

Warehouse fires: strategies and tactics

By Colin Deiner, chief director, disaster management and fire brigade services, Western Cape Government



The concept of warehousing has seen a massive change over in recent years. The rise in the need for online ordering and ‘just-in-time’ delivery has seen a rapid increase in the number and size of warehousing and the frequency of activities within these structures. It has furthermore led to a more

diverse variety of products, with different physical properties, being stored and processed.

Depending on the type of construction, contents of the warehouse and the fixed fire protection, warehouse fires will generally be quickly detected and easily

- ▶ The elements required to successfully manage these POG emergencies can be listed as:
 1. Effective resources
 2. Proven methodologies
 3. Effective plans and procedures
 4. The correct training and competencies

Having stated that, we are reminded of the constant budget restraints under which our local authorities are required to operate, train and respond. In most instances, the resources and training required to effectively mitigate POG incidents in the urban-industrial interface, is highly specialised and expensive. Being aware of this, Industrial Fire and Hazard Control is

well positioned to partner with our local and provincial authorities to provide a response capability to assist when an urban-industrial interface (POG) incident occurs. Industrial Fire and Hazard Control deals effectively with all four points noted above and brings specialised knowledge and expertise to bear when faced with these unique challenges.

One of the most unique features of Industrial Fire and Hazard Control is our very close working relationship with Williams Fire and Hazard Control, who has successfully responded to more than 250 land and marine based flammable liquid fires around the world. These

responses, each one individually, allows the company to build a level of expertise that is unmatched in the industry and it is this level of experience, coupled with a solid in-house knowledge base that allows Industrial Fire and Hazard Control to offer a partnership with our local and provincial authorities that is totally unique when planning for the Urban-Industrial interface incidents.

Should you require more information, please do not hesitate to reach out Zarto Williams on 061 158 6941/Zarto@industrialfire.co.za or Trevor Fiford on 082 651 2580 / trevor@industrialfire.co.za or visit www.industrialfire.co.za. 

dealt with. There is also a responsibility on the first responding fire department to be aware of the warehouse structures in their coverage area and what products are stored in those occupancies. This will help them to develop an understanding of the types of incidents they can anticipate and develop effective incident action plans.

The type of product stored in the warehouse space will in all probability have the biggest impact on the potential firespread and weight of response. Fires in structures containing flammable products such as tyres, paper and plastic products and solvents will have the potential to spread rapidly and will require a multi-alarm response.

A fire in an occupancy where pressure containers or flammable liquids could carry a risk of explosion and an increased fire spread caused by projectiles crashing into unaffected areas of a warehouse space and igniting unburned products. In addition to this a further risk exists when the racking becomes compromised and the risk of collapse presents itself. This could impact on fire fighting operations in several ways. Despite the risk of it collapsing on fire fighters inside the building it could also prevent direct application of water or foam onto the burning product or cut off any escape routes.

A large fire inside a metal truss construction will weaken the structure to a point where it will weaken and collapse onto the fire area thereby impeding any elevated water streams that may have been set up outside.

Working with fixed fire suppression

Fire suppression systems are legally required for different classes of warehouses. These systems are generally designed to control fires in specific areas not to extinguish them. It will still be necessary for the fire department to do the final fire extinguishing and making the building safe. It is therefore important for the responding fire service to understand the working of the fire suppression system and how to work with it.

When responding to a fire where the suppression system (usually a sprinkler system) is in operation, the first responders should ensure that the water supplies to the system are operating effectively and that the fire pumps are operating properly. Valves supplying the system should be kept fully open until the incident commander determines that it is safe to turn it off.

