Bulk Liquid Chemical Handling Guide for Plants, Terminals, Storage and Distribution Depots

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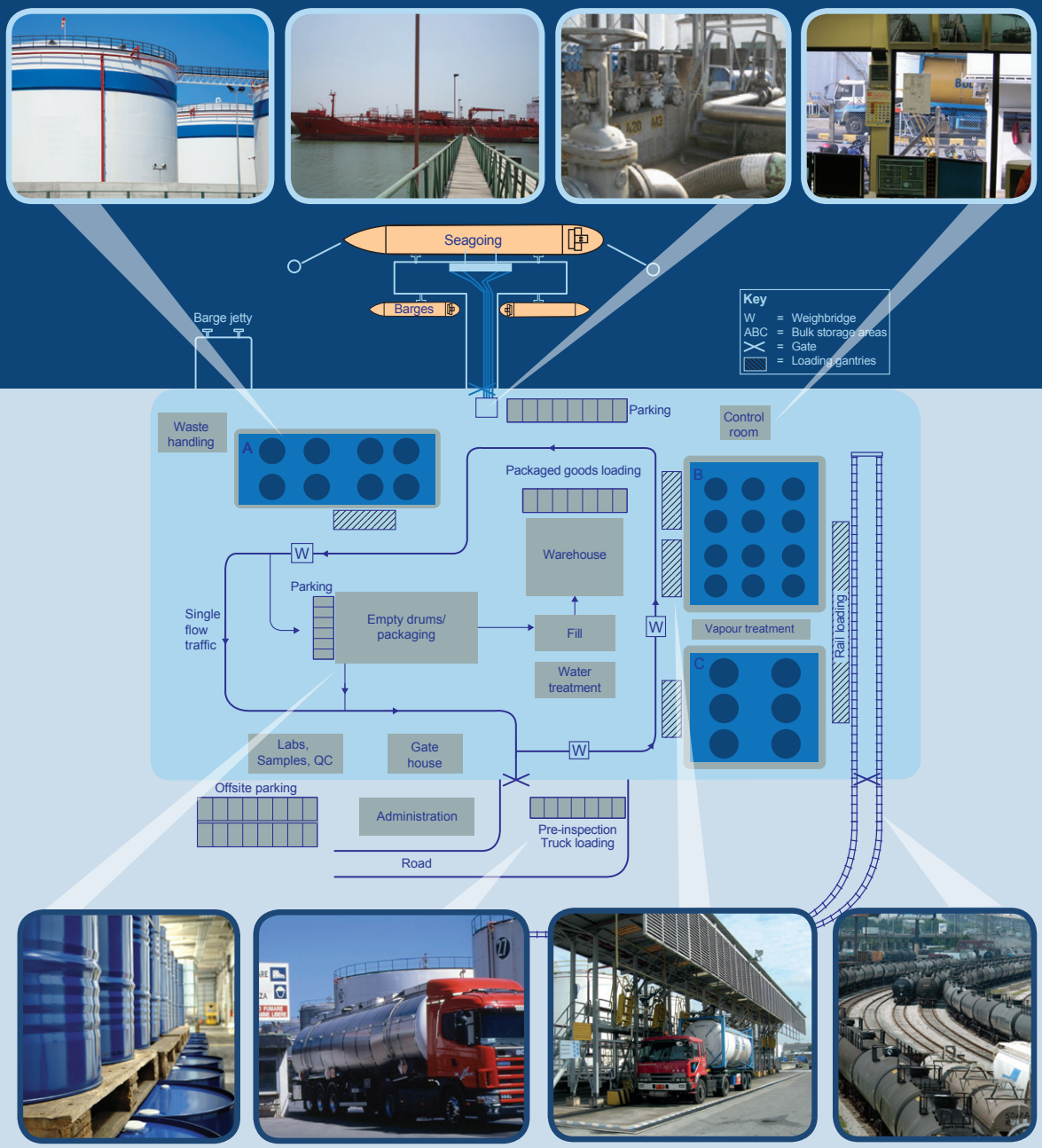

This publication provides a basic yet comprehensive and practical guideline, covering all aspects of typical chemical tank terminal activities, from design and layout to the ongoing safe and efficient operation, maintenance and management of the facility.

