

# D9

## TECHNICAL DOCUMENT

External  
fire  
control

Determination  
of water supply

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**INESC - FFSA - CNPP**

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## Description sheet

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Preamble	<p>The following organisations took part in the preparation of this document:</p> <ul style="list-style-type: none"><li>- CNPP (Centre National de Prévention et de Protection), technical department,</li><li>- FFSA (Fédération Française des Sociétés d'Assurances),</li><li>- INESC (Institut National d'Etudes de la Sécurité Civile).</li></ul> <p>The following organizations were also consulted:</p> <ul style="list-style-type: none"><li>- AGREPI (Association of engineers and executives approved by CNPP),</li><li>- GIS (Group of sprinkler manufacturers and installers),</li><li>- PERIFEM (Technical business and distribution association).</li></ul>
Purpose	<p>This document fully acknowledges the official texts and European standard drafts being investigated at the CEN (European Committee for Standardization) level.</p> <p>The activity and storage classification draws its inspiration directly from the APSAD R1 rule (Installation of automatic water extinguishing systems of the sprinkler type).</p> <p>All the provisions laid down in this document apply without prejudice to the legal texts.</p>

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## **1. PURPOSE AND SCOPE**

### **1.1. PURPOSE**

The purpose of this guide is to provide, for each type of risk, a method used to size the minimum water requirements for the intervention of emergency services external to the risk involved.

The sizing of the water requirements is based on the extinguishing of a fire limited to the maximum non-divided surface and not to the generalized full fire of the site. The notion of maximum non-divided surface is defined for each of the methods in the chapter concerned.

The requirements defined in this way add to the requirements for protections internal to the buildings involved (automatic water extinguishing, RIA) when they are taken from the same source.

In most cases, having a different source for the requirements of internal protections and for the requirements of emergency services is preferable.

### **1.2. SCOPE**

This guide applies to:

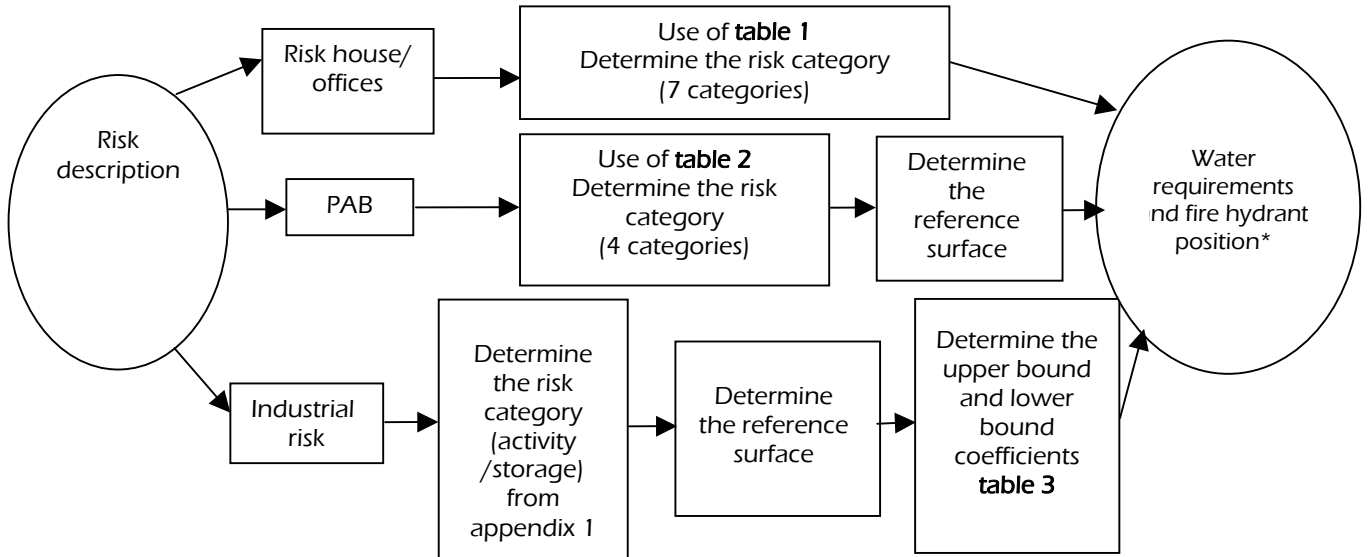
- homes and offices, including high-rise buildings;
- PAB (Public Access Buildings);
- industrial risks.

