

Agrichemical Warehousing Standard Association

WAREHOUSING STANDARDS BULLETIN

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CORRECT STORAGE PATTERNS FOR DANGEROUS GOODS

C2 to C7

Audit Protocol C2

Reference NFC

Storage heights of flammable and combustible liquids meet NFC standards.

The intent of this protocol is to store all liquids with a flash point below 93.3°C at heights consistent with the NFC classes of product. The NFC classes of products and their storage heights are as follows:

	<u>Storage Heights (m)</u>		
	<u>Unsprinkled Building</u>	<u>Sprinklered Building</u>	<u>In rack Sprinklered Building</u>
Class IA – flash point below 22.8°C and boiling point below 37.8°C	1.5	1.5	7.5
Class IB – flash point below 22.8°C and boiling point at or above 37.8°C	1.5	2.0	7.5
Class IC – flash point at or above 22.8°C and below 37.8°C	1.5	2.0	7.5
Class II – flash point at or above 37.8°C and below 60.0°C	3.0	3.0	7.5
Class IIIA – flash point at or above 60.0°C And below 93.3°C	4.5	6.0	12.0

Class IA, IB and IC are flammable liquids under the NFC and

Class II and IIIA are combustible liquids under the NFC

For an unsprinklered warehouse, this translates into the following National Fire Code classes:

Class IA, IB and IC - one pallet high (approx. 5 ft.)

Class II - two pallets high (approx. 10 ft.)

Class IIIA - three pallets high (approx. 15 ft.)

The N.F.P.A. (National Fire Prevention Association), which develops codes for users in the

United States and from which the NFC is modeled, does not allow storage of class II

product on top of IA, IB or IC products or the storage of class IIIA on top of IA, IB, IC, or

II class of products if they exceed the maximum height for the most restrictive classification. It is therefore the NFC and Protocol C2 intent to follow the N.F.P.A. code in this regard.

Audit Protocol C3 Reference NFC

Revised January 2011

Protocol C3 reads:

- Flammable and combustible liquids are stored in
- (a) individual storage areas (ISA's) and
 - (b) in accordance with the maximum quantity limitations in the National Fire Code.

The key in this protocol is to understand the definition of an "individual storage area" (ISA). An ISA is an area occupied by piles, bin boxes, racks or shelves, including subsidiary aisles providing access to the stored products, which is separated from adjacent storage by aisles not less than 2.4 m(8 ft.) in width.

Therefore, all NFC Classes of flammable and combustible liquids (all liquid T.D.G. classes of products and all liquid non regulated products with a flash point below 93.3°C) can be stored in an ISA designated as an F/C liquid ISA.

In addition, in an ISA designated as flammable and combustibles liquid, any class (note must still be in compliance with TDG regulations (appendix A)) of agrichemicals can be stored (including non-flammable and non-combustible liquids such as granulars or powders) provided the height (protocol C2) and quantity restrictions (protocol C3 (b)) for the product with the **lowest flash point** is met. Also, buildings that meet the spatial separation requirements or have the 4 hour fire rating requirements have **unlimited** volumes per fire compartment. As an example, in unprotected storage, you can store 9000 litres of a class IC liquid and 1000 litres of say, glyphosate not regulated under TDG and with no flash point under 93.3 C) in the same ISA and in the same fire compartment. These 10,000 litres would all be considered as IC product for the purposes of quantity limitation. Also, in the same example, if there were a second ISA with 1000 litres of a NFC class IIIA product in the same fire compartment, then protocol C3 (b) would not be in compliance because the maximum quantity limitation for the fire compartment is exceeded. However, if the storage arrangement of the 1000 litres of glyphosate and the 1000 litres of the class IIIA were reversed, then the C3(b) protocol would be in compliance, assuming no other F/C liquids were in storage.

How much product can be stored in an ISA? The NFC Table 4.2.7.5.A lists the maximum quantity per ISA in litres as follows.

<u>NFC class</u>	<u>Unsprinklered</u>	<u>Sprinklered</u>
NFC class IA,IB and IC	10,000 litres	20,000 litres
NFC class II	15,000 litres	40,000 litres
NFC class IIIA	50,000 litres	60,000 litres

Most warehouses have a product mix that includes various quantities of all NFC classes of flammable and combustible liquids except Class IA as well as non regulated products and other TDG classes of products. How then do we store products when we have 2 or more classes of flammable and combustible liquids?

Where containers for 2 or more NFC classes of products are stored together in an ISA, the maximum quantity permitted in the ISA. shall equal that permitted for the liquid with the **lowest flash point**.

If, in an **unsprinklered warehouse**, we want to store 3000 litres NFC class IC and 8000 litres of NFC class II in one (1) ISA, how can this be done?

