
WAREHOUSING WHITE PAPER

Storage and handling of Dangerous
Goods in preparation for, or after,
sea-transport.



EXECUTIVE SUMMARY

Recent decades have shown an increase in serious incidents in the Maritime Containerized Supply Chain, involving both onboard incidents and incidents taking place on shore in warehouses where Dangerous Goods are stored and handled in preparation for, or after sea-transport. Warehouse incidents in Tianjin in 2015 with numerous casualties and the latest serious such incident in Beirut in 2020 causing more than 200 deaths, 6000 injured and leaving an estimated 300,000 people homeless, have caused global concern. They have revealed a need for guidance on warehousing, including consolidation, where Dangerous Goods are involved.

Whilst reports on investigations into such warehouse incidents are seldom made public, a common cause is generally understood to be incorrect handling and storage. This includes segregation of the Dangerous Goods stored and is often combined with issues related to prolonged storage which can influence the stability of the Dangerous Goods.

In the aftermath of such incidents, Container Carriers with cargo in affected ports are often asked to participate in casualty handling and provide Subject Matter Expertise with regards to Dangerous Goods. It has become apparent that there is a desire at port level to have industry guidance on Dangerous Goods Warehousing made available.

In response, 4 industry organisations have developed this guidance document. The organisations are the International Cargo Handling Coordination Association (ICHCA), International Vessel Owners Dangerous Goods Association (IVODGA), National Cargo Bureau (NCB), and the World Shipping Council (WSC).

The guidelines are presented in the form of:

1. a white paper, which identifies the considerations and measures that should be taken by warehouses storing and handling Dangerous Goods and covers topics such as construction of the warehouse, operations, fire protection, security, and emergency response; and
2. a checklist to support these considerations and measures, which can also be used in warehouse audits and inspections.

The white paper has been endorsed by several significant industry stakeholders such as port operators, insurance companies and associations where Shippers are directly involved.

The contents of the white paper have been shared with relevant maritime regulators and the International Maritime Organization (IMO) with an invitation to consider including the white paper and associated checklist in various instruments, codes and circulars published by the IMO, as appropriate.

This white paper does not address longstanding containers and abandoned cargoes that pose a potential risk to life, the environment, and assets. This topic will be dealt with later in an associated white paper.

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ICHCA, IVODGA, NCB, WSC

TABLE OF CONTENTS

-	Executive Summary	2
A	Introduction	4
B	Practical Considerations	6
	1. Applicable Standards	6
	2. Workforce	6
	3. Construction	7
	4. Operations	8
	5. Dangerous Goods Storage	9
	6. Fire and Explosion Prevention	10
	7. Security	11
	8. Emergency Response	13
C	Conclusion	15
D	Warehouse Checklist	16
E	Appendices	30
	1. Glossary of Terms	30
	2. Reference sources and further reading	32
F	About the Authors of this White Paper	33
G	Endorsers	34

A / INTRODUCTION

Every day large quantities of Dangerous Goods are shipped worldwide across international borders. Containerized goods (including Dangerous Goods) are handled intermodally, meaning that goods are interchanged directly between various modes of transport and associated warehouses¹.

Such operations take place in warehouses and marine terminals and may include transfers from truck, rail, barges, etc. with intermediate (or sometimes longer) periods of temporary storage.

Sometimes cargoes are consolidated (often termed “groupage”) in the warehouse before they are despatched to inland receivers or loaded to ships. The reverse can take place for cargoes received from ships.

Thus, in addition to the various intermodal operators, carriers or agents involved -the role played by “duty holders” in warehouses must also be considered.

International, regional, national, and local regulations and standards for the transportation, handling and storage of Dangerous Goods are designed to protect life, the environment and property.

To affect this purpose, regulations and standards impose specific obligations and requirements on duty holders in the transportation chain. Each duty holder may have to rely upon the compliance of the preceding one in the chain. The goal of ensuring safety could be compromised if any duty holder in that chain fails to fulfil their obligations. Compliance with regulatory and applicable industry standards, including implementation of best practice, is key to ensuring a safe workplace for the storage, transport, and handling environments and also protecting surrounding communities.

The terrible event in Beirut in 2020, where a consignment of Ammonium Nitrate exploded with catastrophic consequences, rightly focussed the world’s attention on how something seemingly as simple as the storage of chemicals in a warehouse could go so badly wrong.

There are many incidents across the globe each year involving Dangerous Goods stored in warehouses and there is a potential for another incident on the scale of the two most recent significant events at Tianjin² and Beirut if rules and procedures are not followed.

This Industry Guidance has been developed to help those with responsibility for temporary (or longer term) storage of Dangerous Goods, whether packaged or in bulk. It is also for those who are consolidating cargoes into freight containers or other cargo transport units (CTUs) so that they understand the basic actions that should be taken to ensure that such storage is safe and remains so.

¹ The term warehouse in this document may apply to operators or facilities including warehouses, waterfront facilities at ports or terminals, distribution centers, fulfillment houses, consolidators etc. where goods may be stored before export, in the due course of transit, or after import before distribution to receivers.

² According to various media reports, investigators in that case found more than 11,300 tons of DG stored illegally at a warehouse located at the port of Tianjin. The contents consisted of more than 40 different hazardous chemicals including 800 tons of ammonium nitrate, at least 700 tons of Sodium Cyanide and 290 tons of nitrocellulose, a highly combustible product which had reportedly been stored incorrectly and auto ignited. The resulting blasts killed 165 people, injured 798 and caused over \$1Billion in economic losses.

Much legislation already exists for Dangerous Goods in transit, notably the International Maritime Dangerous Goods Code (IMDG) developed and updated every two years by the IMO. The IMDG code focus however is on the marine side of transportation. Its basic purpose is the protection of the ship's crew, the ship, and the marine environment.

Other legislation exists for various types of modal transport -rail, air, road, and inland waterways, for example, all of which is derived from the same source as the IMDG Code –The UN's "*Model Regulations*" on the Transport of Dangerous Goods also known as the UN "Orange Book".

But what about ports, terminals, inland warehouses or distribution centres and their associated storage facilities?

Existing Dangerous Goods and security legislation may provide labelling, segregation, and security requirements for some facilities with shipments in transit and under temporary storage. There are some existing applicable industry standards, i.e., regional, and national model "Building Codes" relating to the construction, fire protection, security, and other specific elements to facilitate the safe and secure storage of such Dangerous Goods. However, these are not uniform or uniformly adopted. There is no equivalent to the IMDG Code or any similar international legislation to cover the movement, handling, consolidation, and storage of Dangerous Goods in ports or other land-based facilities.

The IMO published the revised version of "Safe Transport of Dangerous Cargoes and Related Activities in Port Areas" in 2007, which contains valuable advice and recommendations. However, those recommendations are "high level" in the main. This paper contains practical guidance for systematic and documented management of Dangerous Goods in warehouses. It sets out clearly identified steps in a **checklist**, to ensure that duty holders are aware of their responsibilities for the cargo they are storing, their duty to the surroundings in which the storage facility is located and, as a matter of priority, to the people who work in them or live in their immediate environs.

Implementation of these best practices will enhance compliance and safety for all involved.

EXAMPLE: OPERATIONS



A fire broke out in a chemical complex 7 hours after a hurricane had passed through the area.

Billowing smoke and a cloud of chlorine gas caused local authorities to raise an emergency alarm and residents had to take shelter over a large neighbouring area.

The complex was closed during the storm, and it is believed that chemicals stored on site were able to mix and cause a chemical reaction.

This example highlights the need to ensure that the building and its construction can withstand extremes of weather.

Further details of this and the other examples included can be found in appendix 1.