This method does not cover tank farms, chemical industries (with a particularly high risk) and other special risks (RS classification defined by appendix 1).

For special risks, additional requirements may be specified (other extinguishing agents, additional water quantity, etc.).

Risks with an especially small calorific potential and an especially significant extent (cement works, steel works...) shall be treated on a case-by-case basis.

### 1.3. METHOD ORGANIZATION CHART



\* Hydrant: fire hydrant.

## 2. HOMES, OFFICES AND HIGH BUILDINGS

Table 1 shows the water requirements for fire fighting for home and office risks.

**Table 1 – Water requirements – Homes and offices**

						MISCELLANEOUS OBSERVATIONS
Building type	Homes	<p><u>1<sup>st</sup> Family:</u> One-family dwellings R+1 maximum</p> <p><u>2<sup>nd</sup> Family:</u> One-family dwellings Multi-storey dwellings R+3 maximum</p>	<p><u>3<sup>rd</sup> Family A:</u> H ≤ 28 m and R + 7 maximum and stairs-home distance ≤ 7 m and stairs access via ladder</p>	<p><u>3<sup>rd</sup> Family B:</u> H ≤ 28 m and one of the 3 conditions of 3<sup>rd</sup> family A not complied with</p> <p><u>4<sup>th</sup> Family:</u> 28 &lt; H ≤ 50 m</p> <p><u>Residential high-rise building:</u> H &gt; 50 m</p>		
	Offices	H ≤ 8 m et S ≤ 500 m <sup>2</sup>	H ≤ 28 m et S ≤ 2000 m <sup>2</sup>		H ≤ 28 m et S ≤ 5,000 m <sup>2</sup> or high-rise building > 28 m irrespective of the surface	S > 5,000 m <sup>2</sup>
Minimum flow rate	60 m <sup>3</sup> /h	120 m <sup>3</sup> /h	120 m <sup>3</sup> /h	180 m <sup>3</sup> /h	240 m <sup>3</sup> /h	Simultaneous minimum flow rate available on area
Number of fire hydrants	1 of 100 mm	2 of 100 mm	2 of 100 mm	3 of 100 mm	2 of 100 mm and 1 of twice 100 mm (150 mm)	Number of fire hydrants as an indication, provided that the minimum flow rate is complied with
Maximum distance between fire hydrants	200 m	200 m	200 m	200 m	200 m	Via aisles (vehicle aisles), in the sense of decree dated 25 June 80.
Maximum distance between 1 <sup>st</sup> fire hydrant and main building entry	150 m	150 m	100 m (CS = 60 m)	100 m (CS = 60 m)	100 m (CS = 60 m)	Via stabilized ways (minimum width 1.8 m) CS = dry riser (when required)
Minimum duration	Unless special arrangements are specified, the minimum duration for applying water requirements shall be 2 hours.					
<p>S: Non-divided developed surface (the surface notion is defined by the area delimited by fire resistance walls and/or floors 1 hour minimum, except for high-rise buildings where the fire stop level shall be 2 hours).</p> <p>H: Height of low floor of highest level compared with the reference threshold.</p>						