In a situation where two or more suppression systems are operating simultaneously, the incident commander should ensure that all sector commanders are so positioned as to be able to monitor the operation in their sectors and to report the effect of the system on that part of the operation. It is important for fire services to have prior knowledge of the building and the systems installed there. Even if the building is sprinklered, improper design or changes in storage

Aerial devices and ladders should be given priority of positioning and be so placed that they can be most used to their fullest potential



may hinder sprinkler protection for the material stored, rendering the system ineffective. I have in numerous previous articles in this magazine advocated the importance of pre-planning for high risk premises in station areas. Loading your crews up and paying a visit to the warehouses in your station coverage area will familiarise them with the layout of the warehouse space, its construction and let them get to know the staff who they might have to communicate with if they ever have to respond to a fire on that site. ▶

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A very important consideration when dealing with a fire containing toxic chemicals is the control of the fire water run-off

- ▶ Working in tandem with fixed fire suppression systems or in situations where they are not present, will require the stretching and advancing of hoselines to various locations in the warehouse. It is important to ensure that the reach of your lines have sufficient reach for this. It may also be necessary to pace monitors in strategic positions to enable the cooling down of exposed structural members to prevent them from collapsing due to high heat exposure.

Several recent fires in different parts of the country have been severely compromised due to a lack of sufficient water supply. In a large warehouse fire, it is a fact that large volumes of water will have to be flowed in order to control and extinguish it.

Although the provision of adequate water pressure seems to be a challenge for many municipalities right now, it is simply not acceptable to lose a structure due to the lack of pressure in your fire hydrants. Fire services must work with their water departments to ensure that any challenges in high risk areas are quickly identified and rapidly dealt with.

Easier said than done? I know.

Consider the impact that the loss of jobs and revenue due to a major warehouse fire will have on a city/ town and it then becomes clear that the maintenance of water supplies is so critical. If you are, however,

confronted by a weak or non-existent water supply, be prepared to establish a water supply sector with shuttle runs or large-diameter hose relays. You might even need to scale back tactics to match the available water supply. This will invariably compromise the operation and could be an extremely difficult decision to take.

Ventilation and forcible entry

Early ventilation of a large structure will assist in providing visibility and limiting smoke damage to goods stored within the structure. The volume of air movement required inside a large warehouse space will be considerable and it might be advisable to consider deploying your positive-pressure ventilation (PPV) blowers. Remember that PPV will only be useful if deployed in conjunction with a coordinated interior attack. Due to the large volume of air you will need to move, you will probably have to set up blowers at several entrances and identify several openings for the smoke to vent out of. In these situations, you will want to ensure that while you are introducing high volumes of air into the structure, you are also sealing off the opening to prevent any smoke coming back at your crews positioned there or using that opening for entry into the building. Placing a larger blower directly at the entrance will achieve the first objective ie high air volume. Position a second, smaller blower slightly back but directly behind the larger blower to create the 'cone' around the opening. ▶

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- ▶ Accessing the roof and reaching natural ventilation openings should also be an initial strategy. However, the location of the fire and the condition of the roof area where you are going to place your ventilation crews, should be carefully evaluated before committing ventilation crews to the roof.

Fires involving metal roofs can affect the roofing material and insulation and can burn and smoulder underneath this material, potentially involving the entire roof. You might consider doing a trench cut along the roof structure to prevent the fire from spreading. The trench cut or 'strip ventilation', is a long narrow ventilation hole that acts as a firebreak on the roof of a structure that is being attacked by fire. This tactic is used when confronted with a concealed fire that is difficult to reach or a fire that has a stronghold on the attic or cockloft space of a long, narrow building. The main focus of this defensive tactic is to cut off fire extension to an area of the building that has not been involved in fire. This must, however, be done with great caution and ensuring the area being trenched does not compromise the structural integrity of the building.

The first step in performing a trench cut is to create a large vent hole over the fire, which will allow heat and smoke to exit the structure. This should also provide the ventilation crew enough time to complete the trench cut. Often this is overlooked due to the ventilation crew looking for a safe enough position to start the trench cut. The officer responsible for the ventilation must have a good knowledge of the roof construction. This will allow your crews to bring the right blades for the saws and other necessary tools to open the trench. Also check for sagging or blistering in parts of the roof. Be sure to identify any areas that are weakened and failing. You may have to adapt your tactics due to roof conditions.

During a working fire in a warehouse it might be necessary to create any number of openings at certain

points. In the high security environment modern fire services operate in, it will be important that, during your pre-planning walkthrough, fire fighters take note of the locking mechanisms and other security systems of the doors and windows. This will inform the types of forcible entry tools that will be needed to force openings in the event of the building being locked and secured.