B / PRACTICAL CONSIDERATIONS

There are many factors that can influence the safe and secure storage of Dangerous Goods in a storage facility or warehouse. To remain manageable, this guidance focuses on some of the more critical elements such as:

- adherence to applicable standards,
- workforce integrity,
- warehouse construction and protection,
- operational controls,
- storage conditions, and
- emergency response.

The measures included here cannot address all circumstances and regulatory frameworks. There are many factors, including characteristics of the goods, type of operation, or location of the warehouse that may warrant additional or more comprehensive assessment and action. National or local regulations and standards will take precedence over the advice in this document.

1. APPLICABLE STANDARDS

Compliance with applicable industry or government standards is a minimum requirement of the duty holder.

Observance of best practice related to storage, operations, security, fire protection and other safety measures may be mandatory or voluntary depending on factors such as contractual relationships, insurance requirements, or adoption by local, national, regional, or international authorities. Voluntary documented application of best practice is generally a good indication of an organisation's safety culture.

Within a national framework there may be multiple standards applicable to warehousing. Examples include, but are not limited to, US Customs and Border Protection Customs Trade Partnership Against Terrorism (CTPAT) security program, European Authorised Economic-Operator (AEO), the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Transported Assets Protection Association (TAPA) Facility Security Requirements or various National Fire Protection Association (NFPA) standards such as NFPA 13 (Standard for the Installation of Sprinkler Systems) or NFPA 400 (Hazardous Materials Code).

2. WORKFORCE

Safe and secure storage of Dangerous Goods is dependent on a competent, trained, and trusted workforce. This starts with a documented screening process in accordance with applicable regulations to ensure prospective employees have the experience and / or qualifications for their

EXAMPLE: OPERATIONS



Officials were attempting to restart a chemical production facility where styrene was stored. This followed a closure during the Covid-19 pandemic.

During that operational process they inadvertently caused the release of styrene from two tanks containing approx. 5000 tonnes of the chemical.

The resulting gas cloud spread over an area of 3km with a second leak reaching 5km and covering several neighbouring villages.

11 people and many animals died from the exposure and hundreds of people were admitted to hospital with burning sensations, especially in their eyes.

This incident shows what can happen if procedures for dealing with such eventualities are either not developed, or not followed or staff have insufficient training.

job function and do not present a potential security risk. Screening should include any temporary employees or contractors that may be working at the warehouse.

A formal induction is also recommended to ensure employees understand and adhere to all applicable policies and procedures and quickly acclimatise to the warehouse safety and security culture.

Induction should include all relevant safety, security, and Dangerous Goods awareness training. Function specific training is also paramount as well as dedicated procedures to ensure employees are competent to operate specific cargo handling equipment. Training should be refreshed on a periodic basis and fully documented with appropriate records maintained.

Security considerations should include proper identification of the workforce, for example by issuing uniforms and security ID. Employee and contractor termination and rehiring processes should be documented. A checklist is recommended to ensure collection of all physical assets and removal of access to physical or electronic company systems immediately upon an employee's departure from the organisation.

3. CONSTRUCTION

Depending on the jurisdiction of its location, the warehouse may need to conform to specific Building Code requirements. These could be in the form of regional, national and / or model codes adopted by local authorities. Building Codes generally include specific standards for the structure, occupancy, fire prevention, energy provisions and consumption, etc., as well as location specific factors such as earthquake, windstorm, flood, and tsunami resistance.

Warehouse utilities (electric, water and gas) and fire protection systems (detectors, alarms, sprinklers, standpipes, extinguishing and annunciation systems, etc.) including their associated pipework and wiring should be protected from physical damage that could impact worker safety, warehouse operations and / or integrity of goods in storage. Sufficient clearance should also be maintained between heat-producing fittings and appliances in the warehouse and goods in storage, particularly flammable or combustible materials.

Inadequate lighting can adversely affect safety in a warehouse, contributing to an increased possibility of workforce error or greater probability of accidents by misjudging the position, shape, or speed of moving objects. Besides sufficient quantity, lighting should also be evaluated in terms of its quality including freedom from glare, shadows, extreme contrasts, correct direction and distribution, and the potential for introduction of visual fatigue.

Warehouse ventilation system(s) should be designed and function as a method of fire protection based on the respective fire codes. This may mean, for example, that it has to be capable of adequately reducing the build-up of heat and humidity and removal of hazardous fumes, based on planned operations and potential emergencies.

EXAMPLE: FIRE



A cotton factory storing chemicals was rocked by a fire and massive explosion which killed at least 12 people. It took several hours and 50 firefighters to douse the blaze.

Many more were injured, and the warehouse partially collapsed causing many of the casualties.

A national source cited *“poor safety standards are a frequent cause of fires”*

A back-up generator or other source of emergency power should also be considered where there is a potential for loss of normal power supply. This is particularly the case in areas prone to natural catastrophes such as windstorms or earthquakes.

Isolated warehouses may also require a back-up water tank to aid with fire-fighting provision.

Every duty holder should enact a preventative maintenance program for the various aspects of their warehouse operations, including:

- **docks and doors,**
- **perimeter fencing,**
- **the cargo handling equipment,**
- **storage rack systems,**
- **building interior / exterior,**
- **fittings and fixtures, especially for dealing with emergencies.**

This will minimise the risk of sudden and unexpected catastrophic failures in the warehouse that could lead to severe injuries and / or damage or loss of goods in storage. Maintenance programs may consist of routine inspections and / or monitoring of equipment and facilities, scheduled services for warehouse systems and / or regular replacement of critical parts.

4. OPERATIONS

Safe operations involving Dangerous Goods start with adherence to applicable Building Codes /Standards. In addition to construction, these will typically regulate the type, configuration, and height of storage (rack, solid-pile, bulk, bin box, etc.), based on factors such as fire protection, security requirements and the nature of the goods in storage. Matters such as acceptable floor loadings, elevation of goods, and type of handling equipment in use will also need to be taken into consideration.

Storage Rack systems need particular attention due to the potential for falling loads and transit accidents. They should be properly maintained with safeguards in place to prevent overloading. Cargo should be stowed in the racks and secured as required for ease of handling and to avoid cargo falling or tipping over.

It is critical that racks are adequately spaced, and aisles kept clear of obstructions to allow suitable room for cargo handling operations, especially with regard to collisions with forklifts or other cargo handling equipment.

Improper handling of cargo or poorly maintained or managed equipment can lead to a potentially major incident. Equipment should therefore be properly maintained, and all operators trained and certified for the specific piece(s) of equipment they operate. Refuelling or recharging stations should be sufficiently clear of cargo storage. Hazardous fuels, such as propane, should be stored according to applicable regulations.

Proper care and management of any pallets for unitization or cargo handling will also minimise the potential for an incident. Pallets should be routinely inspected and repaired or replaced when found in a damaged condition. Idle pallets should be stored flat with large accumulations minimised in storage areas. Any Building Code requirements relating to idle pallet storage such as location, configuration or maximum height should be adhered to.

Good housekeeping practices are essential. These may include:

- a good standard of cleanliness and housekeeping practices,
- effective and documented maintenance practices,
- ongoing prevention of visible pest contamination,
- clear aisles maintained for cargo handling and emergency access,
- clutter kept at a minimum.

Housekeeping “self-audits” carried out on a regular basis will help to maintain standards and indicate any issues before they get out of hand.

Where goods in storage present a risk of combustion or explosion (such as flammable material or dusts in certain conditions) it is essential that this is addressed in the risk assessment and management controls. Controls may include but are not limited to:

- competent design of storage and handling installations
- non-destructive handling
- cleaning
- cargo condition monitoring such as temperature monitoring and thermal imaging
- storage and stack management
- handling equipment design (e.g. intrinsically safe), operation and zoning
- control of ignition sources
- ventilation of explosive/flammable gasses
- dust suppression, enclosures and extraction.