### 3. PUBLIC ACCESS BUILDINGS (PAB)

**Table 2 – Water requirements – PAB**

RISK <sup>(1)</sup>	Class 1 N: Restaurant L*: Meeting, Event (without scenery or effects) O et OA : Hotel R: Education X: Sports covered U: Sanitation V: religion W: Offices (refer to table 1)	Class 2 L: Meeting, event (with scenery and effects + multi-purpose rooms) P: Dance halls, discotheques Y: Museums	Class 3 M: Shops S: Libraries, Documentation T: Exhibition	Sprinkled all classes merged <sup>(7)</sup>
<b>SURFACE</b> <sup>(2)</sup>	<b>WATER REQUIREMENTS (m<sup>3</sup>/h)</b> <sup>(3)</sup>			
≤ 500 m <sup>2</sup>	60	60	60	60
≤ 1000 m <sup>2</sup>	60	75	90	60
≤ 2 000 m <sup>2</sup>	120	150	180	120
≤ 3000 m <sup>2</sup>	180	225	270	180
≤ 4000 m <sup>2</sup>	210	270	315	180
≤ 5000 m <sup>2</sup>	240	300	360	240
≤ 6000 m <sup>2</sup>	270	330	405	240
≤ 7000 m <sup>2</sup>	300	375	450	240
≤ 8000 m <sup>2</sup>	330	420	495	240
≤ 9000 m <sup>2</sup>	360	450	540	240
≤ 10.000 m <sup>2</sup>	390	480	585	240
≤ 20.000 m <sup>2</sup>	To be treated on a case-by-case basis			300
≤ 30.000 m <sup>2</sup>	To be treated on a case-by-case basis			360
<b>PRINCIPLE</b>	0 to 3000 m <sup>2</sup> : 60 m <sup>3</sup> /h per portion or fraction of 1000 m <sup>2</sup>  ≥ 3000 m <sup>2</sup> : add : 30 m <sup>3</sup> /h per section or fraction of 1000 m <sup>2</sup> (e.g.: 4300 m <sup>2</sup> to be treated like 5000 m <sup>2</sup> )	Class 1 x 1,25	Class 1 x 1,5	0 to 4000 m <sup>2</sup> : 60 m <sup>3</sup> /h per section or fraction of 1000 m <sup>2</sup> with a maximum of 180 m <sup>3</sup> /h.  <u>from 4001 to 10.000 m<sup>2</sup></u> : 4 x 60 m <sup>3</sup> /h  <u>Beyond 10.000 m<sup>2</sup></u> : 60 m <sup>3</sup> /h per section or fraction of 10 000 m <sup>2</sup>
<b>NUMBER OF FIRE HYDRANTS</b> <sup>(4)</sup>	According to demanded global flow rate and distribution according to building geometry.			
<b>MAXIMUM DISTANCE BETWEEN FIRE HYDRANTS</b> <sup>(5)</sup>	200 m	200 m	200 m	200 m
<b>MAXIMUM DISTANCE BETWEEN 1<sup>ST</sup> FIRE HYDRANT AND MAIN ENTRANCE</b> <sup>(6)</sup>	150 m (CS = 60 m when demanded)	150 m (CS = 60 m when demanded)	100 m (CS = 60 m when demanded)	150 m (CS = 60 m when demanded)
<b>MINIMUM DURATION</b>	Unless special arrangements are indicated, the minimum application duration shall be 2 hours.			

<sup>(1)</sup> PAB of the EF, SG, CTS, PS, OA and PA categories and campsites shall be treated on a case-by-case basis.  
<sup>(2)</sup> The surface notion is defined by the developed surface not divided by fire resistance walls 1 hour minimum.  
<sup>(3)</sup> The minimum required flow rate cannot be less than 60 m<sup>3</sup>/h. In addition, this is an available simultaneous minimum flow rate.  
<sup>(4)</sup> Number of fire hydrants as an indication, provided that the required min flow rate is complied with.  
<sup>(5)</sup> Via aisles (vehicle aisles) in the sense of the decree dated 25 June 1980.  
<sup>(6)</sup> Via stabilized aisles (min width 1,8 m). CS = dry riser (when required).  
<sup>(7)</sup> A risk is regarded as sprinkled if:  
 - autonomous, complete and sized protection according to the nature of the storage and actual activity under operating conditions, according to good engineering practice and existing references;  
 - regularly maintained and checked installation;  
 - Installation permanently in service.

## 4. INDUSTRIAL RISKS

### 4.1. CLASSIFICATION OF ACTIVITIES AND STORAGES

#### 4.1.1. Principles

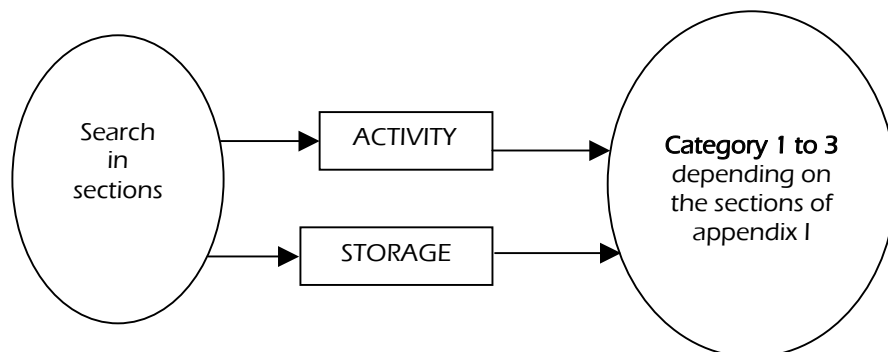
Before determining the water requirements, the risk level which depends on the type of activity carried out in the buildings and on the goods stored in them must be known.

The risk level increases from category 1 to category 3.