It does not replace existing standards, and codes of practice, but provides a complementary document for those involved in and responsible for the management of such facilities. It intends to be consistent with, but not a substitute for, any local or international regulations or requirements.

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1. Chemicals and Classification

To safely operate a terminal a good understanding of the chemical and physical characteristics of the products is required.

This chapter provides an overview of some basic chemistry and chemical properties and their implications when handling products. It also looks at the various classification systems and explains where information about them can be found.

2. Storage Tanks and Equipment

One of the main functions of a terminal is the safe storage of a wide and often changing range of products, which may have very different physical and chemical characteristics and will need to be stored in tanks that are appropriate in terms of safety, efficiency of operation and compatibility. Local regulations generally specify minimum requirements for tank design and product storage. The choice will also depend on local conditions and circumstances and the need for flexibility to cope with the range of products and the various modes of transport. This chapter provides an overview of generally accepted minimum requirements regarding tank choice and use.

3. Product Transfer Equipment

There is a vast array of equipment and systems used for the storage, transfer and handling of a wide range of bulk liquid materials. The choice of equipment is largely dependent on the design of the facility, characteristics of the products handled and the existing infrastructure and layout. Regulatory requirements could also have significant effect.

This chapter covers the general principles relating to cargo transfer systems such as pumps, pipes, valves and other ancillary equipment.

4 . Vapour and Emission Control

This chapter gives an overview of issues relating to the reduction and control of vapour emissions, and the management of air quality. The type of vapour handling and control systems used will be determined by the nature of the products handled, tank design, mode of transport, transfer equipment and infrastructure, and local regulatory requirements. This chapter also provides an overview of the main sources of emissions, their characteristics and the issues associated with their safe and efficient handling, control and treatment.

5. Jetty and Shipping

This chapter gives an overview of typical terminal jetty requirements for the loading and unloading of ships. It covers the infrastructure, equipment and procedures that need to be in place to ensure these operations can be conducted safely and efficiently. There are large variations in the design and operational characteristics of jetties, depending on who owns the jetty and infrastructure, whether there is terminal specific or shared usage, and the nature of the products handled. Local site specific conditions and regulations determine many of the requirements, although these need to be in line with internationally accepted standards or codes of practice.

While ships are normally chartered by the customers who store products at the terminal, the terminal operators have certain obligations and liabilities to ensure that the ships can be adequately berthed and are suitable for the products to be loaded or unloaded. The guidelines in this chapter will assist terminals to ensure that minimum internationally accepted standards, that are acceptable to all parties, are in place.

6. Road and Rail

This chapter looks at the infrastructure and facilities required to load and unload road tankers, tank containers and rail tank cars. The exact nature of the structure and facilities at a terminal will vary based on factors such as facility layout and design, product characteristics, mode of transport, throughputs and local regulatory requirements or constraints. This chapter addresses loading and unloading, station construction, infrastructure and equipment and personal responsibilities of drivers and terminal staff.

While it is normally the customers who contract the carriers, the terminal operators have certain obligations and liabilities to ensure that road tankers, tank containers and rail tank cars are suitable for the products to be loaded or unloaded and are compatible with the terminal infrastructure.

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7. Drumming and Warehousing

This chapter looks at drumming operations and the handling, storage and dispatch of packaged dangerous goods.

While it is common for the customer to classify and provide packaging and labels for products they have requested to be filled into drums or IBCs, the terminal as the packer and consignor of dangerous goods is liable for certain regulatory aspects. As a result, personnel involved in the filling of containers must have a good understanding of the classification, documentation, packaging, labelling and placarding requirements for the transportation of dangerous goods. Highly automated facilities are not that common on a terminal and so the focus in this chapter is on the more manual or semi-automated equipment typically used.

General operational safety, health and environmental issues are also covered.

8. Hazardous Area Classification

An appropriate site hazardous area classification system must meet risk elimination or mitigation criteria while taking into account operational characteristics.

This chapter focuses on the process of hazardous area classification according to the characteristics of the products and the nature of the storage and handling equipment. It gives an overview of the subject and provides an appreciation of the requirements and dynamics involved. It should be noted that this is a complex subject and, for in depth quantitative classification, expertise in this area is required.