Smoking constitutes a significant fire hazard, particularly when flammable or combustible goods are present. A smoking policy should be implemented and may include but is not limited to:

- displaying no smoking signs in prohibited areas
- providing designated smoking areas away from storage areas
- monitoring staff for compliance with the policy
- disciplinary action for non-compliance with warehouse smoking requirements

5. DANGEROUS GOODS STORAGE

Systematic documented arrangements are essential when storing Dangerous Goods regulated under one or more of the nine UN Dangerous Goods classes, including Dangerous Goods transported under special provisions. Multiple layers of interlocking controls are necessary to manage both the individual risk factors associated with specific classes of Dangerous Goods and the additional risks that could arise if incompatible Dangerous Goods are not segregated correctly.

Dangerous Goods acceptance should follow documented processes to ensure that packages, cargo transport units (CTUs) and required documentation are reviewed prior to being accepted for storage. Documented processes should be in place to ensure the warehouse complies with any Dangerous Goods storage restrictions or permitting requirements.

The effectiveness of chemical inhibitors, where used, may degrade over time, especially in elevated temperature environments. Therefore, it is imperative that shipments of reactive substances, stabilized with such inhibitors, are not delayed.

Personnel should be appointed, accountable, competent, and empowered to manage Dangerous Goods compliance. Appropriate training should also be provided for those involved in day-to-day operations.

Documented warehouse protocols should be in place to ensure Dangerous Goods are properly segregated from other Dangerous Goods/non-Dangerous Goods. Designated storage areas should be clearly/legibly identified to ensure proper segregation of incompatible materials.

An Inventory Statement and Management Plan should be developed for all Dangerous Goods stored at the warehouse. This should be updated on a routine basis and maintained at the warehouse.

Dangerous Goods packages and CTUs should be properly marked, labelled and placarded in accordance with appropriate national and international Dangerous Goods transport regulations. A process should be put into place to ensure that package and CTU marks, labels and placards, piece count and documentation requirements are consistent. There should also be processes to ensure that packaging is approved for the Dangerous Goods being offered, and that package integrity is systematically inspected. Up to date safety data sheets and appropriate guidance should be available to warehouse personnel.

Documented and regularly exercised plans and procedures to respond to events such as Dangerous Goods spills are also essential. This will include trained personnel, provision of means of containment, isolation, and clean-up and provision of means of protection for personnel responding to the emergency. Coordination, cooperation, and communication arrangements with emergency services and others should be developed and practiced.

6. FIRE AND EXPLOSION PREVENTION

Fire and explosion are two of the most significant risks associated with transport of Dangerous Goods. Past accidents have demonstrated that fire and explosions in ports, terminals and onboard vessels can give rise to mass fatalities. They can also lead to the loss of vessels, infrastructure, and cargo. An integrated, multi-layered risk management approach is essential. No single control method is sufficient on its own.

Managing fire and explosion risk with Dangerous Goods begins with programs and procedures. These should be based on risk assessments and updated periodically or when significant change occurs.

Procedures should take into account routine and non-routine (such as hot work) operations and include fire response arrangements including ability to deploy competent persons to fight a fire.

In the event of a fire, there should be means of manually alerting those in the affected area and at remote locations such as an emergency control centre. Suitable automatic detection systems (such as smoke or heat detection) should be installed and connected to a monitoring centre. Both manual and automatic systems require periodic testing and maintenance by competent persons.

Fire compartments/safe zones, correctly separated with fire rated walls and doors should be designed into the facility. Training and signage are necessary to ensure that those in the vicinity know where they are and how to use them. Automatic fire rated doors should be inspected on a regular basis and maintained by competent persons.

Risk assessment should be used to identify where and what type(s) of Automatic Sprinkler Systems, may be required. Where installed, they should be capable of providing a sufficient minimum flow rate and pressure (whether public or tank supply) and be adequately maintained, inspected, and tested on a periodic basis. Fire pumps (where installed) should be tested and run on a periodic basis, including flow rate and pressure checks. The system design should incorporate means of preventing accidental or deliberate disabling such as locking open water supply control valves or provision of valve tamper indicators. Competent assessment of the commodity types and storage configuration will be necessary to ensure that the hydraulic design parameters of systems are adequate for the goods in storage. Commodities and configuration should be reviewed periodically to ensure that they remain adequately protected. Systems located in an Earthquake Zone, will need to be fitted with seismic restraints and bracing.

Other fire protection arrangements may include, but are not limited to, appropriate proximity to an adequate supply of water (or other suitable firefighting medium) and an adequate number, type, and location of fire extinguishers (based on type of goods and configuration of storage).

Periodic competent inspection and maintenance of firefighting equipment such as extinguishers, standpipes, and hose stations, is a critical part of emergency response planning.

Means of firewater retention, based on risk assessment carried out by a competent person, may be required to minimize potential environmental hazards. Any system(s) implemented will need to be updated as a result of periodic review or significant changes to the site.

7. SECURITY

Cargo theft results in billions of dollars in losses each year, and according to a recent report³ theft from warehouses accounted for almost one quarter of all global cargo theft in 2020. In the majority of instances, warehouse theft is carried out by employees or others with “insider” knowledge or specific information about the goods in storage.

The highly hazardous nature of many Dangerous Goods also makes them a prime target for terrorists, disgruntled employees, or others. Dangerous Goods can be used to perpetrate harm at the warehouse or to inflict damage to high profile targets or critical infrastructure; potentially resulting in extensive casualties in densely populated areas.

The level of security at a specific warehouse cannot be determined on a “one size fits all” approach. Sophisticated alarm systems or security personnel can be costly and may or may not be necessary. Security should be based on risk assessments. Security risk assessments should take in to account the risks associated with the characteristics of the stored goods and the location of the warehouse and its facilities. They should be reviewed periodically and if there is significant change.

The level of perceived risk will depend on factors such as overall value, consumer demand, ease of sale on the black market, degree of danger represented by the goods (such as highly toxic commodities or explosives) and / or significant impacts created by the loss of goods. Warehouses located in areas of higher crime or civil unrest may also raise the risk of theft, tampering or loss.

Potential vulnerabilities associated with the warehouse should be evaluated as part of risk assessments to ensure an appropriate level of security. Physical areas to address include:

- external areas of the warehouse such as perimeter fencing,
- access gates
- shipping, handling, and receiving yard,
- employee parking,
- roof access,
- external doors, windows, and dock area

EXAMPLE: SECURITY



In the middle of a powerful storm that was pummeling the east coast, “organised” criminals perpetrated a theft involving tens of millions of dollars’ worth of pharmaceuticals from a “secure” warehouse in the US. The criminals specialised in cargo theft targeting facilities that stored cigarettes, consumer electronics and pharma.

Entry was gained into the warehouse through a hole cut in the roof, and the alarm system subsequently disabled. The thieves knew exactly how the subject alarm was set up, and to anyone monitoring the system, it looked as if the storm had knocked out the power. The truck used to load the stolen goods was parked in the only dock not covered by a security camera. Allegedly, the thieves were provided information on the security system by an insider allowing them to exploit weaknesses in the system.

...

³ BSI and TT Club Cargo Theft Report 2021

Specific processes should be implemented to maintain the integrity of cargo during handover and storage at the warehouse. This will include:

- a seven-point physical inspection⁴ on outbound CTU's,
- management, control and use of high security seals,
- a documented process to ensure goods shipped or received from the warehouse are validated at time of handover,
- a pre-alert system to corroborate documentation required to pick up a shipment, including truck driver ID and specific vehicle details,
- the practice of leaving pre-packed or staged CTU's in packed condition.

The type and level of sophistication, or even the need for security systems at the warehouse should be evaluated as part of the risk assessment process. If security systems are utilized, controls should be in place to ensure that the equipment is properly maintained and functional; the integrity of the systems are not compromised, and any alerts are responded to promptly and escalated as required.