The classification of the activity area and of the goods storage area should be differentiated.

The sections in appendix 1 give the most common examples by determining the category of the activity part on the one hand and of the storage part on the other hand.

#### 4.1.2. Method flow chart



#### Special case:

The premises one of the walls of which consists of sandwich panels (cellular plastic) shall at least be classified in category 2.

In the case where goods with a different classification would be brought together in the same warehouse without being placed in specific areas, the classification shall be that of the most dangerous category.

In the case where different products would be stored in distinct areas, reference shall be made to the principle stated in § 4.2. 4<sup>th</sup> paragraph

## 4.2. RISK REFERENCE SURFACE DETERMINATION

The risk reference surface is the surface used as a basis for the determination of the required flow rate.

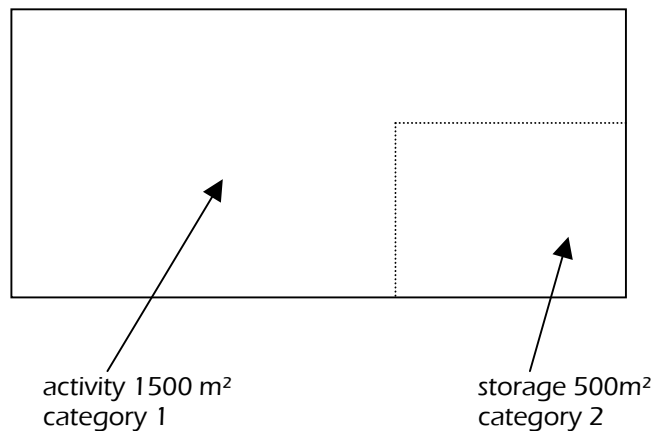
This surface is at least demarcated, either by 2-hour fire walls complying with the decree dated 03 August 99<sup>1</sup>, or by an uncovered obstruction-free space of 10 m minimum. The thermal flows, the relative height of the nearby buildings and the building type may be taken into account to increase this distance.

This surface is to be considered as a developed surface when the (high or low) floors do not have at least a firewall level of 2 hours. This is especially the case for mezzanines.

The reference surface to be considered is either the largest non divided surface of the site when its classification is homogeneous, or the non divided surface resulting in the most important water requirements owing to the risk classification.

### Special case of a non divided area containing several types of risks

Non divided building with a manufacturing area with category 1 risk and a storage area with category 2 risk



Calculate the water requirements for 1500 m<sup>2</sup> in category 1 and add to them the water requirements for 500m<sup>2</sup> in category 2.

## 4.3. REQUIRED FLOW RATE DETERMINATION

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<sup>1</sup> The decree dated 3 August 1999 has superseded the decree dated 21 April 1983.

**Table 3 – Required flow rate determination**

SHORT DESCRIPTION OF THE RISK (...)				
CRITERION	ADDITIONAL COEFFICIENTS	COEFFICIENTS CHOSEN FOR THE CALCULATION		COMMENTS
<b>STORAGE HEIGHT <sup>(1)</sup></b> - Up to 3 m - Up to 8 m - Up to 12m - Beyond 12m	0 + 0.1 + 0.2 + 0.5	Activity	Storage	
<b>BUILDING TYPE <sup>(2)</sup></b> - fire resistant frame ≥ 1 hour - fire resistant frame ≥ 30 minutes - fire resistant frame < 30 minutes	- 0.1 0 + 0.1			
<b>INTERNAL INTERVENTION TYPES</b> - round the clock reception (permanent presence at the entrance) - generalized DAI reported twenty four seven with remote monitoring or to the emergency set round the clock, if any, with call instructions. - fire security service round the clock with suitable facilities second intervention team, in a position to intervene round the clock)	- 0.1 - 0.1 - 0.3 *			
<b>Σ coefficients</b>				
<b>1 + Σ coefficients</b>				
<b>Reference surface (S en m<sup>2</sup>)</b>				
<b>Qi = 30 x <math>\frac{S}{500}</math> x (1 + Σ Coef) <sup>(3)</sup></b>				
<b>Risk category <sup>(4)</sup></b> Risk 1: Q1 = Qi x 1 Risk 2: Q2 = Qi x 1,5 Risk 3: Q3 = Qi x 2				
<b>Sprinkled risk <sup>(5)</sup> : Q1, Q2 or Q3 ÷ 2</b>				
<b>REQUIRED FLOW RATE <sup>(6) (7)</sup> (Q in m<sup>3</sup>/h)</b>				
<p><sup>(1)</sup> Without other details, the storage height shall be considered as being equal to the building height minus 1 m (case of warehouses).</p> <p><sup>(2)</sup> For this coefficient, ignore the sprinkler.</p> <p><sup>(3)</sup> Qi: intermediate calculation flow rate m<sup>3</sup>/h.</p> <p><sup>(4)</sup> The risk category depends on the activity and storage classification (see appendix 1).</p> <p><sup>(5)</sup> A risk is regarded as sprinkled if:                      - autonomous, complete and sized protection depending on the nature of the storage and actual activity under operating conditions according to good engineering practice and existing references;                      - regularly maintained and checked installation;                      - permanently in service installation.</p> <p><sup>(6)</sup> No flow rate may be less than 60 m<sup>3</sup>/h.</p> <p><sup>(7)</sup> The water quantity necessary on the pressure system (cf. § 5 paragraph 5) shall be distributed by fire hydrants located at less than 100 m from the entrances of each of the building cells with a maximum distance between them of 150 m.</p> <p>* If this coefficient is chosen, ignore that of the round the 24/7 reception.</p>				

