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Evaluation of Fire Protection Systems in Buildings

تقويم أنظمة الحماية من الحريق بالمبانى

A Case Study: National Telecom Corporation Tower

دراسة حالة : برج الهيئة العامة للإتصالات

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2.1.2 Theory of ignition:

Definition of combustion: composition is a reaction or series of chemical reactions that generate heat and occurs between one or some materials and oxygen, or material that generate oxygen, or oxide materials, when the combustion degree of heat occurred.

This reaction usually occurred by the fuel oxidation which acts heat, flam, light and other products.

When the rate of reaction is slow the result is the heat only, but the fast combustion results light in addition to the heat.

The flammable materials can be solid, liquid or gas, and product ignition gas that resulted from liquid or solid materials.

Some of solid materials have no gas produced in it's surface when it burned.

To show the main fire elements we usually use the fire triangle fig. (2-1) as follows:

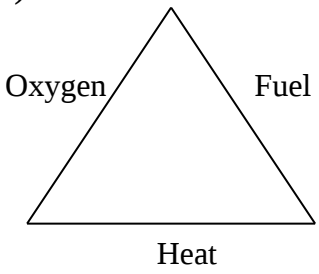

Fig. (2-1) shows the fire triangle

The above shape shows that any fire operation can not be completed unless the existence of three basic members achieved, the three elements (factor) are:-

1- Flammable material (Fuel).

2- Oxide material (Oxygen).

3- Heat.

Fire usually continuing by the existence of these three members, and taking away or omitting of any part of these three members

means omitting one of the fire triangle which is means fire operation stop.

1. Heat:

Any material has certain heat degree that creates material ignition when enough oxygen is exist. Heat recourses are:-

Open flam, hot surfaces, friction, and electricity.

2. Oxygen:

The air around us contains about 20% of oxygen, and we know that a lot of material contains enough oxygen to complete ignition.

3. Fuel:

It is the flammable material, this fuel can be:

A. Solid materials such as wood, clothes, papers and

B. Liquid materials (Hydrocarbon fluid materials), such as oils, cyrosin, benzene).

C. Gas materials: such as (Asetilire and butane).

2.1.3 Types of Fires and Extinguishing Materials:

Fire classification:

Fire classification depends above type. The main give classes are class (A), class (B), class (C) and (D).

- Classes (A) contain the ordinary slid combustibles such as wood, papers, plastic at materials and the carbon fires.
- Class (B) contains liquids and flammable materials fires.
- Class (C) contains he electrical fires.
- Class (D) contains metals fires.

Class (A) Fire: (Fig. (2-2 A ORDINARY
Fig. (2-2 B)

This type of fire contain organic and carbonic solids fire which usually have fire fraction and shinning flame. It is the most common COMBUSTIBLES
Type of fire

The most suitable extinguishing material for this type is water (continuous water line or spread and scatter water).

Examples of this type of fire the "dry weeds plants", wood, clothes and plastic combustibles.

Class (B) fire: (Fig. (2-3 A (Fig. (2-3 B

This type contain:

(1) Flammable liquids and

Solids Fig. (2.3) to choose the suitable extinguishers the flammable liquids can be divided according its solution in water into:-

A/ Liquids that have shine look above 67.5°C.

B/ Unpolluted liquids in water like fats, animal and plant oil and heavy natural oil. Those materials usually product high amount of heat in case of flame for the extend that using water to extinguish that fire usually case big and explosion. Therefore, the best extinguisher for this type is the dry chemical powder and carbon dioxide; but the flame can be return again so it is suitable and advisable to foam materials.

Class (C) fire:- (Fig. (2-4 A (Fig. (2-4 B

This type contain liquid

gases fire in liquid or gas EQUIPMENT

shape like CH_4, $C_3 H_8$, $C_4 H_{10}$

We can use foam or chemical power to fight liquid gases fire. We also use dry chemical powder and gases liquids; normally we use water to cool gases containers to avoided exploration.

Fig. (2-5 A) Fig. (2-5 B)

Class (D) fire:- COMBUSTIBLES

It contain flammable **D**

Fires like Na METAL

"Sodium" and Mg "magnesium etc. The extinguishers that contain water are not affective in this type of fire and it is very dangerous, the same affection occurred when using CO_2 and dry chemical powder, which contain be carbonic materials.

The suitable material for this type of fire is granite powder, tick, soda powder dry soil and caladium stone.

Fig. (2-6)

Electricity fire:

It is not one of the fire types, because any fire contains or start according to electrical case is really one of the above fires Fig. (2-6). The first step in this case is switching off electricity current, and sue the suitable extinguisher for combustible materials. When switching off electrify power is not available we must use special extinguisher with untransfer materials for electrify like gas liquids (Halon), dry

chemical powders and carbodioxide CO_2, although CO_2 has bad affection for sensitive electronic machines (cooling).

In some countries the electrical equipments fire considered as one of the fire types and called class (E).

2.1.4 Theory of extinguishing (fire suppression):

Recently a lot of research developed in fire fighting so a new theory of extinguish appeared as a result of dry chemical materials and halo's affection in fire extinguish this theory called fire cone which change the fire triangle to cone with four faces, its base series of chemical reaction which case continuous flame in addition to the others faces fuel heat and oxygen. To stop fire flame one of the four members must be dismissed, this can be achieved by:

1- Starvation: separate the flamed part from the enflamed part.

2- Something: separate oxygen from fire surface.

3- Cooling: By decreasing temperature to be below flame degree.

4- Change reaction interruptions:

It is proved that powders and halon have affection in change reaction interrupting and fight fire.

3. Introduction:

In this chapter the researcher will going to provide information and definition of the research case study, giving the reasons why he chose that case, showing the building type and risk assessment, in addition to the location, general description of building parts, activates, number of stories and all information that affect building fire safety that will be analyzed in the next chapter.

The researcher will going to show the method he followed to obtain the research information that achieving the research objectives.

Finally the research thinks that it is very essential to provide short background about the fire safety in high-rise building, because the research case study is one of such type. Such background is very necessary to be provided before chapter four which concern the case study discussion. Such background which talks about fire and life safety in high rise building and features characterizes high rise building will form an introduction to the next chapter, as it facility understanding of fire safety strategy and analyses of our study sample.

The researcher would like to say that, although there is a large number of buildings and tours in Sudan such as N.T.C building that achieve acceptable fire protection requirements according to the authorities requirements, we can say fire protection requirements according to the authorities requirements, we can say fire protection and safety in buildings is generally needs a lot of works and efforts from the authorities and engineers to improve fire safety services in buildings.

However the researcher aim through this study to give a look and discuss the fire safety in buildings giving information about the origin of the NFPA codes that controls and guides the technical and scientific fire protection design in buildings.

Also we identified the fire safety engineering, and showed the design concerns, theory of ignition, fire resistance of building materials, fire classification, general safety in buildings, fire spread control, fire suppression systems, fire alarm means and internal compartmentation.

Furthermore the researcher provided a case study of a high rise building (NTC building) as a sample which has achieved a satisfied and high degree of fire safety requirements according to the international standards requirements (NFPA) and BS.