Cyber-security is becoming an ever more present risk and measures should be taken to ensure the integrity of access systems, computer systems and associated monitoring and data processing.

Policy and procedures should be implemented and documented to allow quick response to security incidents, safeguard, and control sensitive information, maintain appropriate records, and ensure all employees are aware of security requirements and measures at the warehouse. Policies, processes, and procedures as well as physical security elements should be tested and verified on a regular basis to ensure that the level of security at the warehouse is appropriate and remains effective for the risks presented by the goods in storage.

8. EMERGENCY RESPONSE

If applicable requirements are complied with, the risk from Dangerous Goods will be mitigated.

If, however, they are handled or stored incorrectly or are allowed to come into contact with another substance or piece of equipment then they may react chemically or thermally. The consequences could be catastrophic.

Duty holders need to assess the risk of such an incident accordingly and ensure that they have developed, comprehensive, practiced, and documented procedures in place for emergency response to deal with such an eventuality.

It is also vital to ensure that others who might be involved in such an incident, for example tenants, fire and rescue services and local authorities, are also familiar with the emergency arrangements and equipment available.

...

This incident, along with many similar examples, shows the importance of developing a robust, documented security program that is audited and tested on a regular basis to ensure that it is adequate for the location of the warehouse and the type of goods in storage.

⁴Details of a "7-point" inspection can be found at [cbp.gov](https://www.cbp.gov) and in the checklist

The Emergency Response Plan should consider the hazard, nature, and extent of possible emergencies. This includes the consequences and possible effects on people and the environment, taking into account the activities and circumstances of the surrounding area, such as adjacent urban and residential areas. It will feature provisions for escape and rescue of affected personnel. An effective warehouse emergency plan will complement the Port or Local Authority plan and ensure effective liaison with the Authorities. It will consider escalation of the incident due to deteriorating conditions such as weather and cumulative effects.

Practicing the plan with third-party services, response teams and the Incident Controller is essential to its effectiveness if it ever has to be used in a real incident. Any emergency plan should be adapted and kept under review to respond to changing circumstances, new facilities, new cargoes, and equipment, as well as changes to the surrounding infrastructure and activities. Emergency Response Personnel should be appointed and competent to play their designated roles in response to an emergency, especially the Incident Controller. Relevant authorities and third-party services will need to be informed about the roles in the warehouse organisation and provided with contact numbers. An Emergency Control Center should be established. An adequate number of employees will need to be trained in first-aid techniques; with sufficient first aid materiel easily accessible to warehouse employees. A Dangerous Goods Inventory Statement, updated on a periodic basis, should be provided to relevant emergency services. Safety data sheets should be readily available to emergency services and other relevant third parties for all Dangerous Goods managed at the warehouse.

C / CONCLUSION

The temporary or long-term storage of Dangerous Goods in a facility, represents an ongoing threat to life, the environment and property. While the major disasters in Beirut and Tianjin have been widely reported there are many other incidents around the globe that do not garner the same attention because they are smaller in nature and contained. Examples have been included in this guidance. However, under the right circumstances there is the potential for smaller incidents to escalate into another major disaster.

There are existing international regulations for Dangerous Goods in transit for various modes of transportation (rail, air, road, inland waterways and by sea), but there is no equivalent for port terminals and warehouses. Many governments have created their own regulations, some of which cross national boundaries, such as the European Union's COMAH directive and associated guidance which is applicable in 30 EU and EEA member states and the UK. Some provide a great amount of detail that includes a combination of regional, national and/or local regulations, while others have only touched lightly on the topic.

This white paper therefore is intended to offer practical guidance for systematic and documentable processes and advice to those responsible for the storage and consolidation of Dangerous Goods to ensure that such storage is not only safe, but also that Dangerous Goods are containable if an incident arises.

The Guidance incorporates a **checklist** that contains the key elements that should be considered. Using this checklist will help make these facilities safer. It will also assist duty holders be better prepared to react effectively if an incident occurs, limiting the potential for another major disaster involving stored Dangerous Goods.

D / WAREHOUSE CHECKLIST

SECTION: 1	GENERAL	YES	NO	N/A
1.1	Certifications			
1.1.1	Does the warehouse ¹ hold certifications demonstrating compliance with relevant industry / government standards ² ?			
1.2	Investigation Program			
1.2.1	Has the warehouse implemented a comprehensive investigation program for accidents, losses, or near-misses?			
1.3	Business Continuity			
1.3.1	Does the warehouse have a business continuity plan in place to keep operations going in case of fire, flood, loss of power, loss of communication, etc.?			

GUIDANCE NOTES:

¹The term warehouse in this document may apply to operators or facilities including warehouses, waterfront facilities at ports or terminals, distribution centers, fulfillment houses, etc. where goods may be stored before their export, in the due course of transit, or before distribution for sale.

²Examples of relevant industry or government standards may include US Customs and Border Protection Customs Trade Partnership Against Terrorism (CTPAT) security program, International Organization for Standardization 9001 Quality Management Standard, Transported Assets Protection Association (TAPA) Facility Security Requirements Standard (for high value theft targeted goods), etc. as applicable.

SECTION: 2	WORKFORCE	YES	NO	N/A
2.1	Screening¹			
2.1.1	Are written procedures in place for screening prospective employees ² and to periodically check current employees ² ?			
2.1.2	Do screening procedures include verification of application information such as identity, past employment, references, and criminal history?			
2.1.3	Do screening procedures extend to temporary workforce and contractors ² ?			
2.2	Formal Induction			
2.2.1	Do new warehouse employees have a formal induction when joining?			
2.3	Identification			
2.3.1	Do warehouse employees wear uniforms?			
2.3.2	Are warehouse employees required to display company ID badges?			

2.4	Termination or Re-hiring Process			
2.4.1	Is the termination or re-hiring process for warehouse employees or contractors documented (including a checklist)?			
2.4.2	Does this process include collection of physical assets ³ ?			
2.4.3	Does this process include termination of access to physical or electronic company systems?			
2.5	Training			
2.5.1	Do warehouse employees and contractors receive relevant awareness and function specific training as appropriate?			
2.5.2	Is required training documented and records maintained?			
GUIDANCE NOTES: ¹ Screening should be conducted in accordance with applicable legal limitations, and the availability of city, state, provincial, and country criminal record databases and other relevant information. ² Degree of screening should be based on the nature and sensitivity of the employee's position or contractor's function. ³ Physical assets may include items such as access badges, keys, computers, etc.				

SECTION: 3	CONSTRUCTION	YES	NO	N/A
3.1	Building Code Requirements¹			
3.1.1	Does construction of the warehouse meet applicable building code requirements?			
3.2	Utilities and Appliances			
3.2.1	Are warehouse utilities including systems and associated wiring and piping protected from physical damage?			
3.2.2	Is sufficient clearance maintained between heat-producing appliances in the warehouse and any stored flammable or combustible materials or cargo?			
3.3	Internal Lighting and Ventilation			
3.3.1	Is warehouse internal lighting satisfactory for working conditions?			
3.3.2	Is warehouse ventilation / exhaust capability adequate for operations and / or emergencies?			
3.4	Emergency Power			
3.4.1	Is the warehouse fitted with a back-up generator or other source of emergency power?			

3.5	Facility Maintenance			
3.5.1	Is a preventative maintenance program established for the warehouse?			
3.5.2	Are maintenance and repair records maintained?			

GUIDANCE NOTES:

¹Depending on applicable jurisdiction, the warehouse will need to conform to specific building code requirements. These may be in the form of national building codes and / or model building codes adopted by local authorities. Building codes generally include specific standards for building structure, occupancy, fire prevention, earthquake, windstorm, flood and tsunami resistance, energy provisions and consumption, etc.

