV8131,         TV9131, TV9151, TV9211, TV9131,         TV9131, TV9151, TV9211, TV9111, TV9111,         TV9131, TV9151, TV9211, TV9111,         TV9211, TV9131, TV9111, TV9111,         TV9211, TV9131, TV113, TV111, TV111,         TV20 FIRE & BUILDING PRODUCTS         TV20 FIRE & BUILDING PRODUCTS         TV211, TV9131, TV113, TV411, TV411,         TV20 FIRE & BUILDING PRODUCTS         TV20 FIRE & BUILDING PRODUCTS         TV21, TV9131, TV113, TV411, TV411, TV411,         TV20 FIRE & BUILDING PRODUCTS         TV21, TV3135, TV3135, TV3337, TV337,				TY4153, TY4191, TY4231, TY4251, TY4292, TY4232, TY4282, TY4332, TY4631, TY4651				
TY5137, TY5151, TY5151, TY5237, TY5337, TY5351, TY5151, TY8151,				TY4831, TY4851, TY4931, TY4951, TY5131,				
115251, 11532, 115332, 115333, 11533, 1153, 1153, 11533, 1				TY5137, TY5151, TY5153, TY5231, TY5237,				
TY8131, TY8151, TY8191, TY8231,         TY8151, TY8281, TY8291, TY8231,         TY9131, TY9151, TY9291, TY9191, TY9291,         TY9251, TY9291, TY9111, TY3113,         TY9211, TY311, TY4211, TY411,         TY3211, TY311, TY411, TY411,         Sprinklers, Automatic and         TY4911, TY3155, TY3250, TY3253, TY3335,         Copen         TY3211, TY313, TY3157, TY335, TY3357, TY3337, TY3337, TY3357, TY357, T				TY5251, TY5332, TY5337, TY5339, TY5831, TY5851, TY6137, TY6237, TY7103, TY7153.				
TY8151, TY8281, TY8291, TY8291, TY82931,         TY9131, TY9151, TY9181, TY9291, TY9131,         TY9251, TY9281, TY9291, TY3111, TY3113,         TY3211, TY3311, TY4311, TY4311,         TY3211, TY313, TY3151, TY3230, TY3235,         Sprinklers, Automaticand         TY4911, TY3135, TY3155, TY3235, TY3337, TY337, TY377, TY37, TY37, TY37, TY37, TY37, TY377, TY3777, TY377, TY3777, TY3777, TY377, TY377, TY377, TY377, TY377, TY3				TY8131, TY8151, TY8181, TY8191, TY8231,				
Sprinklers, Automatic and         TY311, TY313, TY313, TY313, TY313, TY311, TY311, TY411,				TY8151, TY8281, TY8291, TY8331, TY8351, TY9131, TY9151, TY9191, TY9191, TY9131,				
TY3211, TY311, TY4113, TY4211, TY4811,         TYCO FIRE & BUILDING PRODUCTS           Sprinklers, Automatic and         TY4911, TY3135, TY3155, TY3235, TY3335, TY3337, TY337, TY377, TY37, TY				TY9251, TY9281, TY9291, TY3111, TY3113,				
Sprinkers, Automatic and TV4911, 1Y3155, 1Y3250, TY3257, 1Y3230, TY3259, TY3357, TY3337, TY337, TY377, TY				TY3211, TY3311, TY4113, TY4211, TY4811,			TYCO FIRE & BUILDING PRODUCTS	
			Open	TY3250, TY3255, TY3355, TY3230, TY3235, TY3250, TY3255, TY3335, TY3337, TY3339.	EX5985	VDGT	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						
					AMICO CORP.	
Mu	ultiple Alarm Valve Combo				85 Fulton Way	
Un	nit	AVL-XGXGXGXGXGXGXG	E156074	N/A	Richmond Hill, ON L4B 2N4 Canada	UL
		O-CHWAL-*-OXY				
		O-CHWAL-*-AIR				
		O-CHWAL-*-VAC				
		O-CHW/AL_*-N20			AMICOCOPP	
					PE Fultee Mar	
		O-CHWAL-1-DIK			op Fullon way	
Ch	nemetron Wall Outlet	O-CHWAL-*-#	SA9819	N/A	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		<u>//</u>	л	л	<u>n</u>	
	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 Kuhiman 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	НСТМ-РТ	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:SEM3SCCT2 50, US2:SEM3SCCT400, US2:SEM3SCCT600, US2:SEM3SCCT600, US2:SEM3SCCT1200, US2:SEM3SCCT1200, US2 :SEM3SCCT2000, 7K11280-5MA00, 7K11280-5MA01, 7K11280-5MA02, 7K11280-5MA03, 7K11280-5MA04, 7K11280-5MA05, 7K11280-5MA06, 7K11280-5MA07, 7K11280-5MA08	E492531	XNWX7	Siemens Industry Inc 3617 Parkway Lane Peachtree Corners, GA 30092 United States	UL
	Transformers, Distribution, Liquid-Filled	116117021061001 116117021061101	EE 1 4 70 9		Siemens Industry Inc	
	Power Transformers Rated Over 10 kVA	443/03 443/11 443/12 443/18 443/22 443/25	F488922	XNW/X7	DAYTON ELECTRIC MEG CO	UI
	Dry Type Power Transformers	44YU98, 44YV01, 44YV05, 44YV08	E488922	XNWX7	DAYTON ELECTRIC MFG CO	UL
	Industrial Control Type	1141, 835-001-1142, 865-001-1181, 656-001- 1161, 636-001-1171, 636-001-1181, 636-001- 1191, 636-001-1221, 636-001-2431, 636-001- 2411, 636-001-2421, 636-001-2431, 636-001- 2411, 636-001-2481, 636-001-2481, 636-001- 2501, 636-001-2481, 636-001-2481, 636-001- 264, 637-003-495, 637-003-78, 637-1003-399, 637- 1003-400, 637-1003-401, 637-1003-520, 637-1003- 521, 637-1003-420, 637-201 ( $_{1}$ , 637-206 ( $_{1}$ , 637-208 ( $_{1}$ , 637-201 ( $_{1}$ , 637-211 ( $_{1}$ , 637-212 ( $_{1}$ , 637-216 ( $_{1}$ , 637-216 ( $_{1}$ , 637-216 ( $_{1}$ , 637-236 ( $_{1}$ , 637-238 ( $_{1}$ , 637-239 ( $_{1}$ , 637-231 ( $_{1}$ , 637-236 ( $_{1}$ , 637-236 ( $_{1}$ , 637-297 ( $_{1}$ , 637-296 ( $_{1}$ , 637-297 ( $_{1}$ , 637-596 ( $_{1}$ , 637-596 ( $_{1}$ , 637-596 ( $_{1}$ , 637-596 ( $_{1}$ , 637-596 ( $_{1}$ , 637-596 ( $_{1}$ , 637-596 ( $_{1}$		XNWX	JEFFERSON ELECTRIC INC 9550 S FRANKLIN DR FRANKLIN, VIS 313-2-8847 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						
	OI Dual Function Circuit Breakers	Q0115DF, Q0120DF, Q0115PDF, Q0120PDF, Q0115VHDE, Q0120VHDE, Q0115VPDE, Q0120VPDE	N/A	N/A	Schneider Electric Costa Rica, Centro CorporativoEl Cedral, Torre 4, Piro 1 v 2. Ercatu, San Jose	
	Main lugs	NF442L2C, NF430L1C	N/A	N/A	Schneider Electric Costa Rica, Centro CorporativoEl Cedral, Torre 4,	UL
		40553-440-				
		50, HOM24L80ICU, HOM612L125I, HOM612L125ICU,			CONTRACTOR DI COTRICUCA INC.	