## 5. ARRANGEMENTS COMMON TO THE 3 METHODS

The value derived from the calculation shall be rounded to the closest 30 m<sup>3</sup>/h multiple.

A very high flow rate value implies that it is necessary to implement additional protection and prevention steps (automatic water extinguishing, draft stops, different storage arrangement or composition, etc.).

Except for special cases, the water requirements defined previously shall be available during a minimum 2-hour period to ensure fire protection of the establishment.

The fire hydrant layout project shall be validated by the departmental fire and emergency service.

The flow rate does not imply a number of fire hydrants to be installed. The required flow rate may be for example 180 m<sup>3</sup>/h and the emergency services may demand 5 hydrants on the site with hydraulic involvement of 3 fire hydrants at the same time. The number of fire hydrants to be installed may depend on the building geometry.

In the case where the entire available flow rate could not be obtained from the (public or private) water system, it is permitted that the requirements are available in one or several water reserves specific to the site and permanently accessible to the emergency services. These (natural or artificial, public or private) water reserves shall be equipped or built up in accordance with the rules for the layout of water supplies defined by the interdepartmental circular No 465 dated 10 December 1951).

The equipment and layout projects and the building up of said judiciously distributed reserves shall be validated by the departmental fire and emergency service.

Having at least one third of the water requirements on the pressure system is recommended for easier quick fire attack and to reduce the times for implementing the fire fighting equipment.

Example:

Water requirements  $Q = 540 \text{ m}^3/\text{h}$ . The fire hydrants connected to the mains water system can ensure a simultaneous flow rate of  $180 \text{ m}^3/\text{h}$ .

Final assessment:  $540 - 180 = 360 \text{ m}^3/\text{h}$  i.e. for 2 hours, set up of a water reserve of  $720 \text{ m}^3$ .

According to the access and availability conditions, the water resources may be common to several risks.

Special case: The new areas (industrial estates, small business areas, etc.) to be laid out, for which the destination is not precisely defined, shall be investigated according to the urban planning rules and texts in force by taking their possible uses into account.

## **APPENDIX 1**

### **Classification of activities and storage**

#### Distribution in sections

- Section A: Separate accessory risks common to various industries
- Section B: Food industries
- Section C: Textile industries
- Section D: Clothes and accessories. Hides and skins
- Section E: Timber industry. Cork. Luxury goods manufacturing. Basketry
- Section F: Metallurgical and mechanical industries
- Section G: Electrical industries
- Section H: Lime. Cement. Ceramics. Glassware
- Section I: Mineral chemical industries
- Section J: Products of animal origin and fatty substances
- Section K: Pigments and colours, paints. Varnishes and inks. Cleaning products
- Section L: Waxes. Resins. Rubber. Plastics
- Section M: Solid, liquid, gaseous fuels
- Section N: Chemical products not classified elsewhere
- Section O: Wood pulp. Paper and cardboard. Printing. Book industries
- Section P: Show business (Theatre, Cinema, etc.)
- Section Q: Transportation industries
- Section R: Shops. Storehouses. Warehouses. Other sites

S.O: Not applicable

RS: Special risk. Shall be the subject of a specific study.

Reminder: All premises where one of the walls consists of "sandwich" panels (cellular plastic) shall at least be classified in category 2.