SECTION: 4	OPERATIONS	YES	NO	N/A
4.1	Applicable Code Requirements			
4.1.1	Does storage of goods in the warehouse meet applicable building code requirements ¹ ?			
4.2	Rack Systems			
4.2.1	Is storage on rack systems maintained within rated load capacity?			
4.2.2	Is rated load capacity clearly marked on racks?			
4.2.3	Are periodic inspections of rack systems carried out?			
4.2.4	Are rack systems protected from allisions with forklifts or other vehicles ² ?			
4.2.5	Is adequate width of aisles between racks maintained?			
4.2.6	Are aisles between racks kept clear of obstructions?			
4.3	Cargo Securing			
4.3.1	Are stored goods adequately secured against falling, tipping over, etc.?			
4.4	Cargo Handling Equipment			
4.4.1	Is there a minimum clearance of 2m between re-charging or fueling area and stored goods?			
4.4.2	If propane is utilized, is it properly stored outdoors?			
4.4.3	Is a preventative maintenance program in place for cargo handling equipment?			
4.4.4	Is maintenance and repair of cargo handling equipment documented?			
4.4.5	Are equipment operators trained and certified?			

4.5	Idle Pallet Storage			
4.5.1	Does idle pallet storage location, configuration and maximum height conform with applicable code requirements including sprinkler protection?			
4.5.2	Are idle pallets stored flat (not on edge)?			
4.5.3	If allowed to be stored on racks, are idle pallets stored on highest level above other goods in storage?			
4.5.4	Are regular checks carried out for damaged pallets?			
4.5.5	Are accumulations of pallets and other combustible materials minimized in storage areas?			
4.6	Housekeeping Practices			
4.6.1	Are good housekeeping practices maintained ³ ?			
4.6.2	Are housekeeping self-audits carried out on a regular basis?			
4.7	Smoking Requirements			
4.7.1	Are “No-Smoking” signs posted in prohibited areas?			
4.7.2	Are dedicated smoking areas established?			
4.7.3	Is there disciplinary action for non-compliance with smoking requirements?			

GUIDANCE NOTES:

¹Building code requirements as they relate to storage may include types of storage allowed (rack, solid-pile, bulk, bin box, etc.), height of storage allowed, applicable floor loadings, minimum distance maintained from ceiling / roof structure, storage configuration (including idle pallets), proper elevation of floor stored goods to avoid water damage, etc.

²This may be achieved through use of end caps, bollards, posts, etc.

³ Good housekeeping practices may include a high level of cleanliness and maintenance of the warehouse, prevention of visible pest contamination, clear aisles between racks, minimum clutter, etc.

SECTION 5	DA	YES	NO	N/A
5.1	Dangerous Goods Acceptance			
5.1.1	Does the warehouse store Dangerous Goods that are regulated under one or more of the nine UN Dangerous Goods classes ¹ including Dangerous Goods transported under special provisions?			
5.1.2	Are Dangerous Goods packages and / or cargo transport units (CTU) ² , and their required documentation reviewed prior to accepting for storage?			

5.2	Storage Restrictions and Permitting Requirements			
5.2.1	Is there a documented process to ensure the warehouse complies with any Dangerous Goods storage restrictions or permitting requirements ³ ?			
5.3	Personnel			
5.3.1	Is there a designated person accountable for Dangerous Goods compliance and safety?			
5.3.2	Is Dangerous Goods training ⁴ provided to warehouse employees?			
5.4	Segregation of Incompatible Goods			
5.4.1	Does the warehouse have documented protocols to ensure Dangerous Goods are properly segregated/separated from other Dangerous Goods/non-Dangerous Goods as appropriate?			
5.4.2	Does the warehouse have designated storage areas for Dangerous Goods to ensure proper segregation from incompatible materials?			
5.4.3	Are designated storage areas clearly identifiable with adequate, legible signposting?			
5.5	Inventory Statement and Management Plan			
5.5.1	Has an inventory statement ⁵ been developed for all Dangerous Goods stored at the warehouse?			
5.5.2	Is the inventory statement updated on an on-going basis ⁶ and maintained at the warehouse?			
5.5.3	Does the warehouse have a Dangerous Goods management plan ⁷ ?			
5.5.4	Is the Dangerous Goods management plan updated on an on-going basis and maintained at the warehouse?			
5.6	Marks, Labels and Placards			
5.6.1	Are all Dangerous Goods packages and / or CTUs properly marked, labeled and / or placarded in accordance with the appropriate national and international Dangerous Goods transport regulations?			
5.6.2	Is there a documented process to ensure that required Dangerous Goods package and / or CTU marks, labels and / or placards, as well as piece count are consistent with Dangerous Goods documentation requirements?			

5.7	Packaging			
5.7.1	Is there a documented process to ensure that the packaging is approved for the Dangerous Goods offered?			
5.7.2	Does the warehouse have an inspection program for the integrity of all packages holding Dangerous Goods?			
5.8	Emergency Response Procedures			
5.8.1	In the event a package and / or CTU is leaking is there a documented spill procedure, readily accessible Personal Protection Equipment, and appropriate equipment in place to properly isolate the package and / or CTU and contain the contents?			
5.8.2	Are up to date safety data sheets ⁸ , appropriate guidebooks ⁹ and emergency response procedures, as applicable, readily available to warehouse employees for all Dangerous Goods managed at the warehouse?			

GUIDANCE NOTES:

¹United Nations Model Regulations commonly known as the “Orange Book” and as amplified in the International Maritime Dangerous Goods (IMDG) Code.

²Dangerous goods packages may include non-bulk or bulk packaging such as drums, barrels, boxes, bags, pressure receptacles, or intermediate bulk container. CTU's may include road transport tank or freight vehicle, a railway transport tank or freight wagon, a multimodal freight container or portable tank, multiple element gas containers (MEGC).

³Based on international or national regulation, local ordinance, relevant fire protection standards and / or lease agreement as applicable

⁴Training should include internal procedures and processes applicable to Dangerous Goods handling specific to the employee's job functions.

⁵A Dangerous Goods inventory statement should be developed for each building or compartment where Dangerous Goods are stored. This statement should include the hazard class, common or trade name, chemical name, Chemical Abstracts Service (CAS) number, composition (pure or mixture / solid, liquid or gas), maximum aggregate quantity stored, and required storage conditions for each dangerous good listed.

⁶Relevant inventories, plans and procedures should be updated on an on-going basis. An “on-going” basis could be defined as what is required to keep the subject material relevant and up to date at all times. It may also be based on specific requirements imposed by the authority having jurisdiction. For example, where adopted, the NFPA 400 Hazardous Materials Code requires an amended Dangerous Goods Inventory Statement (or HMIS) to “be provided within 30 days of the storage of any hazardous materials that changes or adds a hazard class or that is sufficient in quantity which exceeds 5 percent for any hazard class”.

⁷A Dangerous Goods management plan should include relevant general information concerning operations at the warehouse, a general site plan, a building floor plan which shows designated Dangerous Goods storage areas within the warehouse, segregation, and compatibility controls, monitoring program, inspection and record keeping, employee training, and emergency response procedures.

⁸Safety data sheets are a component of the Global Harmonized System (GHS) of Classification and Labeling of Chemicals. They should be produced when chemical substances and mixtures meet the harmonized criteria for physical, health or environmental hazards under the GHS.

⁹Appropriate guidebooks may include the “Emergency Response Guidebook: A Guidebook for First Responders During the Initial Phase of a Dangerous Goods / hazardous materials Transportation Incident (ERG)”, “Dangerous Goods–Initial Emergency response Guide”, “Emergency Response Intervention Cards (ERIC)”, etc.

SECTION 6	FIRE PROTECTION	YES	NO	N/A
6.1	Programs and Procedures			
6.1.1	Are fire protection risk assessments ¹ carried out for the warehouse and updated on an on-going basis?			
6.1.2	Is there a documented fire protection impairment program ² established for the warehouse?			