		8 US16020018 US21215018 US22420018 US23620			LOW VOLTAGE ASSEMBLED PRODUCTS	
	Panelboard Accessories, Interiors for	018, US24820018, US26020018, US31210018, US324			330 WEAKLEY LN	
	Mounting Circuit Breakers	20018, US33620018, US34820018, US36020018	E6294	QEUY2	SMYRNA, TN 37167-2024 United States	UL
		NQC20FWG, NQC30FWG, NQC54F, NQC54FW, QOCMF3			SCHNEIDER ELECTRIC USA INC	
		CMF54UC, QOCMF54UCW, QOCMF60UC, QOCMF60UC			330 WEAKLEY LN	
	Panelboard Accessories, Mono-Flat Covers	w	E6294	QEUY2	SMYRNA, TN 37167-2024 United States	UL
					SCHNEIDER ELECTRIC USA INC	
	Panelboards and Enclosed Panelboards,	Q0122X, Q0130, Q0142, Q0W142, Q0154 and Q0160,			LOW VOLTAGE ASSEMBLED PRODUCTS	
	Neutral Ready Interior Construction	may be followed by 0. G. C. RB. WG. TT. QG or MR.	E6294	QEUY3	SMYRNA, TN 37167-2024 United States	UL
		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,				
		UR1A or UR2A, PL1C or PL2C, SL3A, UR3A or PL3A, SL2A,			Eaton, 845 Corporate Cir	
	Panelboard Interiors	PL4 or UR4	E2544	N/A	Sumter, SC 29154-8193 United States	
					Eaton, 845 Corporate Cir	
	Circuit Breaker Panelboard	PRL4	E2544	N/A	Sumter, SC 29154-8193 United States	
	Panelboard	POW-R-LINE 4D (PRL4D), Pow-R-Line 4DX (PRL4DX)	E2544	N/A	Sumter, SC 29154-8193 United States	
		PRL1A(b), PRL1a-LX, PRL1X-LX, PRL2A(b), PRL2a-LX,				
		PRL2X-LX, PRL3A(a), POW-R-LINE-4, PRL1(W10B,			Eaton, 845 Corporate Cir	
	Panerboards and Enclosed Panelboards	W10PJ, PKL2(W22B, W22P), PRL3E	£2544	N/A	Sumter, St. 29154-8193 United States	
		3MMSURGE1, 3MMSURGE2, 3MMSURGE2D.			Eaton Corporation, 1725 1200TH AVE	
	Enclosed Panelboards	3MMSURGE3	E8741	N/A	Lincoln, IL 62656 United States	
		20679+#, 301760+#, 304129+#, 304130+#, 304422+#.				
		31578+#, 37573+#, 38661+#, 39780+#, 3BR3L100,				
		BR1020B100&, BR1020H100, BR24L100CBR,				
		BR24L125, BR24L70, BR2B100, BR2B40RPGF15, BR2B50RPGEIS BR21125 BR40SPAS BR481125				
		BR485L124, BR50SPAS, BR612L125, BR816L125,				
		BRC48L125RP, CH250SPA+, CH260SPA+, CH2L125,				
		CH2L40, CH2L70, CH30SPA+, CH40SPA+, CH4L125,				
		CH816L125, CH8L125, CH5PA30+, CH5PA40+.			Eaton Corporation, 1725 1200TH AVE	
	Panelboards	CHSPA50+, CHSPA60+, RWCH series, RXCH series	E8741	N/A	Lincoln, IL 62656 United States	
					Eaton Corporation, 1725 1200TH AVE	
	Barrier Kits	M378K, W378K	E52977	N/A	Exten Corporation 1725 1200TH AVE	
	Bonding Kits	мнвк	E52977	N/A	Lincoln, IL 62656 United States	
					Eaton Corporation, 1725 1200TH AVE	
	Conversion Kits	MBBB225, MBBB2257	E52977	N/A	Lincoln, IL 62656 United States	
	Equipment Grounding Bars	GB and GBK	E52977	N/A	Lincoln, IL 62656 United States	
		QFP-2125T (b), QFP-2150T (b), QFP-2175T (b), QFP-				
		2200T (b), QFP-LCB (b), VQFP-2125T (b), VQFP-2150T			Eaton Corporation, 1725 1200TH AVE	
	Main Circuit Breaker Kits	(b), VQFP-2200T (b)	E52977	N/A	Lincoln, IL 62656 United States	
	Main Lug Kits	NLK-2/0, TL20-2 (b)	E52977	N/A	Lincoln, IL 62656 United States	
					Eaton Corporation, 1725 1200TH AVE	
	Main Lug or Sub-Feed Plug-In Blocks	TL12-2 (b), TL12-3 (b)	E52977	N/A	Lincoln, IL 62656 United States	
		AMLK3225 (Cutler-Hammer 3BR5225 or Challenger				
		Challenger CSK125), MLK2125 (Culter-Hammer BKS125 or Challenger CSK125), MLK2150 (Culter-Hammer BRS150)				
		or Challenger CSK150), MLK2225 (Cutler-Hammer				
		BRS225 or Challenger CSK225), MLK3150 (Culter-				
	Main Lug or Sub-Engl Terminal Kits	Hammer 3BRS150 or Challenger CSK3150}, WTL12-2, WTL12-2C	EE 2077	N/A	Eaton Corporation, 1725 1200TH AVE	
	Main Log of Sub-reed Terminal Kits	2CD15 (a) 2CD20 (a) 2CD22 (42.42)(NT 2CD22 (a)	632377	17/0	cincolit, it ozobo oliteta states	
		3SL15 (a), 3SL20 (30-42)(NT, 3SL20 (a), 3SL22 (a),				
		3SLB10 (a), 3SLB12 (a), 612ML1125, 612ML1125C,				
		816ML1125, 816ML1125C, FLAHP, FLAHPB3, SB10 (a),				
	Mounting Bracket Kits	SB12 (a), SB15 (a), SB20 (a), SB22 (a), SL12 (a), SL15 (a), SL20 (a), SL22 (a), SLB12 (a), SLB20 (a)	F52977	N/A	Laton Corporation, 1725 1200TH AVE	
	Inconting Distance Kito	18N100, 9N100, CHNEU/NFU. D10406-G16. D10406-	01311		carcony at \$2.550 Oniced States	
		G17, D10406-G18, D10406-G19, D10406-G20,				
		D10406-G24, D10406-G27, D10406-G28, N22-34-925,			Eaton Corporation, 1725 1200TH AVE	
	Neutral Assemblies	140-24	t52977	n/A	Encorn, IL 62656 United States	
	Barrier Kits	TICMBERCSR, TIHPCCSR, TIHPDK, TIMBERCSR	E52977	N/A	Lincoln, IL 62656 United States	
		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,				
		tollowed 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			Eaton Corporation, 1725 1200TH AVE	
_	Panelboard Interiors, "INT Series"	by B, 1, C, D, SR, SRO V1 through V99	E52977	N/A	Lincoln, IL 62656 United States	
		1224INT200B, 1224INT3125B, 1224INT3200B,				
		120ML1125, 120ML1200, 120ML1200C, 1624INT12CB 1836INT3150B 18048 2150				
		2024INT125B, 2024INT3150B, 20DML1125.				
		20DML3150, 2424INT125B, 2442INT3150B,				
		24DML1125, 2DML3400, 3040INT200B,				
		3040INT3150B, 3042INT3200B, 30DML1125C, 30DML125C, 30DML1200, 30DML1150, 30DML2150, 30DML2200, 30CL2200, 30CL22000, 30CL2200, 30CL22000, 30CL2000, 30CL2000, 30CL2000, 30CL2000, 30CL2000, 30CL2000, 30CL20000, 30CL2000, 30CL20000, 30CL20000, 30CL200000, 30CL200000000000000000000000000000000000				
		24)INT, 3CL12(18-36)INT, 3CL12(24-36)INT, 3CI 20(12-				
		24)INT, 3CL20(18-36)INT, 3CL20(24-42)INT, 4-				
		8ML1125, 4242INT225B, 4242INT3225B, 42DML1225,				
		42DML1400, 42DML3225, 42DMT1400, 42DMT3400, 45MI 1125, 65MI 1125, 81-19844-7447, 81-19849				
		43ML1125, 65ML1125, 81-19844-7MX, 81-19848- 2MX, 81-19848-4MX, 81-19855-2MX. 81-19855-4MY				
		81-26158-2MX, 81-26158MX, 816INT200B,				
		8DML1200, 8SML1125, 8SML1125BH, 8SML3125,				
		G04, D10420-G05, 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,				
		010420-G15, D10420-G16, D10420-G17, D10420- G18, D10428, G01, D10428, G02, D10428, G02				
		D10428-G04, D10428-G05, D10428-G06, D10428-				
		G07, D10428-G08, D10428-G09, D10428-G10,				
		D10428-G11, D10428-G12, D10428-G13, D10428- C12, D10428, C01, D10428, C03, D10428, C03			Entre Corporation 1735 1200TU AVE	
	Den ally and later later	D10420 C04 D10420 C05 D10420 C05 D10420	FF 2077		Linearly II COSEC 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				NOTIFIER	
	Station	NBG-12LX	S692	UMGX	12 Clintonville Rd	UL
	Indoor Horns	HR, HW	S4011	SYKJC	System Sensor Unincorporated, DIVISION OF HONEYWELL	UL
		SR,SR-P, SR-SP, SRH, SRH-P, SRH-SP, SW, SW-P, SWH,			System sensor unincorporated, DIVISION OF HONEYWELL	
	Indoor Strobes	SWH-P	S5512	SYKJC	INTERNATIONAL INC. 3825 Ohio Ave, St. Charles, IL 60174	UL
		P2R,P2R-P,P2R-SP, P2RH, P2RH-P, P2W, P2W-P, P2WH,			System Sensor Unincorporated, DIVISION OF HONEYWELL	
	Indoor Horn Strobes	P2WH-P, P4R, P4R-P, P4RH, P4W, P2WL-LF, P2RL-LF	S4011	SYKJC	INTERNATIONAL INC. 3825 Ohio Ave, St. Charles, IL 60175	UL
		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-			NOTIFIER	
		200T (b)(d), NP-200T-IV(d), FSP-951T-SELFT(d), FSP-951T			12 Clintonville Rd	
	Heat Automatic Fire Detectors	ISO-SELFT(d)	S1115	UPLV	Northford, CT 06472-1610 USA	UL
	Smoke / Carbon monoxide detector	FPC-951, NP-200C, FCO-851	\$1115	FSVW	NOTIFIER	UL
					NOTIFIER	
	Smoke / Heat / Carbon Monoxide Detector	FCO-951, FCO-951-IV, FCO-951-ISO	S1115	SFVW	12 Clintonville Rd	UL

## **Appendix L: Devices**

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

ices						
		LS260, LS260645260, L6266, J7266, U3260, LS2606, LS260	2.			