9. Fire Safety

This chapter gives an overview of requirements for the prevention, detection, protection and response to fires. The actual equipment, protection systems and procedures used will be mainly based on local regulations, internationally accepted standards or codes of practice, the nature of the products handled, facility design and operational characteristics.

10. Buildings

This chapter looks at the buildings found on a typical terminal, identifies issues related to their location, gives an overview of associated hazards and suggests ways of managing the risk.

Specialist studies and assessments may be required depending on the complexity of the facility, the degree of hazard posed and local standards and regulations. While this chapter mainly concerns existing buildings, it could also be useful in the design and location of new buildings.

11. Solid and Liquid Waste

All terminals should identify, monitor and control waste streams as part of the overall waste and terminal management policies and procedures. Infrastructure also should be in place to adequately contain, treat and safely recycle or dispose of any waste material generated. The level of control, treatment or disposal will largely depend on the terminal location, environmental conditions, facility design, equipment used, products handled and local or international regulations or requirements.

12. Electrical and Power Distribution

This chapter looks at the main types of electrical and associated equipment and networks that may be found on a terminal, and some of the issues concerning safe installation, operation and maintenance. Requirements will vary from terminal to terminal depending on the types of products stored, terminal layout, equipment used and modes of transport. This chapter cannot cover all permutations, but it does examine areas common to a typical terminal.

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13. Traffic Circulation and Control

There can be a large variety of vehicles and other traffic on a terminal at any time. To ensure that all operations involving vehicles and other traffic are conducted in a safe manner, it is important that there is adequate site traffic control. This control relies on a combination of factors, including the selection of vehicles appropriate to the tasks to be carried out, the prevailing site conditions and risks, road layout and marking, suitable signage, and considerations such as systems, procedures and training. This chapter examines site traffic circulation and control systems relating to road, rail and pedestrian traffic.

14. Personnel Safety

Personnel working on or visiting a terminal can be exposed to varying degrees of personal risk. Terminals should ensure that everyone working on or affected by the terminal operations is aware of the potential risks, and management systems are in place to eliminate or mitigate and control the risk. The safety management systems used from terminal to terminal will vary due to facility design, the nature of the operations conducted, regulatory requirements and general local conditions or circumstances. Many of the potential risks are terminal specific and this chapter provides an overview of the systems required to effectively manage the risks and ensure the safety of all personnel at the terminal.

15. Emergency Response

All terminals should have emergency preparedness and response plans in place. These plans are largely dependent on factors such as local legislation and regulatory requirements, the nature of the facility in terms of equipment and infrastructure, product characteristics and local conditions and circumstances. Due to the variability and constantly changing circumstances encountered at different terminals, this chapter cannot be prescriptive or cover all eventualities. However, it gives an overview of typical requirements, and guidelines on the content of emergency management system and plans.

16. Security

Terminals are responsible for the security of large quantities of dangerous goods and high value products as well as for the terminal infrastructure, operations and any personnel working on or visiting the facility.

Security arrangements should cover all areas under the direct control of the terminal, including any offsite equipment or infrastructure such as pipelines and jetties. Some terminals are situated within an industrial complex and have shared infrastructure and security resources. In such instances, the terminal still remains responsible for the adequacy of these security arrangements must ensure that the shared resources and procedures are integrated into their own site security policies and plans.

In many instances, particularly where high consequence dangerous goods are handled and stored, additional security arrangements should be in place covering the receipt and dispatch of products. These arrangements need will be drawn up in conjunction with the relevant external parties, such as customers, transport companies and port authorities, and will form an integral part of their respective security plans.

This chapter provides an overview of security risks and requirements associated with typical terminal operations, with due consideration to international standards, guidelines and requirements.

17. Management of the Terminal

Terminals should comply with not only local and national, but also applicable international regulations, standards and codes of practice. To operate safely and ensure compliance with these requirements, a terminal should have a comprehensive and auditable management system in place that governs its day to day activities and processes.

Traditional management systems focus mainly on the quality and customer satisfaction aspects of running a terminal. To meet the overall requirements however, there should be an integrated management system in place that also includes aspects such as safety, health, environment, security and regulatory compliance.