The maximum quantity that can be stored in this warehouse in one (1) ISA. is 10,000 litres of Class IB and IC. Therefore the storage of 11,000 litres in one ISA is not permitted because when the products are in one (1) ISA., you have to consider that **all** the products are a NFC class IC, that with the lowest flash point.

There is still 1000 litres to be stored, so we must develop a 2nd ISA. to store the 1000 litres of NFC class II. In this ISA., we could store an additional 14,000 litres of NFC class II products to reach the maximum quantity per ISA. of 15,000 litres or we could store 14,000 litres of glyphosate in this ISA .

These two (2) ISA's now must be separated from each other and from other adjacent storage by clear aisles not less than 2.4 m (8 ft.) in width or by a 2 hour fire resistance rated separation wall which will create a new fire compartment. .

Where buildings are designed for the storage of flammable and combustible liquids and the storage facility has in-rack sprinklers there is no limit on the total quantity of storage per fire compartment.

In larger warehouse facilities where other non-agricultural dangerous goods are stored within the same fire compartment as agrichemicals, these products must also be in compliance as they impinge on the integrity of the certified area.

Audit Protocol C4 **Reference NFC**

TDG regulated products are stored in compliance with the NFC separation chart for storage of Dangerous Goods Table reprinted as Appendix "A" in the 2006 Audit Protocol Manual.

This protocol includes flammable and combustible liquids (all liquid products with a flash point below 93.3°C) because all T.D.G. class products, not just the flammable and combustible liquids, must comply with the separation chart.

Where the storage of products coincides with an "X", you are **not** permitted to store in the same fire compartment. If however, the volumes of one of the products stored falls under the small quantity exemption found in the NFC reprinted as Appendix "D" in the 2019 Audit Protocol Manual, then it is considered not to be in storage.

Where the storage of products coincides with an "A", in the separation chart, they must be separated by a minimum 1 metre horizontal distance. This does not say a 1 metre clear aisle or space - just a minimum 1 metre horizontal distance. Therefore, to maximize warehouse space, this 1 meter horizontal distance could be utilized by the storage of compatible products - those where the storage of products coincide with a "P".

Where the storage of products coincides with a "DS", this refers to the information provided in the MSDS for the specific dangerous good.

In larger warehouse facilities where other non agricultural dangerous goods are stored within the same fire compartment as agrichemicals, these products must also be in compliance as they impinge on the integrity of the certified area.

Audit Protocol C5 **Reference NFC**

Storage heights of TDG regulated products other than flammable and combustible liquids meet NFC standards.

This protocol deals only with dangerous goods that are not classified as NFC flammable and combustible liquids (which includes all products with a flash point below 93.3°C).

The method of storage of these dangerous goods shall be determined to ensure stability of the stored products and not to exceed the maximum heights of storage as follows:

<u>Classification</u>	<u>No Sprinkler</u>	<u>Protected Sprinkler</u>	<u>In-rack Sprinkler</u>
Packing Group I	1.8 m	2.4 m	unlimited
Packing Group II	2.4 m	4.0 m	unlimited
Packing Group III	4.5 m	6.0 m	unlimited

Storage heights for a protected storage area are permitted to be exceeded provided the dangerous goods are stored on racks or shelves.

Stack heights of products must not be breached by piling a product with a lessor risk requirement on top of one with a more stringent risk requirement unless the pile height meets the requirement for the most stringent product in a non-sprinklered building.

Example: You cannot stack a pallet of T.D.G. class 6.1, P.G. II on top of a pallet of T.D.G. class 6.1, P.G. I. unless the pile is 1.8 meters or less.

In larger warehouse facilities where other non-agricultural dangerous goods are stored within the same fire compartment as agrichemicals, these products must also be in compliance as they impinge on the integrity of the certified area.

Audit Protocol C6

Reference NFC

TDG regulated products (other than flammable and combustible liquids) are stored in a separate ISA. The sum of the individual storage areas (I.S A's) in a building may not exceed 100 m² in unprotected storage.

Note: Non regulated products with a flash point at or above 93.3°C can be stored in this dangerous goods ISA.

When determining this area, the space taken up by non regulated products and T.D.G. class 9 with no other classification and the space taken up by the flammable and combustible liquids are not included in the calculating. The area of subsidiary aisle within the ISA must be included.

You can, in addition, store any quantity of T.D.G. class 9 and non regulated products in the balance of any space available in the warehouse.

It is not permitted to exceed the 100 m² area unless a fire suppression system (sprinkler system) is installed.

Audit Protocol C7

Reference NFC

A plan view of the storage area must be posted in the warehouse to show

- a) the aisles
- b) the storage (ISA's)—both for flammable/combustible liquids and other dangerous goods
- c) the T.D.G. class of product being stored in each storage area (ISA)
- d) the plan view must meet the standards outlined in C2, C3, C4, C5 and C6