	Flanged Outlets	740955, 7487, 7595	E140596	RTDV	STATES	UL.
	Lighted Receptacles	NTL81TR	E140596	RTDV	STATES STATES OF THE OWNER OF THE STATES OF THE STATES	UL.
	Hig Tal Connectors	PENDLO, PENDLO, PENDLOS, PENDLOS PE	1340596 4, 5- 1- 6- 8- 2-	RTDV	9005	υ.
	Receptacles	1532, 1533, 1542DR, 3232(H), 3232CN(H), MOR24(H), 3330, 3430, 3474, 3801(d), 3802(d), 3804(d), 3820, 8200MRI, 8300MRI, IG8301, SG63HWS, TR62HWS, P58200HS, P58300HS, TR63HWS, 8200WS, 8200HWS	E140596	RTDV	PASS & SEIMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
		%, H.201, 8284, 82944, 810085 %, 81006455, 8101, 2000465, 80045, 80045, 8004, 2000465, 8012, 20004665, 80045, 80042, 8012, 20004665, PT8200, PT8200, IGS2024H, ISS362HG, 20322HG, 20322HG, PT823462, 8712, 97124, 97124, 97124, PT26322HG, PT2632HG, PT2562HG, PT8204, HT8204 PT26322HG, PT2632HG, PT2562HG, PT8204, HT8204 PT26322HG, PT2632HG, PT2562HG, PT8204, HT8204 PT26322HG, PT2632HG, PT2632HG, PT8204, HT8204 PT2632HG, PT2632HG, PT2632HG, PT8204, HT8204 PT2632HG, PT2632HG, PT2632HG, PT8204, HT8204 PT2632HG, PT8204, PT8204, PT8204, HT8204HG, HT8204HG, PT8204 PT2632HG, PT8204, PT8204, PT8204, HT8204HG, PT8204HG, PT8204 PT82632HG, PT8204, PT8204, PT8204, PT8204, PT8204, PT8204, PT8204 PT82632HG, PT8204, PT			PASS & SEMMOURINC, 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	
	Receptacles: Hospital Grade	PT8300HSC, IG-3804(d) TR8200PI, TR8300PI, TR8200HPI, TR8300HPI,	E140596	RTDV	STATES	UL.
	Receptacles: Tamper Resistant, Hospital Grade	TRE200H, PTTR62H, PTTR63H, TR8201, TR8300H, TR8200H, PTTR62H, PTTR63H, TR8201, TR8301, TR26261HG, TR26361HG	E140596	RTDV	PASS & SEYMOUR INC., SO BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
	Receptacies: interchangeable or Modular Type	1332, 1333, 1432, 1433	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
	Modular 2 Type Receptacles	ARTH152, ARCD152, ARCH152, AD04100AA, ARTH202, ARCD202, ARCH202 ARTH153, ARLTR153, 981607, 981608, 981609,	E140596	RTDV	PAGS & SEYMOURINC, 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES PASS & SEYMOURINC, 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	uL
	Modular 3 Type Receptacies	981641 PTIG5262, PTIG5362, PTIG26262, PTIG26362, PTIG8200, PTIG5862, PTIG53625C, PTIG262625C, PTIG586525C, PTIG53625C, IG5362 PTIG88005C, PT263525C, IG5362, IG5362	E140596 2,	RTDV	STATES PASS & SEYMOUR INC., SO BOYD AVE, SYRACUSE, NY 13209 UNITED	u
	Receptacies: Isolated Ground	165662, 165862, 1626262, 1626362 8210-16, TRIG8200#5, TRIG8300#5, TRIG8262030465, TRIG8300#5,	E140596	RTDV	STATES	UL
	Grade	168800, 1626262HG, 1626362HG	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	UL.
	Receptacles: Self Contained	SC014, SC821, SC830, SC085, SC80, SC080	£140596	RTDV	STATES PAGS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL UL
		PTTR62, PTTR63, H*4188A15US, H*4188A20US, 885TR(+), 3232TR(+), 885TR(x), (4), TM885TR(+), TR15	i,		PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	~
	Receptacles: Tamper Resistant Receptacles: Tamper Resistant, Isolated Ground	TR20, TR5262, TR5362, 880TR	E140596	RTDV	STATES PAGS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u.
	Receptacles: Tamper Resistant, Single Receptacles	TR5251, 5251F8R, 5251F8TR, TR5351, TR26361, TR26261	£140596	RTDV	PASS & SEYMOUR INC., S0 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
	Receptacles: General Grade, Tamper Resistant, Daplex 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, Tampe Resistant, Daplex Receptacles	r WR5352TR, WR5252TR, WR26352TR, WR26252TR, WR15TR, WR20TR	E140596	RTDV	PAGS & SÉYMOURINC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES PASS & SEYMOURINC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	u
	Receptacle, Display, Tamper Resistant Receptacles: Tamper Resistant/Weather	1542TRDR 885TRWR(+), 3232TRWR(+), WR5262TR, WR15TR+FS,	E140596	RTDV	STATES PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	uL
	Resistant Receptacies: Tamper Resistant - Plue Tail	WR5362TR, WR20TR-FS PTTR5262, PTTR5362, PTTR26262, PTTR26362	E140596 E140596	RTDV	STATES PAGS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u.
	Receptacies: Tamper Resistant - Plug Tail -	PTTR52625C, PTTR53625C, PTTR262625C, PTTR263625C, PTTR52625CSOL, PTTR53625CSOL,	1140330		PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	~
	Split Circuit Receptacles: Recessed Duplex Outlet, Tamper Besistant	PTTR262625CSOL, PTTR263625CSOL	E140596	RTDV	STATES PAGS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u.
	Lamper Hetistant	TM826USB, TR5262USB, TR5362USB, TR8200HUSB, TR8300HUSB, ARTRUS8153. #WC826USB, ard	£140596	RIDV	214162	UL.
	Receptacles: Hospital Grade - Tamper Resistant US8	RWC5362USB, TR8284USB (b), TR8384USB (b), TR8201USB (b), TR8301USB (b)	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL.
		TMB26U38, R26U38AC, R26U38AC, TR52622U38, TR5362U38, TR51SU38AC, TR20US8AC, TR51SUSRC, TR20USBC, TR51SU38AC, TR51SU38CC, TR52OHU31 TR52OHU33, TR20US8AC, R22OHU36C, R22OHU30 TR1SU38AC6, TR20US8AC6, ARTINIS8206AC, ARTINIS820CC, TR15US3BAC6, TR20HU38AC6.	B. 6,			
		R26USBCC6, TR15USBCC6, TR20USBCC6, TR15HUSBCC6, TR20USBCC6, WRTM820USB, WRT85562USB, WRT8562USB, WRT805058AC, WRR26USBCC, WRTR15USBAC, WRTR20USBAC, WRT815USBCC, WRTR20USBCC, WRTR20USBAC, WRT815USBCC, WRTR20USBCC, WRTR20USBAC, WRT815USBCC, WRTR20USBAC, WRTR20USBAC, WRT815USBC, WRTR20USBAC, W				
		WRTR15USBCC6, WRTR20USBCC6, ARTRUSB156AC, ARTRUSB156CC, TM88USB (b), TR5251USB (b),				
	Receptacles - Tamper Resistant USB	TR5351U58 (b), TM8U58 (b), TR5261U58 (b), TR5361U58 (b) PTTR5262HG PTTR8200 PTR200TR PTP:////TR	E140596	RTDV	PAGE & SCHWOURINC., 50 BOYD AVE, SHRACUSE, NY 13209 UNITED STATES	u
		PTTR5362HG, PTTR8300, PTTR26262HG, PTTR5362HG, PTTR8200, PTTR26262HG, PTTR26362HG, PTTR5262HGSCSOL, PTTR82005CSOL,				
	Receptacles: Hospital Grade - Tamper Resistant - Plug Tall Receptacles: Hospital Grade - Two	PTTR5362HGSCSOL, PTTR83005CSOL, PTTR26262HGSCSOL, PTTR26362HGSCSOL PTTR5262HGSC, PTTR526362HGSCSOL	E140596	RTDV	PAGS & SÉYMOURINC, 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES PAGS & SEYMOURINC, 50 BOYD AVE, SYRACUSE, NY 13200 UNITED	UL.