## Section A

### Separate accessory risks common to various industries

		RISK CATEGORY	
		Activity	Storage
01	Boiler rooms and fixed gas generators .....	RS	RS
02	Driving force .....	RS	RS
03	Special workshops and general maintenance store.....	1	2
04	Special paint and/or varnish workshops the flash point of which is Less than 55° C .....	RS	RS
05	Research, test or inspection laboratories.....	1	2
06	Computers, electronic assemblies, electronic equipment of control units and control rooms .....	1	2

## Section B

### Food industries

Reminder: All the premises one of the walls of which is made of sandwich panels (cellular plastic) shall as a minimum be classified in category 2.

		RISK CATEGORY	
		Activity	Storage
01	Windmills and other materials suitable for making bread .....	1	2
02	Corn, grains or miscellaneous seeds, and/or dry vegetables traders Cooperatives and grain storers. Processors of seeds or other and risks of the same nature Denaturation of wheat .....	1	2
03	Feed meals, flour mills without windmill, without fabrication of animal food .....	1	2
04	Pasta factories.....	1	2
05	Biscuit factories .....	1	2
06	Gingerbread, diet bread, continental toast factories. Industrial bakeries and pastries.....	1	2
07	Animal food factories with grain crushing .....	1	2
08	Mustard and miscellaneous spice factories .....	1	2
09	Roasting with or without crushing.....	1	2
10	Driers of chicory root (without roasting).....	1	2
11	Processing of hops or plants for herb trade .....	1	2
12	Factories of dried flowers.....	1	2
13	Plant sterilization.....	1	2
14	Processing of walnuts and halved walnuts.....	1	2
15	Tobacco.....	1	2
16	Lucerne drying.....	1	2
17	Crushing of forage and other dry plants.....	1	2
18	Sugar refineries and refineries. Beet juice factories.....	1	2
19	Factories of molasse-containing products .....	1	2
20	Sugar and black treacle stores.....	1	2
21	Colouring caramels (manufacture using any methods) .....	1	2
22	Carbonated soft drinks. Aperitifs. Wines .....	1	1

		Activity	Storage
23	Brandy distilleries (up to 72° centesimals).....	1	RS
24	Alcohol distilleries (more than 72° centesimals).....	RS	RS
25	Liquor factories.....	RS	RS
26	Vinegar factories.....	1	1
27	Breweries.....	1	1
28	Malt houses.....	1	2
29	Chocolate factories.....	1	2
30	Confectionery, nougats, liquorice extract, syrup factories. Honey processing.....	1	2
31	Olive oil or walnut windmills.....	1	2
32	Copra, groundnut and miscellaneous seeds oil mills (except grape seeds).....	RS	2
33	Grape seed oil extraction.....	RS	2
34	Oil cake grinding.....	1	2
35	Margarine factories.....	1	2
36	Sweetened concentrated milk or milk powder factories.....	1	2
37	Dairy industries, butter factories, cheese factories.....	1	2
38	Tinned food and salt meat. Canned fruit and vegetables (with or without drying). Industrial delicatessen.....	1	2
39	Fish industry.....	1	2
40	Slaughterhouses.....	1	2
41	Artificial ice factories.....	1	2
42	Degreening. Ripening. Fruit and vegetable ripening room.....	1	2
43	Storage in silos	S.O.	R.S.

## Section C

### Textile industries

		RISK CATEGORY	
		Activity	Storage
	All the spinning preparation workshops shall be classified in category 1.....		
01	Hemp, jute, linen and/or cotton cloth fraying (without oily rags).....	1	2
02	Cotton wool, nappy pants and derived items factory.....	1	2
03	Cotton waste traders.....	1	2
04	Sheep skin pulling (with or without wool washers). Wool washers (without sheep skin pulling). Chemical wool picking.....	1	2
05	Manufacturing of dressings.....	1	2
06	Jute spinnings.....	1	2 <sup>1</sup>
07	Cotton spinnings.....	1	2 <sup>1</sup>
08	Glass weaving.....	1	1
09	Carpet with coating factories.....	2	2
10	Coating, sizing or printing of fabrics or paper.....	1	2
11	Fabric singeing.....	1	2
12	Waterproofing of canvas sheets.....	1	2

<sup>1</sup> The case of the jute or cotton warehouses shall be the subject of a special survey because of the dangers for the strength of the construction resulting from the water absorption by the raw material.