Firewalls and fire doors are a key building feature that may prove to be invaluable in a fire fighting operation. They are normally rated for between one and three hours of fire exposure. Fire fighters must know where they are located and ensure that they haven't been compromised.

Offensive operations

Interior offensive operations can only be started after a good size-up has been completed. Probably the most important factor in starting an interior attack will be the starting position of the attack teams. You will want to provide them the most favourable tactical advantage possible. It might be a good idea to deploy a rapid intervention team to locate the fire and carry out any rescues that can be safely achieved. They can report their findings to the incident commander who can then decide on the best path in ingress for the attack teams.

Interior crews must be supported by a good ventilation strategy and forcible entry crews throughout their advance as accessing the seat of the fire may require teams to move deep into the building, beyond the limit of the fire fighters' self-contained breathing apparatus (SCBAs). Building layout and heavy smoke conditions may prove disorienting and that can complicate egress from the building and can cause even the most experienced fire fighter to become disoriented. Ventilation should be ongoing and forcible entry teams should continuously be aware of the progress of the attack teams. It would be advisable to create several escape routes for the attack teams as the progress through the structure towards their objective. This is especially important where building is heavily barricaded with burglar proofing.

Exterior operations

If the fire in a warehouse has reached the point where it has overpowered the fixed fire suppression systems and already vented through the roof or caused partial roof collapse or become too dangerous to commit crews to the interior, an exterior fire fighting operation will be the only option. This may be due to the sheer volume of the building content, the type of product stored, an explosion or a design flaw that prevent the suppression system to effectively reach the fire.

Deciding on a defensive approach should be a simple decision and should become obvious during the early stages of the size-up. It is important that crews should only be deployed offensively if the reward matches the










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Pressure containers or flammable liquids could carry a risk of explosion and an increased fire spread caused by projectiles



- ▶ risk. If the risk to staff is significant and the chances of saving the building are minor, go defensive.

Aerial devices and ladders should be given priority of positioning and be so placed that they can be most used to their fullest potential. During a defensive operation they will be used as elevated water streams. A good strategy could be to place them in a position where they can direct their monitor into the doors used for loading and unloading the delivery trucks. This should allow them to flow water deeper into the warehouse than any handline or ground monitor.

A defensive strategy does not necessarily mean that it must be an exclusively exterior operation. It might be possible to set up handlines and ground monitors inside a structure where only part of it is on fire. This will be done to prevent the fire from spreading and will be dependent on several factors such as the integrity of the structure, smoke profile, etc.

A very important consideration when dealing with a fire containing toxic chemicals is the control of the fire water run-off. The incident commander must consider the topography of the surrounding area and note any risk of the potentially toxic run-off reaching water sources nearby. Products specially developed for the containment of run-off have been acquired by some fire departments and in other cases agreements with hazardous waste removal companies have been reached whereby they will respond to such incidents and deal with the run-off control. Not controlling the run-off could lead to a bigger disaster than the actual fire damage.

Strategic considerations

A large warehouse fire will present an incident commander with several challenges. Large fire column, water supply, resource allocation, collapse potential and other considerations will all have to be factored in to achieve an eventual solution. It will be important to focus on certain priorities:

- Size-up, Size-up, Size-up. The information gathered in the early stages of the incident will determine the direction for the next few hours. It is through this information that the most important strategic decision, whether to go offensive or defensive, will be made.
- Ventilate early to enable attack teams to enter the structure safely and effectively.
- If the decision is to go offensive also prepare for an extended defensive operation and prepare your command sectors for a possible change in strategy.
- Never confuse your strategy by going defensive and offensive concurrently. Defensive operations, by its nature, will invariably compromise the effectiveness and safety of the interior attack crews.
- Assign an experienced officer to take charge of the water supply and give them everything they need. All your plans will come to nothing if you don't have enough water or lose your water supply.
- You will probably be there for a while. Ensure that relief crews, additional foam, rehab and other support resources are activated and available.
- Ensure effective hazardous run-off control. It might keep you off the news cycle for a few weeks.
- Remember the pre-planning visits. They are much more important for crews than sitting around the fire station, watching TV or cleaning fire trucks. ⚠