	Resistant - Plug Tall - Split Circuit	PTTRB3005C, PTTR26262HGSC, PTTR26362HGSC, WR15, WR20, WR5262, WR5862, WR5862, WR5862,	E140596	RTDV	STATES PASS & SEYMOURINC, 50 BOYD AVE, SYRACUSE, NY 13209 UNITED	UL.
	Receptacles: Weather Resistant Receptacles: Weather Resistant, Hospital Grade	WR5652, WR5852, WR5642, WR5842	E140596	RTDV	STATES PAGS & SEYMOUR INC., SO BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u.
	Receptacies/ Surge Protective Devices, Type 3 Application	5252*5P, 5262*5P, 5352*5P, 5362*5P, IG5262*5P, IG5362*5P	E140596	RTDV	PASS & SEYMOUR INC., SO BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	uL
	Receptacies/ 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.
	Receptacies/ Surge Protective Devices, Type 3 Application, Tamper Resistant Receptacies/ Surge Protective Devices	TRG5262X5P, TR5262X5P, TR5352X5P, TR5362X5P, TRG5262X5P, TRG5362X5P	E140596	RTDV	PROVIDE ANTIMUUR INC., SO BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
	Type 3 Application, Hospital Grade, Tamper Resistant	TRIG8200XSP, TRIG8300XSP, TR8200XSP, TR8300XSP	E140596	RTDV	PAGS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
	Receptacles/ Surge Protective Devices/ Plug Tail, Type 3 Application Receptacles/ Surge Protection Devices/	PTS262XSP, PTS362XSP, PTIG5262XSP, PTIG5362XSP	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
	Plug Tail, Type 3 Application, Hospital Grade Receptacies/ Surge Protective Devices/ Plug Tail, Type 3 Application, Tanana	PT8200*SP, PT8300*SP, PTIG8200*SP, PTIG8300*SP	E140596	RTDV	PASS & SEYMOUR INC., SO BOYD AVE, SYRACUSE, NY 13209 UNITED STATES PASS & SEYMOUR INC., SO BOYD AVE, SYRACUSE, MY 13204 UNITED	uL
	Resistant Receptacies/Surge Protective Devices/	PTTR5262*SP, PTTR5362*SP	E140596	RTDV	STATES	UL
	Plug Tail, Type 3 Application, Hospital Grade, Tamper Resistant	PTTR8200XSP, PTTR8300XSP	E140596	RTDV	PAGS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
	Pop-Oat Tamper Resistant Receptacles	ARPTR15XGYZ and ARPTR20XGYZ	E140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	uL
	Nonmetallic Cover Plates with Recentaria	60W47DFLX, 60W33DFLX, 60W49DFLX, 60W48DFL3 Is 65W47DFLX, 65W49DFLX. 65W34DFLX	C. E140596	RTDV	PASS & SEYMOURINC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	UL
	Clock Hanger Receptacle, Tamper- Resistant	\$3713TR	£140596	RTDV	PASS & SEYMOUR INC., 50 BOYD AVE, SYRACUSE, NY 13209 UNITED STATES	u
		HKRL10, HKRL20, WTRL10, WTRL20, WWRL10, WZ3RL10, ASTP155RM, ASTPRF2, ASWR155RM, ASTR1523, ANTH1523, ASMR1523, ASWR155RM,			PASS & SENMOURING	
	Industrial Control Switch	ASTP1532, ASTH1532, ASWV1532, ASTH155RM, ASTH88 ASW888 LC2201 LC2203	F350248	NMK	S0 Boyd Ave Swacuse, NY 13209 United States	

# **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.

0000000								ITT ITTO ITTO ITTICE ICTORS AFTER ICT ITTO				
	EMIT Connectors and Couplings. Compression Type Coupling-Steel	6615 6615 8635 6645 8655 6845 6675 9685 687	5 6725 (18434		TOPA2 ELECTRIC CORP. \$15 WAVERLY AVEHOLTSHILE. NP 11742 109 United States	U.		HER, BES, RESEE, RESEG, REA, REALING, REAL REAL RES. RES.				
	EMIT Connectors and Couplings, Compression Type - Raintight - Steel	6515RT 6525RT 6535RT 6545RT 6555RT 6565RT 6585RT 6585RT 6605RT	1575RT 111475		TOPA2 ELECTRIC CORP. 935 WAVERLY AVEHOLTSHULE, NY 11742 NS. 1129 United States	u.		ICHCI, ICHCI, ICH, ICHCI, ILF, ILFO, ILH, ICHCI, ICHCI, ICH, ICHCI, ILHI, ILHIO, ILHIO, DHAYI, DANAYA DHAYA DHAYA DHAYA DHA DHAYA				
	EMIT Connectors and Couplings. Compression Type with insulated Three	<ul> <li>6515/816525/816529/816545/8165559/816565</li> </ul>	ar.		TOPA2 ELECTRIC CORP. \$15 WAVER YAVE HOLTSHULL MY 11742			LENCS, LLM, R.M., RLMCS, RLMS,				
_	Rawlight - Steel IME Convertion and Countings	6575AT 6585AT 6595AT 6605AT	(1843)		MX 1109 United States	u,		LIMOS, LIMOS, BARNES, BALL, BA				
	Compression Type Raintight Coupling - Steel	661587 662587 663587 664587 665587 666587 668587 668387 67087	14758T		TOPA2 ELECTRIC CORP. \$25 WAVERLY AVE HOLTSHILLE, MY 11742 1129 EWINE MARK			BLING, BLA, BLA, BLAGE, BLS, BLS, BLSCE, BLING, BLA, BLAGE, BLS, BLSCE,				
		077681 077682 077685 077684 077685 0775	5 1011.04					DARG BURG DIS DISCO DRI DRIE DRIE				
	STEEL ENT CONNECTORS COMPRESSION THE & MAN TALKT	OF7683-W OF7604 W OF7685-W OF7606 W OF	1927-		Debit Industries Inc., DBA UMI, 2180 S FIGUERDAST, LOS ANGELIS MAN INVESTIGATION OF A STATE	<sup>c4</sup>		LESCE DESCE, DAS, DAS, RUSA, RUSA, RUSE, DAS, DESCE, DESCE, DAS, DESCE, DAS, DASCO, DAS,				
		OF7881-5-0F7802-5-0F7883-5-0F7804-5-0F7802	4			-		ILBR, ILBRICH, ILBRICH, ILBRICH, ITTA, ITTA, ITTA, ITTA, ITTA, ITTA, ITTA, ITTACK, ITT				
		OF7681 SW OF7602 SW OF7603 SW OF7684 SV	Ĉ.					ITECS, EM, EM, EMCG, ETS, ETS, ETSCI, ETSCI, ETSCI, ITECS, ETT, ETTCO, ETK, ETK ETKER, ETKER, ETK, ETKER				
	TYPE& MAN TIGHT INSULATED	OF7695-SW OF7618-SW OF7695-SW OF7618-SW	(33066)	о <i>к</i>	Distribution inc. DW DM, 21805 HIGGROUS (LOS ANGELIS MX 90807 United States	u .		LH155, LH255CG, LH255, LH255CG, LH355, LH255CG, LH455, LH455CG, LH555, LH255CG, LH555, LH555, LH555CG,				
		0F7617 0F7638 0F7639 0F7639 0F7631 0F76	6 1612-14					11716, 1171606, 11296, 1129606, 11396, 1139605, 11416, 1141606, 11508, 1150906, 11408, 1140905,				
	TYPE& MAN TIGHT	W 07%08-W 077819-W 07%03-W	633066	• ×	050 Mouth in Collary March 21103 House Multis 90807 United States			LIKISS, LAUSSOG, LADIS, LIKISSOG, LIKISS, LAUSSOG, LIMSS, LIANSSOG, LIKSSS, LIKSSSOG, LIMSS, UNISSOG,				
	Concrete Pull Ellicons	ECI-50, ECI-75	8332668	o x	Distribution Inc. DBA UM, 21203 HIGUERDAST, US AMUELS MX 80807 United States	а а	Conduit Bodies for DMT	T155, T159CG, 1253, T259CG, T265, T265CG, 1455, T483CG, 7555, 7559CG, T885, T889CG	(195124	00972	TOPA2 ELECTRIC CORP., 925 WAVERLY AVEHOLTSHILLE, NP 11742- 1129 United States	и.
