Flame propagation on cables

Engineering

The paper " Flame Propagation on Cables' " is a worthy example of a term paper on engineering and construction. Recently, there has been a concern about the characteristics of the flame propagation of cables. Under normal conditions, it is apparent that the cables, when subjected to fire, may lead to loading of combustible fire and the toxicity that emerges from the generation of the smoke. Apparently, most buildings are made of a variety of cables. This may cause serious fatalities when they are loaded across the building. This requires that the cables that have to be used have to meet certain accepted standards in order to enhance the safety of the buildings. In most buildings, the fire retarded cables have been used due to their low cost. In a scenario where the cables are used as a single wire or they are used as bundles, the spread of fire would be minimized to a small area. This would, in turn, minimize the effects of fire in the building as a result of fire propagation. This paper elucidates the test that was conducted on a 100cm cable single wire in order to determine the level of failure. This was done by using the thermocouple to record the temperature and the Bunsen burner to provide the flame.

- 1 Introduction

The test for the electric cables is conducted so as to obtain their mechanical, physical, chemical and flammable properties so as to gauge the level of their resistance. Despite the fact that the cables are not the main cause of the fire, they are subject to the consequences that may arise. This means that they have to be fitted with fire survival properties (Bertrand, Chaussard, Gonzalez, Lacoue, Mattei, and Such, 2002). Apparently, the cables would respond differently when subjected to heat depending on the materials

which they are made of such as PVC or nylon. Cables may contribute to fire by providing new fuel that would enhance combustion, the release of toxic gases and propagation of flames that may spread from one area to another area. While testing the properties of cables in flame propagation, the aspects of hazards emanating from their combustion and the fire resistance levels are highlighted. In the design process, it is important to consider the vulnerabilities that may arise. All these factors constitute to the safety of the systems and structures that are set up (Davis, Quinard, and Searby, 2001). The class that categorizes the cable performance of a single wire is governed by IEC 60332-1 and IEC 60332-2. The specimen would deem to have passed the test when the burning would have ceased. The charred part is not less as the 45mm given the lower point of the top clamp which may be estimated to the 440mm that is above the given application of the flame (Davis et al., 2001). The study of cables used in buildings facilitates the fundamentals in the resistance of fire that would lead to the probabilistic assessment of fire safety.

- 1. 1Hypothesis

The tilted flame indicated a correlation in the length that had been burned and the propagation of the flame for the wire which was tested. On the other hand, there is no relationship in the materials which have greater burn lengths which have an angle of more than 45 degrees. This gives a concern that it may not be eliminated the wiring strategies that leads to the propagation of fire when subjected to severe conditions. The use of electric cables may be classified as, retarded fire cables on a single configuration, flame retarded cables that are based on a given bunch of bundles of

configuration and the cables. A cable of 100cm cable vertically and apply a 125mm long flame at an angle of 45 degrees in which the gas burner is placed at the bottom of the cable to heat the cable. Gas burner Digital readerThermocoupleClampFigure 1 apparatus set up

- A one-meter cable was placed into the top and bottom of the clamp to ensure they are tight.
- A distance of 20mm line was marked starting from the top edge of the bottom clamp so as there is a distance of approximately 420mm allowance for burning distance.
- The Bunsen burner was set to a flame height of about 125mm leaving the inner core to be blue Place a filter paper underneath the cable.
- The thermocouple was set such that, it touches the top and the bottom of the wire while ensuring the data logger is functioning.
- The flame impinged at 45 degrees at the 20mm.
- The flame was left impinged on the cable for a duration of 60 seconds.
- The temperatures for both thermocouples were recorded after every 15
- The cables were observed to see whether the cables actually burned from the top clamp and whether the droplets would really ignite the filter paper.
- This process is done with different cables.
- Repeat with the second sample of a different cable.
- The other remaining samples were inclined at 45 degrees having the widest part being their bottom while observing their behavior.

From the results, it was evident that the yellow and green striped cable which was placed vertical failed the test, while the white PVC which was placed vertical and the green and yellow nylon which was placed at an angle of 45 degrees passed the test. The nylon cable that was placed vertically had the longest burnt length. The function analysis carried out at the cables gives the damage levels of a given cable. There are a number of electric cables namely the power cable, instrumentation cables, and control cables. In case of a fire outbreak, the insulators which are the cables are damaged and may lead to the wrong reading of measuring instrumentsGraph 1 Thermocouple temperature vs. Time of a green and yellow striped nylon (7core)-verticalGraph 2 thermocouple temperature Vs. the temperature of green and yellow striped nylon(7core)- 45 degrees Graph 3 thermocouple temperature Vs. The temperature of white PVC (3 core)- vertical Graph 4 thermocouple temperature Vs. The temperature of white PVC (3 core)- 45-degree angle It was also observed that in the experiment having green and yellow striped nylon (7core)-vertical, the top temperature was rising gradually and it took more time for it to cease burning making the test fail. The orientation of the cable also affects the time it takes to cease burning (Bertrand et al., 2002). When the cables are inclined at an angle of 45 degrees, as shown in graphs 2 and 4, the bottom temperatures of the thermocouple increases steadily. This proves the correlation between the 45 degrees angle and the flammability test. Additionally, it gives an indication, that there is no correlation in the materials used in the length of the burn with the flammability test. There were systematic and absolute errors that occurred during the experiment. Most of the errors emerged due to systematic factors such as poor calibration of types of equipment, parallax

errors and weather conditions. This experiment may not be efficient in the testing of small wires as a result of the melting points of the conductors when the flame has been applied. In case there is an underground cable installation, there is a necessity of sealing adequately the penetrations above the ground to counteract the high-intensity fires that have a high rate of flame propagation. It is also imperative to have the initial detections that would involve the protection of the underground fires. This may be provided by the accelerator malfunction. As a stringent measure that has to be considered in the construction of buildings, the slow propagation rate is needed to install the sprinklers. The slow rise in the temperatures of the thermocouple is an indication that the heat detectors that are erected in the cable trays may not necessarily indicate the heat detected. It is suggested that portable cables could be used as the high ventilation rates would have little signs on the horizontal propagation of flame. In such cases, smoke equipment has to be used.