13	Oilclothes, linoleum.....	1 Activity	2 Storage
14	Any other natural fibre industry (silk, wool, jute, cotton, linen, hemp and other plants, etc.).....	1	2
15	Any other mixed or synthetic fibres industry .....	1	2

**Section D**

Clothes and accessories. Hides and skins

		RISK CATEGORY	
		Activity	Storage
01	Manufacture of clothes, corsets, lingerie, with or without retail sale.....	1	2 <sup>1</sup>
02	Furriers, with clothing work .....	1	2
03	Fabric or skin glove factories.....	1	2
04	Factories for woollen felt hats, fur felt hats, silk hats, of berets. Makers of straw hats .....	1	2
05	Cobblers. Bookmakers. Saddlers.....	1	2
06	Factories of footwear, except rubber or plastic items (Cf. section L) .....	1	2
07	Factories of blankets.....	1	2
08	Factories of quilts and linings for clothes and headgear, wadded clothes, with use of wadding, kapok, wool, down or cellulose or synthetic fibres.....	1 <sup>2</sup>	2
09	Factories of mattresses (with or without springs), disinfection, cleaning and repair of mattresses consisting of wool, horsehair, kapok, artificial or synthetic fibres and other textile materials. Seat upholsterers with mechanical tools.....	1 <sup>2</sup>	2 <sup>3</sup>
10	Umbrella factories.....	1	1
11	Belt, tarpaulin, sail for navigation, bag and miscellaneous fabric object factories.....	1	2
12	Button, rosary factories.....	1	1
13	Linen laundry and ironing .....	1	2
14	Dry cleaners-degreasers.....	1	2
15	Ornamental, finery feathers and feathers for bedding and continental quilt .....	1	2
16	Artificial flower factories .....	1	2
17	Tanneries, currying plants, tawdriest.....	1	2
18	Chamois leather .....	1	2
19	Skin seasons for furriery and fur .....	1	2
20	Varnished leather factories.....	1	2
21	Shoe ankle factories .....	1	2
22	Manufacture leather goods, saddlery, leather or plastic travel goods, miscellaneous leather objects .....	1	2
23	Skin dyeing .....	1	2

<sup>1</sup> 3 for plastic or cellular rubber rolls.

<sup>2</sup> 2 if use of cellular plastics.

<sup>3</sup> 3 if cellular plastics are used.

**Section E**

Timber industry. Cork. Cabinetwork. Basketwork

		RISK CATEGORY	
		Activity	Storage
01	Round sawmills (excluding forest sawmills). Mechanical wood work (not classified elsewhere). Wood work shops without mechanical tools.....	1	2
02	Particle board, reconstituted wood, chip-based moulded wood, sawdust, flax anas or similar materials factories. Wood fibre panel factories.....	2	2
03	Trunk makers-packers, wooden pallet factory.....	2	2-3 <sup>1</sup>
04	Wooden barrel factory.....	1	2
05	Slicing and rotary cutting of veneer, plywood factories.....	1	2
06	Wood modelling flour factories.....	1	2
07	Cork preparation (raw cork processing). Cork stopper factories Agglomerated corks, with all crushing, grinding, trituration, sieving operations with classification and assembly of cork board, with or without manufacture, machining of agglomerated cork.....	2	2
08	Items from Saint-Claude. Hardened wood items.....	1	1
09	Basketwork.....	1	2
10	Brushes, brooms.....	1	2

**Section F**

Metallurgical and mechanical industries

		RISK CATEGORY	
		Activity	Storage
01	Metallurgy, foundry.....	1	1
02	Shaping, machine work, machining, fitting and assembly of metals.....	1	1
03	Electrolytic applications, galvanizing, nickel plating, chromium plating, tin plating, metallizing, phosphating and polishing of metals.....	1	1
04	Enamelling. Painting. Metal printing.....	1	1
05	Asphalting of metal objects.....	1	1
06	Aircraft manufacture or assembly.....	RS	RS
07	Car factories.....	2	2 <sup>2</sup>
08	Vehicle bodies - all types.....	2	2 <sup>2</sup>

<sup>1</sup> 3 if the storage units have a floor area greater than 150 m<sup>2</sup>.

<sup>2</sup> According to the stored goods.