		OF603-5, DF603-5M, OF622-5, OF682-9W, DF60 OF603-5M, OF604-5, OF604-9W, OF605-5, DF60	HS, HSW,				Conduit Budies for EMT - for Writ Locations	001,002,0107,0181,0182,0180,071	6195124	QUFZ	TOPAZ ELECTRIC CORP., R25 VANABILY AND HOL TOPICLE, NP 11 M2- 1189 United States	u.
		0F608-5, 0F609-5M, 0F687-5, 0F687-5W, 0F60 0F608-5W, 0F609-5, 0F689-5W, 0F613-5, 0F61	HS. HSW,					C18, C1000, C7, C700, C8, C800, C9, C900, U800, U81900, U87, U8700, U84, U8400, U84, U8400, U18.				
	Connections	07705-5, 07702-5, 07703-5, 07793-5, 07795-5, 07705-5, 07707-5, 07707-5, 07703-5, 07793-5, 07793-5	0 3066		Debit Industries Inc. 08A UAI, 2180 STIGUERDA ST. LOS ANGELES MR 90007 United States	ov u		113000, 117, 11700, 118, 11800, 119, 11900, USO, 183900, US7, US700, US, USEO, US, US900, USO,			TOPAZ ELECTRIC CORP., 525 WAVERLY AND HOLTSHULE, MY 11742-	
		000-50, 000-75, 05601, 05681-W, 05602, 056 05503, 05563-W, 05504, 05504 W, 05605, 055	2-W. 05-W.				Comulai I Bandhes for Rigid Metal Carvo	T1000, T7, T700, T8, T800, T9, T900	1195124	QM12	1129 United States	u.
		01505, 01585 W. 01507, 01507-W. 01608, 010 01509, 01589 W. 01518, 01533 W. 01703, 017	08-W. 02,					C406, C465, C5, C505, C535, C6, C605, C605, C81, (805) C405, C5, C505, C535, C6, C605, C605, C61,				
	Convertions, Straight	0f703, 0f764, 0f795, 0f706, 0f707, 0f708, 0 0f733	1709, 8330668	o x	Orbit Industries Inc. 08A UMI, 2180 STIGUERDAST, USE ANGELIS MX 90807 United States	CA UL		LINES, LIN, LINES, LLS, LLSCS, LLS, LLSCS, LLS, LLSCS, LLS, LL				
	Connectors: Straight	003-58, 003-75	(33)969		Orbit: Industries Inc, DBA UM, 2180 S FIGUREDA ST, US ANGELIS MR. 50007 United States	сл И	Concluit Bodies for Rigid Metal Conv	LHIDS, LHZ, LHIDS, LHJ, LHIDS, LM, LHACS, LHS, MIT- LHSOS, LHS, LHIDS, TJ, TLOS, T2, T2OS, T3, T3OS, T4,			TOP A2 DUCTING CORP. \$25 WAVER YAVE HOLTSHULE MP 11742-	
		04611.04611.W.04612.04612.W.04613.04	13-W.				for Wet Locations	THESE IS, ISSEE IN, INCO.	6195124	QMZ	1189 Livited States	u.
		OFE14, OF614 W: OFE15, OF615 W, OFE16, OF OF617, OF617 W: OF618, OF618 W, OF615, OF	15 W.					18100, 18200, 18000, 184, 18400, 187, 188, 11200, 18100, 18200, 18800, 184, 18400, 187, 188, 11200, 11500, 11500, 115, 11500, 115, 11500, 187, 187, 187, 187, 187, 187, 187, 187				
	Couplings	01533, 01623 W, 01713, 01712, 01713, 01714 01715, 01715, 01717, 01718, 01718, 01728	(33066		Debit Industries Inc. DBA UMI, 2180 STIGUERDA ST, LOS ANGELES MX 90007 United States	CA III.	Conduit Budles for Rigid or Internet Conduit	diale LRICG, LM, LMCG, LMC, T2CG, T2CG, T3CG, T4, T4CG, T5, T4CS, T6, T5CS, T5, T4CS, T5, T4CS, T6, T5CS, T5, T4CS, T6, T5CS, T5, T4CS, T5, T4CS, T5, T4CS, T5, T4CS, T5, T4CS, T5, T4CS, T5, T5, T5, T5, T5, T5, T5, T5, T5, T5,	0185124	0007	TOPA2 ELECTRIC CORP., B25 WAVERLY AND HOLTINELE, MP11342- 1189 ENVIRONMENT	
		OF NOT 46, OF NOT 46, OF NOT 49, OF THOS	97665- 8.		Divisi Industriani Inc. DANUM. 21801 FIGURINANT UR AMERICA	ca.	fandele fanden het field en berenen	211, 212, 213, 214, 21401, 215, 216, 21691, CL, C2,				
	Rain Tight Compression Connectors	OFINED-W OFINED-W. OFINED-SW. OFINED-SW. OFINIO-	E3 2064	0 K	M9 90807 United States	u.	Conduit - for Wet Lacations	112, 113, URL, 182, URS, URS, URS, TJ, T2, T3	(195124	0972	1189 United States	K.
	Rain Tight Compression Connectors with Implicitor	of Nation, of Nation, of Nation, of Nation	av, (33969		Orbit Industries Inc., DBA UM, 2180 S FIGURIDAST, USI AMERLIS 90807 United States	CA II.	formation from the Real of the International	LINCE DIMOL 181, US2, UR1, UR4, UR5, UR1, UR5, UR1, UR2, UR1, UR2, UR1, UR2, UR1, UR3, UR1, UR2, UR1, UR3, UR1, UR2, UR1, UR3, UR1, UR2, UR2, UR2, UR2, UR2, UR2, UR1, UR2, UR2, UR2, UR2, UR2, UR2, UR2, UR2			TORALD COTTON CORP. AND INCIDENT AND INCIDENT AND INCIDENT	
		OF7611-W, OF7612-W, OF7613-W, OF7614-W, W, OF7634-W, OF7644-W, OF7644-W, OF7644-W, OF7644-W, OF7644-W, OF7644-W, OF7644-W, OF7644-W, OF764-W, OF7644-W, OF7644W, OF7644W, OF7644W, OF7644W, OF7644W, OF7644W, OF7644W, OF7644-W, OF7644W, O	97515-		Deal Industria Inc. DRAUM. 2180 MILLERGENT LOCAMERUM	a.	Metallic Conduit	LNAME, LNESHE, LNESHE, LNESHE, TJ, TZ, TJ, TA, TS, TS, TS	0195124	09972	1129 United States	и
	Rain Tight Compression Couplings	012650-M	03066	e e	M8 90007 United States	U.	Constant Realize for First or Internet	ILTE, HEAF, HEAF, HOW, HESE, HEAF, HEAF, ILBEC, HEME, HESE, HEME, HELSE, HEAF, HEAF,			TRACTOR CORE AND ADDRESS VALUES TRACT AND THE	
		OF7631, OF7601-6, OF7631-6W, OF7631-W, OF	¥32.				Vetallic Conduit - for Wet Location	BAR THE, CLEAR THE, COLE, COLE	6195124	QPFZ	119 United States	u.
	Bad Conception Presentant Concept	CFN812X, CFN8134, CFN814, CFN81, CFN814, CF	903-5.		One industry in the last the strength of the last		Locations with Covers for Well	571, 572, 579, 576	6185124	QIFZ	109 A LICENC CORP. KIS WAVER, VAN HICKSHILL, NP 1143- 1109 Livited States	u.
	Tight	OF NOS-W, OF NOS, OF NOS-5, OF NOS-5W, OF OF NULL OF STULY, OF NOS-5, OF NOS-5W, OF	NOS-W EXCOLOR	0 K	Mr. B0007 United States	UL.	Conduit Barly Covers	\$350, \$17, \$170, \$19, \$190	8185324	QNFZ	1129 Livited States	u.