6.1.3	Is there an established employee fire brigade at the warehouse?			
6.1.4	Is fire extinguisher training provided for all employees at the warehouse?			
6.1.5	Are there written hot work procedures in place for the warehouse?			
6.2	Sensors and Alarms			
6.2.1	Are manual pull fire alarms installed at the warehouse?			
6.2.2	Do manual pull fire alarms connect to an offsite central monitoring station?			
6.2.3	Are smoke / fire detection sensors installed at the warehouse?			
6.2.4	Do smoke / fire detection sensors connect to an offsite central monitoring station?			
6.2.5	Are alarms and related equipment inspected on a regular basis and maintained by a qualified third party?			
6.3	Fire Compartments			
6.3.1	Are designated fire compartments properly separated with fire rated walls?			
6.3.2	Are openings between fire compartments fitted with fire rated doors?			
6.3.3	Are automatic fire rated doors inspected on a regular basis and maintained by a qualified third party?			
6.4	Automatic Sprinkler Systems			
6.4.1	If public water supply, is minimum flow rate and pressure maintained?			
6.4.2	If public water supply, is flow rate and pressure checked on a periodic basis?			
6.4.3	If on-site tank water supply, is adequate quantity of water maintained?			
6.4.4	If on-site tank water supply, is tank inspected on a periodic basis?			
6.4.5	If fire pump installed, is the pump tested and run on a periodic basis?			
6.4.6	If fire pump installed, is the flow rate and pressure checked on a periodic basis?			
6.4.7	Are water supply control valves locked open or provided with valve tamper indicators?			

6.4.8	Are hydraulic design parameters of the system adequate for the goods in storage ³ ?			
6.4.9	Is storage of goods (commodity types, configuration, etc.) reviewed on a regular basis to ensure conformity with the hydraulic design parameters of the system?			
6.4.10	Is the automatic sprinkler system adequately maintained?			
6.4.11	Is the automatic sprinkler system periodically inspected and tested?			
6.4.12	Are all areas of the warehouse (where goods are stored) adequately protected by the sprinkler system?			
6.4.13	If located in an Earthquake Zone, is system fitted with seismic restraints and bracing?			
6.4.14	Is the sprinkler system linked to an alarm system monitored by a central alarm station 24/7?			
6.4.15	Is the alarm system tested on a periodic basis?			
6.5	Other Fire Protection Equipment			
6.5.1	Is the facility located within close proximity to an adequate number of fire hydrants (or other adequate source of water)?			
6.5.2	Are number, type and location of fire extinguishers adequate for the warehouse (based on type of goods and configuration of storage)?			
6.5.3	Are fire extinguishers inspected on a periodic basis?			
6.5.4	If the warehouse is fitted with standpipes and / or hose stations, are they adequately maintained?			
6.6	Firewater Retention			
6.6.1	Has a risk assessment ⁴ been carried out to determine if the warehouse requires a firewater retention facility and / or risk management plan?			
6.6.2	If required, has a risk management plan for retention and control of firewater been implemented?			
6.6.3	Is the firewater risk assessment and / or risk management plan reviewed and updated as applicable in the event of significant site changes ⁵ ?			

GUIDANCE NOTES:

¹ Risk Assessments referred to here would include those carried out by the warehouse to ensure fire protection is adequate for the goods in storage. Other risk assessments may be carried out by the local fire department or for insurance purposes.

² A fire protection impairment program is used to supervise the safe shutdown of fire protection systems, control potential fire hazards during impairments and restore the fire protection system to service as soon as possible.

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³ This can be determined by reviewing Hydraulic design information found on the hydraulic data plate for each system installed. These plates are attached in various locations on the system and include information such as location of the design area(s), discharge densities over the design area(s), required flow and residual pressure demand at the base of the riser, occupancy and commodity classifications, maximum permitted storage height and configuration, sprinkler demand, etc.

⁴ Firewater risk assessments should evaluate the risk of firewater run-off to the environment based on the significance of a fire event and the quantities of firewater, and subsequent run-off that may be generated, leading to a potential environmental hazard.

⁵ Significant site changes may include relevant changes in inventory, drainage or containment systems, fire compartments or risk assessment areas.

SECTION 7	SECURITY ¹	YES	NO	N/A
7.1	Perimeter / Warehouse Exterior			
7.1.1	Is cargo handling, shipping, and receiving yard adequately illuminated (particularly in loading and unloading areas)?			
7.1.2	Is cargo handling, shipping, and receiving yard adequately controlled ² to prevent unauthorized access?			
7.1.3	Are external dock areas including doors fully illuminated?			
7.1.4	Are external dock areas including doors covered via CCTV ³ cameras that can view all operations and movement at all times?			
7.1.5	Is personal parking restricted to designated areas ⁴ ?			
7.1.6	Are exterior walls and roof designed and maintained to resist penetration?			
7.1.7	Is external access to roof physically locked?			
7.1.8	Are all warehouse external doors alarmed to detect unauthorized opening and linked to main alarm system?			
7.1.9	Are dock doors constructed of sufficient strength to deter and / or delay forced entry with small hand tools?			
7.1.10	Are warehouse pedestrian doors constructed to resist penetration?			
7.2	Warehouse Access Control			
7.2.1	Is access at visitor entry points controlled by an employee, guard or receptionist ⁵ ?			
7.2.2	Is there a process in place to receive visitors outside of operational hours?			
7.2.3	Are visitors required to show a government issued photo ID?			
7.2.4	Are visitors registered when they check in?			
7.2.5	Is a visitor log maintained ⁶ ?			

7.2.6	Is workforce entry point(s) access controlled 24 hours per day / 7 days per week?			
7.2.7	Is access to internal dock / warehouse areas or sections restricted to authorized workforce and escorted visitors based on business need?			
7.2.8	Are all drivers identified using government issued ID?			
7.2.9	Is a driver log maintained?			
7.2.10	Are all internal dock areas including doors covered by CCTV?			
7.2.11	Are views of freight being loaded / unloaded clear at all times?			
7.3	Cargo Integrity			
7.3.1	Are CTUs pre-loaded or staged in loaded condition at the warehouse dock or in the storage yard during non-operational hours ⁷ ?			
7.3.2	Is a seven-point physical inspection ⁸ performed on all outbound dedicated CTUs?			
7.3.3	Is the seven-point inspection process documented?			
7.3.4	Are seals that meet or exceed the most current ISO 17712 standard for high security seals ⁹ utilized for all applicable shipments?			
7.3.5	Are there documented procedures in place for management and control of seals, CTU door locks, and other security equipment?			
7.3.6	Are seals affixed or removed by authorized personnel only?			
7.3.7	Are procedures in place to ensure cargos shipped and received are validated at point of handover by conducting a manual and / or electric piece count?			
7.3.8	Is the handover / validation process documented?			
7.3.9	Are abnormalities found during the handover / validation process consistently recognized, documented, and reported?			
7.3.10	Are truck driver ID, cargo pick-up documentation or other specified pre-alert details ¹⁰ validated prior to loading?			
7.4	Security Systems¹¹			
7.4.1	Are all intruder alarm systems activated during non-operational hours and linked to the main alarm system?			
7.4.2	Are alarm events monitored 24 hours per day / 7 days per week / 365 days per year via an internal or 3rd party external monitoring post?			
7.4.3	Is the monitoring post protected from unauthorized access ¹² ?			

