LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
CO-OPERATIVE GOVERNANCE,
HUMAN SETTLEMENTS AND TRADITIONAL AFFAIRS

PRESENTATION

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Integrated Sustainable Human Settlements

PURPOSE

- THE IMPACT OF FIRE SUPPRESSION, INCIDENT TERMINATION AND FIRE STATION DESIGNS ON FIREFIGHTERS LIFE SAFETY

Introduction

- Firefighting is one of the world's most honoured but hazardous occupation. It is the duty of fire service/department to practice Life safety, Incident stabilization and Property conservation, this includes environment.

- It is a profession that exposes an individuals to a high level of personal stress and danger, yet least studied occupations in terms of exposures and their relationship to occupational disease.

Introduction Cont…

- The smoke that firefighters were exposed to 20 or 30 years ago is not the same as it is today.
- Wood, cellulose, cotton, silk, wool, etc., were bad decades ago, but they were nowhere near as toxic as the chemically-manufactured materials of today.

Presence of Polymeric Materials

- **Acetyls**:-aerosol containers, combs, lighters and pens
- **Acrylics**:-glues, food packages and skylights
- **Nylons**:-various household containers, brushes, sewing thread and fishing line.
- **Polyesters**:-hair dryers, computers and kitchen appliances
- **Polypropylene**:-bottles, diapers and furniture
- **Polyurethanes**:-shoes and cushions
- **Polyvinyl chlorides (PVC):-**carpet, clothes, purses, records and shower curtains
- **Thermo sets**:-TVs, coatings, toilets, buttons, flooring and insulation

Other materials involved during fires

- Petroleum in upholstery.
- Home and agricultural pesticides.
- Formaldehydes in insulation, carpets dyes and glues.
- Teflon(Polytertrafluoroethylene-PTFE) is also a polymeric material and Perfluorooctanoic Acid (PFOA) used to make some kitchen items and electrical insulation.
- Asbestos in siding, fire proofing, flooring, roofing paper, thermal insulation.
- Creosote in roofing and wood preservative.
- Pressure treated wood, when burned can off-gas its chemical for hours.

Other Chemicals

Other chemicals that can be added to this toxic list include carbon monoxide, nitrogen dioxide, **poly-nuclear aromatic hydrocarbons(PAHs)**, formaldehyde, acid gases, phosgene, benzene and dioxins. In short, the smoke of today is a highly complex mixture of solids, liquids, fumes and gases that are produced when there's a thermal decomposition of materials, or in other words, when these materials burn.

- Most firefighters are aware of the fact that where there's smoke, there's CO and HCN. But what's even more disturbing and not well known: Hydrogen Cyanide(HCN) is 33–35% more dangerous than CO, because it can damage the systems of the body in many ways, such as through ingestion or inhalation, injections and skin exposures. HCN affect low oxygen sensitive organs, e.g. Brain, Lungs and Hearts.

Sources of Poly-nuclear Aromatic Hydrocarbons(PAHs)

- Soot from incomplete combustion.
- Diesel engine exhaust in the station(unventilated vehicle bay).
- At every fire scene.
- House contents including furniture.
- Wood, Coal and Tobacco.
- Soot from petroleum fuel fires.

Adverse health effects associated with PAHs

- Elevated incidences of coronary heart disease and several cancers(Bladder, Lung, Prostate, Breast) including kidney failures.
- Exposure to PAHs may also result from skin contamination and resultant dermal absorption during **overhaul and during normal fire conditions.**

Design of Fire Stations

- The design of the fire stations should be emphasized on the safety and health of the end-users(Firefighting Personnel).
- It is recognized that many of the fire stations in the country were built many years ago, if not decades.
- Point to consider is to encourage, develop and implement a safety and health concept for the well being of the emergency service personnel when designing and building fire stations.
- The fire station began to take on the duties of a business. Stations included administrative offices for the various functions of the organization.