	Steel Compression Couplings, Concrete Tailst	OFREIS-W, OFREIA, OFREIS-W, OFREIS, OFRE OFREIS-W, OFREIS-W, OFREIS, OFREI OFREIS-OFREIS-W	ŝw.		Other Industries Inc, DBA UM, 2180 STIGUERDA ST, USS AMGELIS MX. 90007 United States	CA	Concluit Body Covers	FSDBM, PSDSM	(195124	0992	1199 United States	и.
	Seel Set Array Conservors Connector	047781, 047701-6, 047782, 047702-6, 047783			Other Industries Inc. Still UNE 2180-5192 ERC+17 + 27 Hort Pro-	a.	Constant Ray Conserv	FISM, FISM, FISM, FIRCM, FICSSM, FICSSM, FICSSM,		-	TOPA2 ELECTRIC CORP., 835 WAMER, VANEHOLTINELE, MP 11742- 1188 Factor Dates	
	Tight when Taped Steel Set Screek Countings / nonret *	C#7736, C#7706.8	833366	0 A	No. 90007 United States Obit Industrian Inc. DBA UAR 2180 CD2 Alline CT 1 or 180 CD2	us.	LONGET BUT LEVES	C1192, C1193, C1194, C1194, C1197, C2217, C2214,		-941		
	when Taped	047711, 047712, 047713, 047714, 047715, 04	716 632066	e 4	MS 90007 United States TOPAZ ELECTRIC CORP. B35 VAMARIE VAMA LAW HUMIN	u		12235, 02340, 02341, 02342, 02343, 02344, 02345, 02346, 02347, 02348, 02349, 02346, 02345, 03451,				
	4"Drawn Square Bases	INVESTIGATION CONTRACTOR	111512	4 0	PZ 1129 Livited lister TCPA ILLCRC COP, 515 AMARY VAN AVAILANT THE	u.		1.1452, C3453, C3454, C4450, 06151, 06151, C7511, C7512, C7518, C7514, C7515, D8612, FWC12, F2217,				
	4" Ortagen Bores	02451 03450 04457	019532	4 0	INFE 1109 United States TOPA2 DUCTRIC CORP. \$25 WANTE VANTHS THEIL F MILLION	W	Cover Plates	+2399, F2240, F2240, F2240, F2250, PV90777, R2240 RC141, RC142, WRC8	(195324	Q#Z	THEY ME ALL THE CORP., BUS WANTED AND HOLTSHILLE, MP 11242- 1109 United States	и,
	4" Welded Square Beam	06351 08547 86549 06543 06558	(19512)	4 0	WZ 1109 United States TOPA2 LLCCRC CORP. S15 WARRIN VAN LWS TURN: *******	UL.		571M, 571M, 571S, 571S, 572M, 572M, 572S, 572S, 572M, 572M, 572S, 572S, 574M, 574M, 534K, 534K				
	411/16" Drawn Square Dotensian King	1961	618512	• •	P2 1129 United States TDPA TRACK CORP. 313 (March 1996) TRACK WAR	u		578M, 576M, 5785, 5785, 577M, 577M, 5775, 5775, 579M, 579M, 5795, 5795, 7716, 771607, 7746				
	Blank Caver Plates	EWC13 PV38744 MC28	111512	4 0	PZ 1129 Living lines	u.		77262,1, 7725, 7736, 773627, 7735, 7746, 73462,1 7745, 7756, 775627, 7755, 7760, 77562,1, 7362				
		CIR CION CIEM CIM CIM CIM CIM CIM CIM	ISM.					777GLT, 7775, 779G, 779GLT, 7795, C1155, C6504, FSBCM, FSBCM, FSDMA, FSDMM, FSDMS, FSDMS, FSDMS,				
		ICLDC, ICLCI, ICZ, ICA, IDICI, ICAC, ILAI, ILA	8C,				Courses.	ISOPE, ISOSM, ISOSM, ISOSM, ISOSE, MCG48 (N), ACCERR (H), MCGRR (N), ACCERR (H)	8185124	QMPZ	TOPA2 ELECTRIC CORP. 525 WAVERLYARE HOLTSHILLE, NP 11742- 1129 Ewised Bases	u.
		BLIDER, BLIA, BLIACH, BLIDE, BLIDE, BLRE,	c,				Covers for Constall Bodies	534, 577	6195124	0972	TOP A2 ELECTRIC CORP. \$35 WAVER, YAVE HOLTSWILLE, MP 11742- 1129 United States	А
		ET20C, ET2CE, ET2, ET20C, ET6, ET6CE, ET8C, LBD LB12M, LB12M, LB1					Covers-for Wet Lacations	PV96743, PV96778, PV97464, WC18, WC188, WC189, WSC1, WSC1, WSC1940	6195124	QUEZ	TOP A2 ELECTRIC CORP., RES WAVER, VAVEHOLTERUE, NP 11342- 1189 United States	u.
		LIMSS, LINSM, LINEM, LINESS, LIP?, LIN?M, LIN?M, LI	6. 1214				Device Bases	FRATS, FRACA, MARTS, MARTS, MARSS, MARSS, MARSS, MARSA, MARSS, MARSS, MARSS, MARSS	6185124	QIFZ	TOPA2 ELECTRIC CORP., 825 WANGELY AND HOL TOPILE, MP 11742- 1109 United States	is.
		LE255, LE3M, LE4M, LE5M, LL6M, LE7, LE7M, LL5 LE3M, LP3D, LP10M, LP1M, LP2M, LP3M, LP3M,	LLEM,				Ensure Orthograp Essen	04451, 04452, 04453, 04454, 04455, 04456, 04457	0195124	0007	TOPA2 ELECTRIC CORP. 935 WAVER, YAVE HOLTSHILLE, NP 11742- 1129 Linised States	
		LINEAU, LIK?, LIK?H, LIKE, LIKEAU, LIKEAU, TSOMI, TSM TSM, TSM, TSM, TSM, TZ, TSM, TR, TSM, TSM, TSM, TSM, TSM, TSM, TSM, TSM	1296				Inter Betterle Knee	MART MART MART MART MART	0185124	0007	TOPA2 ELECTRIC CORP. 925 WAVERLY AND HOLTSHULE, MP 11742- 1189 Entrad Street	
	Conduit Bodies	TB256, TB366, TB466, TB566, TB666, X366, X266, X2 X466, X566, X666	M. (19512)		TOPA2 ELECTRIC CORP. \$15 WAVER, YAVEHOLTSHUE, MY 11742 1129 United States		Drawn Reund Norm	P3451, P3451, P4451, P4452, P4452	6185124	QIFZ	TOPA2 ELECTRIC CORP. R35 WAVER, VAVEHOLTINELE, ME11342- 1109 Derived Materi	15.
	Concretor Rimpa	01278.01271.01272.01273.01274.01275.0	1236 (19512)		TOPA2 ELECTRIC CORP. R15 WAVERLY AVEHOLTIWILLE, MP11742 1189 United States	15	Drawn Souger Room	84452, 84452, 84452, 84452, 84453, 84453, 84453, 84451, 84452, 04455, 04454	1195124	OWE	TOPA2 ELECTRIC CORP., 825 WAVERLY AVE HOL TERELE, NP 11742- 1129 Environ Rates	
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_	Combit Bades Contait Bodies Court with Casting	TIM	119512	4 0	IP2 1129 Living Later Tread to CTUP CODE 315 WARDER VALUES THEFT AND 1242	u.	Drawn Steel Quillet Brans	04452,64452	6185124	QIFZ	TOPAZ ELECTRIC CORP., 935 WAWER, YAMEHOLTSHILLE, ME11742- 1109 Divised Materi	15
	Screen	573, 574	619512	4 0	PT 1129 United Sales	ы. И	DATION AND Control Index with	THISSOS, THISSOS, THISSOS, THASSOS, THISSOS, THISSOS, FILINGS, VIEWS, VIEWS, MARKER, MORES,			TOPAZ D OTTALCORE SUS WANTER VANDAGE THREE MET 1342-	
	Conduit Badies for Electrical Metallic Tobles	ILBS, ILBS, ILBS, ILR2CS, ILR2CS, IT2, IT2CS, IT2CO, ITA, ITA	m,		TOPA2 ELECTRIC CORP., R25 WAVERLY AND HOLTENELE, MP11342 1997 1998 1999 1999		Covers, Rated for Wet Locations	N655C5	6195124	QUFZ	1189 Livited States	u.