7.4.4	Are all security system alarms responded to in real-time 24 hours per day / 7 days per week / 365 days per year?			
7.4.5	Are alarms acknowledged by monitoring post and escalated promptly ¹³ ?			
7.4.6	Is there a documented procedure to ensure alarm system access (including servers, consoles, panels, networks, and data) is restricted to authorized individuals or system administrators?			
7.4.7	Are access privileges promptly updated when individuals depart the organization, change roles, or no longer require access?			
7.4.8	Does the alarm system transmit an alert on power failure or loss?			
7.4.9	Is access tightly controlled to CCTV system (including hardware, software, and data / video storage)?			
7.4.10	Is CCTV system ¹⁴ only viewed by authorized personnel?			
7.4.11	Does the warehouse have documented maintenance programs in place for all physical security installations / systems to ensure functionality at all times?			
7.4.12	Is security system functionality verified on a regular basis?			
7.5	Policy and Procedures			
7.5.1	Does the warehouse maintain an emergency contact list for security incidents?			
7.5.2	Is the emergency contact list updated regularly?			
7.5.3	Does the warehouse have a formally appointed person responsible for security on site?			
7.5.4	Does the warehouse maintain (and communicate) a documented security policy, including cybersecurity, that ensures all relevant persons (i.e., employees and contractors) are clearly aware of security expectations?			
7.5.5	Does the warehouse conduct vulnerability risk assessments that are documented and recognize the likelihood and impact of security related events ¹⁵ ?			
7.5.6	Is access to shipping documents and commercially sensitive information on stored goods controlled ¹⁶ ?			
7.5.7	Are documents safeguarded until destruction according to applicable regulation or customer requirement?			
7.5.8	Does the warehouse maintain records of all collections and proof of deliveries ¹⁷ ?			

7.5.9	Is there a documented procedure, log and / or key plan to track how keys are managed and controlled?			
7.6	Information Technology (IT)			
7.6.1	Has there been a screening conducted for (new) employees by HR?			
7.6.2	Has the warehouse installed appropriate software and hardware protection for its computer systems to protect against common cybersecurity threats such as malware or internal or external intrusions?			
7.6.3	Are measures in place to prevent unauthorized physical access, damage and interference to the organization's information and information processing facilities?			
7.6.4	Does the warehouse have a system in place to identify unauthorized access of IT systems or data or abuse of policies and procedures?			
7.6.5	Is employee or other authorized user access to IT systems restricted based on job description or assigned duties?			
7.6.6	Is user access to IT systems safeguarded against infiltration ¹⁸ ?			
7.6.7	Do all devices, including personal devices used for work purposes, adhere to warehouse cybersecurity policies and procedures including regular updates and means of secure access to warehouse IT systems?			
7.6.8	Does the warehouse employ measures to prevent the use of counterfeit or improperly licensed IT products?			
7.6.9	Is warehouse data backed up on a regular basis as appropriate?			
7.6.10	Is all sensitive and confidential data stored in an encrypted format?			
7.6.11	Does the warehouse account for IT equipment or media that contains sensitive information through regular inventories?			

GUIDANCE NOTES:

¹ The level of security should be based on on-going risk assessments considering the goods in storage and location of the warehouse. Level of risk will depend on parameters such as over-all value, consumer demand, ease of sale on black market, degree of danger represented by the goods (such as highly toxic commodities) and / or significant impacts created by the loss of the goods. Location of the warehouse also plays a role as those facilities located in higher crime areas or areas of civil unrest may elevate the risk of theft, tampering or loss. The recommendations included in this checklist should be considered as a minimum for warehouse storage.

² Controls to prevent unauthorized access may include: a physical barrier enclosing the yard area; gates that are manned or electronically controlled; visible perimeter signs indicating no unauthorized access or parking; visible signs on external doors or walls instructing drivers, visitors, etc. to proceed to appropriate entry location; or periodic sweeps or patrols by CCTV, guards, or responsible member of workforce.

³ CCTV systems with color or day / night capability are recommended.

⁴ It is recommended that designated parking areas be at least 25m walking distance from dock areas.

⁵ Persons controlling visitor access points should be trained on entry / exit procedures including required information, badge issuance, escort requirements, etc. as applicable.

⁶ It is recommended that visitor logs be maintained for at least 30 days.

⁷ This practice is not recommended.

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⁸ A seven-point physical inspection includes inspection of the CTU undercarriage, right and left sides, front wall, ceiling / roof, inside / outside doors and floor and any locking mechanism as applicable.

⁹ Qualifying cable and bolt seals are acceptable.

¹⁰ Pre-alert details are provided prior to pick-up and validated at time of pick-up. Details may include driver name, carrier name, truck license tag number, time of pick-up, order number, etc.

¹¹ Security systems may include lighting, CCTV, access control and / or intruder detection systems as applicable based on the level of risk presented by the goods in storage and location of the warehouse.

¹² Unauthorized access may be controlled by means of an electronic access control system, physical locks, biometric scanners, etc.

¹³ To ensure timely response to potential intruders, it is recommended that any alarm activations are escalated in less than 3 minutes.

¹⁴ It is recommended that CCTV systems include digital recording capability with recordings stored for a minimum of 30 days where allowed by local law.

¹⁵ It is recommended that security vulnerability risk assessments be conducted at least annually (or more frequently as risk factors dictate or in the event of a security breach). These assessments should include the testing of IT infrastructure security.

¹⁶ Access to shipping documents and commercially sensitive information should be controlled on a “need to know” basis with all access monitored and recorded.

¹⁷ It is recommended that applicable records be maintained for a period of not less than two years to ensure their availability for investigations as required.

¹⁸ Access may be protected through the use of strong passwords, passphrases or other forms of authentication that are changed on a regular basis or as soon as possible in the event of system compromise.

SECTION 8	EMERGENCY RESPONSE	YES	NO	N/A
8.1	Emergency Response Plan			
8.1.1	Is there an emergency response plan for the warehouse?			
8.1.2	Does the plan consider fully the hazard and nature and extent of the possible emergency ¹ ?			
8.1.3	Does the plan consider the consequences and the possible effect on people and the environment?			
8.1.4	Does the plan include provisions for escape and / or rescue of affected warehouse personnel ² ?			
8.1.5	Does the plan consider all the activities, urbanization etc. that are adjacent to the facility?			
8.1.6	Does the plan complement the plan that the Port or Local Authority have developed and is there effective liaison with the Authorities in place and ongoing?			
8.1.7	Does the Plan consider escalation of the incident due to deteriorating conditions (including weather) and/or through cumulative effects?			
8.1.8	Has the Plan been tested, and practice drills carried out with the third-party services and response teams (especially the Incident Controller ³)?			
8.1.9	Has the Plan been adapted and kept under review to respond to changing circumstances, new facilities, new cargoes and equipment, changes to the surrounding infrastructure and activities?			

8.2	Emergency Response Personnel			
8.2.1	Are there selected and trained essential personnel who will have a role to play in emergency response, especially the Incident Controller?			
8.2.2	Have all the relevant authorities and third-party services been informed about the roles in the warehouse organization including contact numbers?			
8.2.3	Has an Emergency Control Center ⁴ been established?			
8.3	Emergency Response Information			
8.3.1	Has a Dangerous Goods Inventory Statement been developed for the warehouse?			
8.3.2	Is the Dangerous Goods Inventory Statement updated on a periodic basis and provided to the local fire department?			
8.3.3	Are up to date emergency response procedures, including safety data sheets where provided, readily available to local fire department and other relevant third parties for all Dangerous Goods managed at the warehouse?			
8.4	First Aid			
8.4.1	Has an adequate number of employees been trained in first-aid techniques?			
8.4.2	Are the means for first-aid ⁵ available to warehouse employees in adequate numbers?			
8.4.3	Are the means for first aid easily accessible in the warehouse?			

GUIDANCE NOTES:

¹ Examples where an emergency response plan may be required include explosion, fire, loss of power, severe weather, active shooter, riot, strike, etc.

² This would include the development of escape and emergency routes; and ensuring these routes (and exits) are freely accessible with appropriate signage, not blocked, obstructed by parking or locked.

³ The incident controller is responsible for overall management of an incident. This will include coordination of emergency response resources, staff, and third-party services.

⁴ An emergency control center can be an installation or activity from which a series of operations related to emergency response is directed.