Design Factors

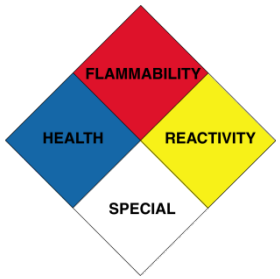
- Fire station designs have changed over the past decades.
- They are being recognized more and more as specialized facilities with their own specific design approaches. Design and facility features differ among fire stations.
- Differences in station design can occur as a result of slightly different roles of the specific department, Departments with integrated emergency medical responsibilities have additional station design requirements for accommodating EMS needs.
- More Fire Services/Departments are building training facilities into their fire stations.
- One important and intentional effort that we're seeing is the rise of "gender neutral" designs.

Design Factors Cont…

- Fire stations are open 24 hours a day, 365 days a year and, as a result, need to serve as more than just public and residential space; they need to provide a home away from home for staff during lengthy stays.
- In addition to serving the community through performance-forward designs, Fire Service/Department should recognize the opportunity to play a larger role in the community, e.g. public education and station visits.
- One potential concern about public access is security. Carefully choreographed design can maintain security inside the station. Visitors are only invited into certain areas, such as the entry, displays, restrooms and meeting rooms.

NFPA in relation to Safety and Health of the Emergency Personnel/Firefighters

NFPA 1500	Standard on Fire Department Occupational Safety and Health Program
NFPA 1581	Standard on Fire Department Infection Control Program
NFPA 1582	Standard on Comprehensive Occupational Medical Program for Fire Departments
NFPA 600	Standard on Industrial Fire Brigades
NFPA 1901	Standard for Automotive Fire Apparatus
NFPA 1402	Guide to Building Fire Service Training Centres



Firefighters Health & Safety Considerations in the Design of Fire Stations Cont….

- Numerous studies have shown firefighters are at increased risk of many types of cancer. Firefighters are exposed to causes of cancer from the smoke in a burning building to the diesel exhaust from the apparatus. The National Fire Protection Association (NFPA) standards specify that fire stations be equipped with equipment that removes the **diesel exhaust from a fire station** and **have procedures for properly cleaning and storing the turnout gear** that firefighters wear when fighting a fire.
- Fire Stations must meet the requirements for exhaust removal.

Firefighters Health & Safety Considerations in the Design of Fire Stations Cont….

- The gear storage racks that are located on the apparatus floor do not only expose the firefighters working there to the smoke from the fires that remain in the clothing, but they also absorb the contaminants from the diesel exhaust. The NFPA standard, specify that the firefighter's gear is stored in a **special storage room**.
- The standard also indicates that offices, training, meeting and storage rooms are separated from the apparatus /vehicle bay and gear storage rooms.

Firefighters Health & Safety Considerations in the Design of Fire Stations Cont….

- Firefighters are aware of the risks that they face when they respond to a call, but they should not be expected to risk their health and even their lives when they are working in the fire stations.
- The design separates potentially toxic and non-toxic areas of the building by having decontamination and similar facilities accessible directly from the bay area. Shower facilities have dual access.

Firefighters Health & Safety Considerations in the Design of Fire Stations Cont….

- The fire department should set aside an area in each fire station for the storage, cleaning of equipment. The room should be physically separated by from other fire station areas.
- Fire Stations to have Exhaust Systems in the vehicle bay.
- Safety place for the PPE away from the vehicles.
- Ablution facility away from the vehicle bay and the living quarters.

RECOMMENDATIONS FOR ENHANCHING FIREFIGHTERS` LIFE SAFETY

(1) Fire Suppression Practices

-Adopt modern suppression technology.

-Prioritize ventilation and decontamination

-Continuous training

-Health monitoring during suppression

RECOMMENDATIONS FOR ENHANCHING FIREFIGHTERS` LIFE SAFE

(2) Incident Termination Protocols

-Structured post-incident procedures

-Rehabilitation zones

-Psychological support

-Data driven reviews

RECOMMENDATIONS FOR ENHANCHING FIREFIGHTERS` LIFE SAFETY

(3) Fire Station Design

-Zoned layouts for contamination control.

-Improve air quality system.

-Ergonomic and safe integration

-Smart technology integration.

-Resilient infrastructure.

Conclusion:

- To establish compliance guidelines for new station construction, existing station modification with model specifications that can be adopted as part of a Fire Service/Department's station design and construction.
- The specifications to form integral part of the stations designs irrespective of the category and size of the fire station.

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