		C255, C255, C418, C655, BLR2C6, BLR2C6, BLR2C6, BLR2C	h.			-		C4455, C4456, C4457, CT1551, CT1551, CT1553,				
		LIBISCS, LIBISCS, LIBISCS, CHISS, CHISSCS, CHIS LIBISCS, LIBISS, CORSISCS, CHISS, LIBISS, CHISS,	5, 11.115,				Datamaion Rings	R2241, R2242, R2243, R2244, R2245, R2246	6195124	QUFZ	119 United States	K.
	Colour books for Districal Metallic	THE THEORY AND A CASE OF SECOND SECOND	1356		TOPA2 COCTRIC CORP. 515 WAVERCY ARE POCTSWELL, Nº 11742						1109 United States	
	races appear non manufactures.	0.48.7.4958.764	(19512)	4 Q	WZ 1189 United States	U.	Extension Rings-for Wet Locations	WEEPSDET	6185124	QUFZ		K.
		44872408724L	(19515	4 0	WZ 1189 United States	u	Extension Rings-for Wet Locations	WEATSOT	6185124	QBFZ		ĸ
_	Fluch Device Boost	2245, 84445, 10455, 10465, 10471, 108273, 108273, 108274, 104574, 104574, 1046744, 1046744, 104674, 104674, 104674, 104674, 104674, 104674, 10	1205124	4 G	WE 1109 Living States OPACELETING COMP. 325 WWW/REF WE HOUTSHELD WY 11742- ILIPI United States UK	и.	Extension Kings- for Wet Locations	WIL4300	6185124	G#2		-
	Fluch Device Boxes	2249, 4449, 14450, 14468, 14471, 14873, 14874, 8012, 18550 1383, C138, C138, C138, C139, 189C13, 89C13, 9077, NC1, NC1, NC18, NC18,	1395124 1295124	4 0 0#72 0#72	WE 1189 Write Steen OPACINETIC CONT. RSS WARDLY AND INCOMEND. WY 11742- INFORMATING CONT. RSS WARDLY AND INCOMEND. WY 11742- INFORMATING CONT. RSS WARDLY AND INCOMEND. WY 11742- INFORMATING CONT. RSS WARDLY AND INCOMEND. WY INFORMATING CONT. RSS WARDLY AND INCOMEND. INCOMENDA INCOMEND. INCOMEND.	U.	Latension Rings-for Wet Locations	WELFISHT	0185124			_
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## **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, CN-LS, CMG, CMG-LS, CMP, CMP- LP(0, 5A)(05C), CMP-LP(0, 5A)(75C), CMP- LP(0, 5A)(90C), CMP-LP(0, 5A)(105C), CMP- LP(0, 7A)(90C), CMP-LP(0, 7A)(105C), CMP- LP(0, 7A)(90C), CMP-LP(0, 7A)(90C), CMR- LP(0, 5A)(75C), CMR-LP(0, 5A)(90C), CMR- LP(0, 5A)(75C), CMR-LP(0, 5A)(90C), CMR- LP(0, 7A)(75C), CMR-LP(0, 7A)(90C), CMR- LP(0, 7A)(75C), CMR-LP(0, 7A)(90C), CMR-LS, CMX, CMX Outdoor, CMX Outdoor-CM, CMX Outdoor-CMG, CMX Outdoor, CMX Outdoor-CM, CMX	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 Values and Accessories	Material Name	Model Name	Company Information	Type of Certification	Price	Source
	WFDN Series Waterflow Detector	Macsensor Electromagnetic Pulse Flow Measuring Instruments Flow Sensors Water	MacSensor Shenchen, China	CE	\$150.00	https://inacsensor.an.made.in. china.com/anstruct/folimAar/TWYD/China- Macountor-floctromagnetic-Public/Flow. Measuring-instruments-Flow-Sensors. Water.html
	300 lb. WWP UL/PMButterfy	WZLD Stainless Steel Gear Triple Offset	WZLD Zhejiang,			https://www.alibaba.com/broduct, detail/WZID-Stainless-Steel-Gear-Triple- Offset 42145816530.html?spmsa2700.aslier vofferlist.normal_offer.d_title.51503866a60V
	Valves, Lugged Wafer	Wafer Butterfly Volve Superior Quality Stop Price ANSI		None	\$30.00	63Asup&fullFintScreenstrue https://www.elbaba.com/product: detai/Janing-Check.Wahn-Check.Saing, Check.1600121041844.htm?spm:s2700.gp
	Model G Swing Check Valves	Swing Check Valve Stainless Steel Non Return Valve	TKYCD Jiangsu, China	OHSAS 18001, ISO 9001, ISO 14001	\$57.00	Tenyofferlist.normal_offer_d_title_187e5affoo Ratio⊃ https://www.aiibaba.com/product- detail/Cast-iron-Flanze-Type pressure
	AWWA Check Value: Swing	Cast Iron Flange Type pressure Price non slam slow closing swing check valve	IMGV Tianjin, China	α	\$25.00	Price 62515078173.html?spmva2760.pplier vofferlist.normal_offer.d_title.3db45affV/9x A&ssp&/ulFirdScreenstrue https://www.albaba.com/product-
Pumps	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	detail/arcoiteringricularity Stormer Test- And 62013236785.htmlhpmis2700.gallery offerfist.normal_offer.d_btfe.16482e6dim82 CH
	Centrifugal Fire Pumps, Vertical Turbine	High-grade Fire Pump-long shaft turbine pump fire pump vertical turbine	yeschamp Zhejiang, China	α	\$500.00	httos://www.allbaba.com/product: detail/High-grade-Fire-Pump-long: shaft_1600087314457.html/hpmsa2708.det alls:0.0.4a455997WFM24Q
	Centrifugal Fire Pumps, Horizontal Split Case	LEO Water Horizontal Split Case Centrifugal Fire Fighting Pump	LEO Zhejiang, China	Œ	\$400	https://www.sibble.com/product: detail/JDO Water-Horizontal.built.Case: Centrifuga 66745058564.html?ppms2700, gallerysfferfist.normal.offer.d.ttile.1974328 sakhomr&a-p&fulfintScreen-true
Piping						https://petpvf.com/ss-10-80-degree-
	Grouped and Plain End	Statelers Stat Groups 30 Derren		Only NSF/ANSI 372 which does not coverside state or		albow/hku-55-10-30- 218aclid=CONCOANP208hD4ARisAELXHaZi YebroKoOELonCodEXacrashr/SOEZuEn1-
	Fittings	Elbow Ruland CLC-10-10-F, 5/8* x 5/8*	SHURIOINT Ruland Manufacturing Co.,	govenment compliance	\$78.00	b_idr195yxRPEXEYEalwExEALw_wc8
	Rivid Countine	Rigid Coupling, Black Oxide Steel, One-Piece Clamp Style with Keyway, 1 5/16" OD, 2" Length	Inc. 6 Hayes Memorial Drive Marihorouzh, MA 01752	a	\$77.34	http://www.ruland.com/checkout/cont/
	Flexible Counting	Rigid flexible Couplings Spacer brass Fluid Flange HRC Jaw Gear MH PIN Chain Coupling Catalog shaft Universal Spain trailer	Ever-Power Zhejiang, China		\$20.00	https://www.alibaba.com/product: detail/Rigid Resible Couplings Spacer brass: Ruid_60730075083.html?spm=a2200.them ePage Rest 2.6567283458-88
		Standard DIN stainless steel groove	8DavaVula			https://www.alibaba.com/product- detail/Standard-DN-stainies-steel-groove- flange_50492555441.html?spm=s2700.galie proferint.normal_offer.d_title.2013.html?iX
Anchors & Accessories	Grooved Flange	flange 8 hole steel gasket	Hebei, China	None	\$55.00	<u>sus</u>
Extinguishers	for Conduit 115 Standard Duty Loop Hanger					
			for the set			https://www.firesafetystore.co.uk/fire- extinguishers/dry.gowder-fire-
	ABC Fire Extinguisher	Extinguisher	UK	Œ	\$25	freedingsiber/
	CO2 Fire Extinguisher	2Kg Co2 Fire Extinguisher	FireGuard UK	85 DN3 CE	\$37	extinguishers/co2-fire-extinguishers/fireguand- 2kg-co2-fire-extinguishers/ bittor://www.foordetations.co.uk/fire-
	Water and Foam Fire Extinguisher	2Ltr AFFF Foam Fire Extinguisher	FireGuard UK	BS EN3 CE	\$23	entinguishers/all/foam-fire- entinguishers/freepaard-21z-all/foam-fire- entinguisher/
	Connections (Inlet Connections) Connections and Variations)	3764 5771 5773 5775 5775 5776 5786 5781 5786 5791 5792 5866 5669	POTTER-ROEMER LLC. 17451 Harley Street Po. Box 3327 City of Industry, CA91744 0327 UIX POTTER-ROEMER LLC. 17455 Harley Street Pass 3527 City of Industry, CA 91746- 0327 UIXA	се. 		