⁵ The means for first aid will vary according to the activity carried out at a particular warehouse. Some examples of items that may be included are information pertaining to relevant first aid treatments, sterile dressings of various sizes and shapes, bandages, safety pins, adhesive dressings, sterile wipes, gloves, face shields, foil blankets, burn dressings, clothing shears, antiseptic creams, scissors, tweezers, automatic external defibrillators (AED), etc.

E / APPENDICES

1. GLOSSARY OF TERMS

3rd Party Warehouse	Warehousing and inventory management functions, including shipping and receiving and possibly consolidation, are outsourced to a third party.
Bin Box	Five-sided wood, metal, or cardboard box with open face on the aisles in which boxes may be self-supported or part of a rack system. Generally used for organization, sorting, and storage of smaller items.
Bollards	Safety devices that act as a barrier to protect warehouse rack systems and other equipment from damage caused by forklifts and other cargo handling equipment.
Bulk	Unpackaged commodities carried in the holds, hoppers or tanks of cargo vessels, trucks and railcars and generally transferred by such means of conveyors, clamshells, and pipeline.
Cargo Transport Unit (CTU)	Means a road transport tank or freight vehicle, a railway transport tank or freight wagon, a multimodal freight container or portable tank, or and MEGC.
Code	<p>A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.</p> <p><i>Synonym(s): National regulation, Local ordinance, Industry guidelines or best practices, international requirements, or guidelines</i></p>
Consolidator	Is an individual or firm who accepts less than container load (LCL) shipments from individual shippers, and then combines them for delivery to the carrier in full container load (FCL) shipment. OR The party performing a consolidation service for others.
Country Specific	Used to describe a code, requirement, or process that is designed and implemented by a particular country, rather than adopted across many countries.
Container Freight Station (CFS)	A facility at which (export) small cargo lots are received from Shippers for loading (stuffing) into containers or at which small cargo lots (import) are unloaded (stripped) from containers and delivered to Consignees.
Dangerous Goods	<p>Materials, substances, and articles that meet the defining criteria of one or more of the nine UN hazard Classes and/or which are harmful to the marine environment (marine pollutants). NOTE: Local regulations may regulate other substances or articles as Dangerous Goods/hazmat beyond the UN classification.</p> <p><i>Synonym(s): Hazardous Materials</i></p>

Freight Container	An article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use; specifically designed to facilitate the transport of goods, by one or more modes of transport, without intermediate reloading, designed to be secured and/or readily handles, having fittings for these purposes, and approved in accordance with the International Convention for Safe Containers (CSC), 1972, as amended. In addition: small freight container means a freight container that has an internal volume of not more than 3m ³ . Large freight container means a freight container that has an internal volume of more than 3m ³ .
Full Container Load (FCL)	A container stuffed or stripped under risk and for account of the Shipper and/or the Consignee.
Hangar	A device or assembly used to support the gravity load of the system piping.
Idle Pallet	A pallet that is not in use.
Less than Container Load (LCL)	A general reference for cargo in any quantity intended for container carriage, where the amount of cargo is not enough to warrant an FCL. An LCL container usually consists of multiple consignments. Also called CFS cargo.
Pallet	A material-handling aid designed to support a unit load with openings to provide access for material-handling devices. Pallets are generally constructed of plastic or wood.
Port	General area of a shore establishment having facilities for the landing, loading/unloading, and maintenance of vessels; harbor with piers. <i>Synonym(s): Intermodal ports, Dry ports, Inland ports</i>
Monitoring Post	Station for monitoring security and / or fire protection systems. May be internal or external to the warehouse.
Qualified Person	A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems related to the subject matter, the work, or the project.
Rack	Any combination of vertical, horizontal, and diagonal members that supports stored materials.
Solid Pile Storage	Storage of commodities stacked on each other.
Transit Shed	A transload facility for cargoes usually located on a pier or wharf and primarily used for transfer of breakbulk-type cargo.
Warehouse	A building used for short and long-term storage and consolidation of commodities in contrast to temporary storage in container freight stations and transit sheds.

2. REFERENCE SOURCES AND FURTHER READING

All regulations and standards were current at the time of publication and the links provided alongside each reference were verified. Links may change overtime at the discretion of the applicable organization. Regulations and standards are subject to periodic updates. Always make sure the most current regulation or standard is being utilized.

Ammonium Nitrate Behind Beirut Explosion – Blessing and Curse, Datalators, (2021)
https://www.datalators.com/ammonium_nitrate-beirut-explosion/

Ammonium Nitrate Disaster Timeline, RPMASA, (2020)
https://cdn.ymaws.com/www.saioh.co.za/resource/resmgr/docs/2020/ammonium_nitrate_distasters_.pdf

BSI & TT Club Cargo Theft Report 2021, BSI and TT Club, (2021), BSI & TT Club Cargo Theft Report

Chemical Warehousing: The Storage of Packaged Dangerous Substances, Health and Safety Executive, (2009)
<https://www.hse.gov.uk/pubnS/priced/hsg71.pdf>

Chemical fire in Lake Charles after Hurricane Laura's landfall prompts shelter-in-place order, Nola, (2020)
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F / ABOUT THE AUTHORS OF THIS WHITE PAPER



ICHCA -International Cargo Handling Coordination Association. Established in 1952, ICHCA International is an independent, not-for-profit organisation dedicated to improving the safety, productivity and efficiency of cargo handling and movement worldwide. ICHCA's privileged NGO status enables it to represent its members, and the cargo handling industry at large, in front of national and international agencies and regulatory bodies, while its Technical Panel provides best practice advice and develops publications on a wide range of practical cargo handling issues.

Operating through a series of national and regional chapters, including ICHCA Australia, ICHCA Japan and Correspondence and Working Groups, ICHCA provides a focal point for informing, educating, lobbying and networking to improve knowledge and best practice across the cargo handling chain.

Contributors: Richard Steele and Richard Brough



The International Vessel Operators Dangerous Goods Association (IVODGA) is an international organization comprised of representatives of the ocean common carriers of the world, operating under the flags of several nations, dedicated to improving the understanding and uniform application of rules and regulations governing maritime Hazardous Materials / Dangerous Goods Transportation, including the IMDG Code. Collectively, IVODGA members are responsible for the safe transportation of over 75% of the ocean borne container traffic internationally. IVODGA's mission is to foster the safe handling of dangerous goods, and to offer the expertise of the ocean carriers in forging regulatory development.

Contributors: Adria Mead, Uffe V Ernst-Frederiksen, and Ken Rohlmann



NCB Group, comprising New York based National Cargo Bureau and subsidiary, Exis Technologies, based in the UK, provides comprehensive support to the industry for the safe transport of dangerous goods through various services which include marine surveying, loss prevention, digital tools, and training. Together their not-for-profit mission is the Safety of Life and Cargo at Sea.

Contributors: Scott Brown, Bob Ahlborn, Eric Rounds, and Ian Lennard



World Shipping Council (WSC) is the united voice of liner shipping, established in 2000 as a non-profit trade association with offices in Washington, Brussels, Singapore. WSC's purpose is to shape the future growth of a socially responsible, environmentally sustainable, safe, and secure shipping industry. WSC's 19 members operate 90% of the world's liner vessel services and transport more than USD 4 trillion worth of goods annually.

Contributor: Lars Kjaer

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ICHCA

E: secretariat@ichca.com

W: www.ichca.com

IVODGA

T: 1-518-761-0263

E: mail@ivodga.com

W: www.ivodga.com

 www.linkedin.com/company/the-international-vessel-operators-dangerous-goods-association-ivodga

NCB

E: ncbnyc@natcargo.org

W: www.natcargo.org

WSC

 Anna Larsson, Communications Director, World Shipping Council

E: alarsson@worldshipping.org

W: www.worldshipping.org