		AG1414 AG1425 AG1435	AG FIRE SPRINKLER SL.			
	Model AG66-QR Series Quick Response Standard Spray	A61475 A61485 6202 6214 6224 6224	Olivos 28905 Getafe, Madrid Spain	α		
	Free-Standing Fire Dept. Inlet Connections (6200 Series)	6236 6242 6244 6264	GUARDIAN FIRE EQUIPMENT, INC. 3430 NW 38TH Street Miami, FI 33142-5034 USA	Œ		
		1510 1520 1530	GUARDIAN FIRE EQUIPMENT, INC.			
	Hose/Extinguisher/Valve Cabinets (1500 Series)	1540 1550	3430 NW 38TH Street Miami, FI 33142-5034 USA GUARDIAN FIRE	CE		
	1 1/2" Fire Hose Rack Assemblies (3000 Series)	3007 3010 5010	GUARDIAN FIRE EQUIPMENT	Œ		
	Hose Valves (5000 Series)	5015 5020 5025	INC. 3430 NW 38TH Street Miami, FI 33142-5034 USA	CE		
	Cabinets	Large Single Fire Extinguisher Cabinet	FireChief UK	CE	\$66.79	https://www.fragratectionshap.co.uk/frag artinguisher-cabinets/brows-and-covers/frag- 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 worker for sprinkler	Shanahai Hao Yu Trade Co., Inc.		\$6.00	https://www.alibaba.com/product- detail/12724-Size-1-2inch-quick; response: 62560337377.html?spmna2700.gc _countrysearch.main07.80.3ab0732595cn2 m
Medical Gases			AMICO CORP. 85 Fulton Way Richmond Hill, ON L48 2N4			
	LED Alarm	A3AR-L30000000	Canada AMICO CORP. 85 Fulton Way Bichmond Will CN L4B 2NA	α		
	LCD Ethernet Master Alarm	AHN X XX W-ISO-G-05 W-ISO-G-07 W-ISO-G-10 W-ISO-G-12 W-ISO-G-15 W-ISO-G-22	Canada AMICO CORP. 85 Fulton Way Richmond Hill, ON L48 294	G		
	pen valve with Extensions	w-50-9-25	AMICD CORP. 85 Fulton Way Richmond Hill, CN L48 2N4	u		
	Wall Outlet Quick Disconnect	O-CHWAL-L-RXK	Canada AMICO CORP. 85 Fulton Way Richmond Hill, DN L48 2N4 Canada	CE OE		
			AMICO CORP. 85 Fulton Way Richmond Hill, ON L48 2N4	-		
	Vacuum Regulator	SRX-BXXXX-XXEX(*	Canada	a		https://www.allbaba.com/oreduct: detail/China-Medical-Gas-Outlet-Bed- Head_60783888949.html?spm:sa2700.galler
	Wall Outlet	Medical Gas Outlet Bed Head	Hunan Eter Medical Co., Ltd.	CE/ISO	\$50	potential, normal_affer.d_stitle.7b433b62bHN gLR&sp&5allErstScreen-true https://www.allbaba.com/product- desi//Medical/space-fronting_UTP
	Medical Gas Alarm System	LED Area Alarm Panel Hospital Alarm Sy	s Amcaremed Technology Co., Lt	e CE	\$750	Area_1600073388299.html?spm:ra2201.pc_ countrysearch.main07.38.52a678b6nHLcM8

## **Appendix Q: Electrical Non-Compliant**

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

Category Lamps	Material Name	Model Number	Company Information	Type of Certification	Price	Source
	OBALS Ceiling Recessed		Sheki Lakar			https://www.alibaba.com/ product-detail/Led: Downlight-Led-Led: Downlight: 15w_1600190913017.ht ml?spms2700.psileryoffe tlist.normal.offer.d title.2
	Dimmable LED Flat Panel	AF29-A2	Ubas Lighting	CCL, LE, ROMS		https://www.alibaba.co m/product-detail/Led- Flat-Panels-Panel-Light- Led_1600192574029.ht ml?spm=a2700.galleryof ferlist.normal_offer.d_ti tle_2d1b5b054nuhww&s =p
Conduits						https://www.alibaba.com/
	Steel EMT Compression Coupling					product-detail/Steel-EMT- compression-Coupling-by- shina_62178825687.html 2spm=s2700.details.0.0.3 cdd236fsp7PMH
	Galvanized Steel EMT					https://www.alibaba.co m/product-detail/44xk1 1-2-depth-galvanized- steel_1600106538996.htt ml?spm=a2700.galleryof ferlist.normal_offer.d_ti
	Londuit Box	5415	1 Hangzhou MQ Electric Co,			tie.29df\$119/WabWc https://www.alibaba.com/ product-detai/1/-2- electrical-rigid-conduit- bodies.62042013860.ht ml?spma2700.pailexyoffe rlist.normal_offer.d_title.7
Cables	Bodies		Ltd.			c1e27afRgepU
	Electrical Wire Copper THHN Wire	6 8 10 12 AWG		CE		
	Metal Clad Cable MC/8X		Shangjin Shanghai Yongjin			https://www.alibaba.com/ product: detail/Competitive-price- cable-cost-Metail: Clad_60603244279.html? spm=a2700.galleryofferlist .normal_offer.d_sitie.767f
Devices	Armored	YJLHV82	Cable Group Co., LTD.	CCC		7013fhSe6w
			Yueqing Hongji Trade Co.,			https://www.alibaba.co m/product- detail/vicopital-Grade- Receptacle-Hospital- Receptacle- Socket_1600190225094. html?spm=a2700.gallery offerlist.normal_offer.d_ title.ic8f2d9759pug8as-
	Hospital Grade Receptacles	YQ15R-HG	Ltd.	4.571		p https://www.alibaba.com/ product-detail/Receptacle; Tamper-Resistant: American:125V: 15A_60752340276.html? spensa2700.galleryofferlist yoormal_offer.d.title.424b 7747129278.even
	Tangar tannan recepcion					https://www.alibaba.co m/product-detail/LA- 1025-6-outlets-surge- protected_60425082096. html?spm=a2700.gallery offerlist.normal_offer.d_ title.14777106dUCL248.s
	Surge protective receptacles	LA-1025	Ningbo Litesun Electric Co.	, IETL/CETL		=p https://www.alibaba.com/
	Nonmetallic cover plates with	r DQ-2420AA	Shenzhen S-Lord Electronic C	o., Ltd.		motost-twietaul/LS-White- product-detaul/LS-White- Duplex-Receptacie-Outlet- Wali_6252235197.html? spm=a2700_alleryofferlist .normal_offer.d_title.7f71 5e5122Dcl9
						https://www.alibaba.co m/product-detail/15A- 125V-WR-TR-Household- outdoor_1600093718120 .html?spm=a2700.galler yofferlist.normal_offer.d
Fire detction	receptacles	G120209	Hangzhou Jukings Tech Co.	, ICUL ETL		_title.6ec7579bX08UZ7
						https://www.alibaba.com/ product-detai//Wireless_ 433Mhz:315Mhz: Temperature-Heat. 5moke_1600054775634.h tm?spm=a2700.gaileryoff erlist.normal_offer.d_title.
	smoke/ heat/ carbon monoxid	e (33)503	Shenzhen L&L Technology Co Zhongshan Guta Fire	, CE/MOHS/ICC		https://www.alibaba.co m/product-detail/indoor- Fire-Strobe-Sounder- Horn- Strobe_1600190958705. html?spm=a2700.gallery effectionement_offection
	indoor horn strobes	AW-CSS2166-2	Ltd.			title.5d7fa0bddRP2/d
	indoor strobes	15-776	THUNDEROUS SOUNDERS ELE	CTRONIC LTD.		https://www.alibaba.com/ product-detail/flash- vellow-indoor-red-strobe- light_1700001119848.ht ml?spm=a2700.palleryoffe flist.normal_offer.d_title.1 8c1c43bo?BYAD
	Dual Action Addressable					https://www.alibaba.co m/product- detail/Outdoor- Explosion-Proof- Addressable-Non- Coded_60621415619.ht mi?spm=a2700.galleryof ferlist.normal_offer.rd ti
	Manual Pull Station	MLXB	Ningbo Meilin Machine Co.	, Ltd.		tle.2be4799aA1pek8