		Activity	Storage
09	Metallic paper factories (aluminium, tin) .....	1	1
10	Precious metal refineries .....	1	1
11	Jewellery, goldsmith's and silversmith's .....	1	1

## Section G

### Electrical industries

		RISK CATEGORY	
		Activity	Storage
01	Television and broadcasting transmitting stations. Microwave relay stations .....	1	SO
02	Manufacture, assembly and repair of industrial electro technical equipment and of high, medium and low voltage equipment.....	1	2
03	Manufacture, assembly and repair of electrical low voltage household equipment, portable and/or electrical household appliances, consumer electronics .....	1	2
04	Manufacture, assembly and repair of radio or low current electronic instruments, and/or of electrical or electronic measuring equipment and devices .....	1	2
05	Manufacture of electronic components (transistors, resistors integrated circuits, etc.) and of electrical components for low currents (oscillating circuits, etc.) .....	1	2
06	Accumulators (factories for) .....	1	2
07	Dry cells (factories for) .....	1	2
08	Incandescent lamp and/or fluorescent lamps or tubular lightings	1	1
09	Factories of wires and electrical cables .....	1	2

## Section H

### Lime. Cement. Ceramics. Glassware

		RISK CATEGORY	
		Activity	Storage
01	Manufacture of lime, plaster, cement, lime mills, plaster, limestone, phosphates or cement clinker .....	1	1
02	Cooking of pebbles, crushing and mechanical preparation of pebbles, earth, ochre, miscellaneous ores .....	1	1
03	Factories of cement mouldings and blocks, factories of sand-lime products.....	1	1
04	Artificial marble factories, marble or quarry stone sawmills .....	1	1
05	Brickworks and tile factories .....	1	1

		Activity	Storage
06	Earthenware, pottery, porcelain, stoneware, vitrified tile, refractory products, ceramics painters/enamellers.....	1	1
07	Glass and mirror factories (hot glass blowing and shaping) .....	1	1
08	Pharmaceutical ampule factories.....	1	1
09	Mirror factories.....	1	1

## Section I

### Mineral chemical industry

SHALL UNDERGO RS PROCESSING IN PARTICULAR:

#### **01- manufacture and storage of miscellaneous chemical products**

(chlorine, chlor-alkalis, hypochlorites, chlorates et perchlorates (by cold electrolysis), sulphuric acid, hydrochloric acid, alkali sulphates, metal sulphates, soda, potash, synthetic ammonia, ammonia, ammonium sulphate, ammonium nitrate sulphate, calcium cyanamide, sodium nitrate, niter, salpetre factories, salpetre refineries, nitric acid, ammonium nitrate, nitrates of ammonia, sodium nitrate, niter, superphosphates and compound fertilizers, liquid air, oxygen, nitrogen, carbon dioxide, sulphur, carbon bisulphide, calcium carbide, alum, copper acetate, etc.)

#### **02-Household refuse processing**

EXCEPT:

		RISK CATEGORY	
		Activity	Storage
03	Matches.....	2	2

## Section J

### Products of animal origin and fatty substances

SHALL UNDERGO RS PROCESSING IN PARTICULAR:

- 01 Processing of miscellaneous animal materials
- 02 Degas, animal oils and fats
- 03 Bone degreasing
- 04 Animal black
- 05 Suet foundries
- 06 Casein factories
- 07 Stearing manufactures with or without candle manufacture
- 08 Stearic candles
- 09 Glue and gelatine factories
- 10 Albumin

EXCEPT:

		RISK CATEGORY	
		Activity	Storage
11	Soap factories .....	1	1
12	Glycerine purification .....	1	2

## Section K

### Pigments and colours, paints. Varnishes and inks, cleaning products

		RISK CATEGORY	
		Activity	Storage
01	Metallic pigments .....	1	1
02	Mineral pigments.....	1	1
03	Vegetable colours.....	1	1
04	Lacquers and synthetic organic colourings (artificial colours) Factories of paints, varnishes and/or inks with natural or synthetic resins, with cellulose (other than nitrocellulose lacquers), with bitumen, with tar or with latex, oil varnishes .....	RS	RS
05	Organic-based paint and ink factories.....	1	2
06	Cellulose lacquer and paint factories .....	RS	RS
07	Water-based paint and emulsion ink factories.....	1	1
08	Polish or wax polish.....	RS	2

## Section L

### Waxes. Resins. Rubber. Plastics.

		RISK CATEGORY	
		Activity	Storage
01	Waxes, candles and wax candles .....	1	2
02	Natural resin .....	2	2
03	Manufacture of raw materials for plastic objects (pellets).....	2	2
04	Polymerization and processing of cellular plastics.....	2	3
05	Processing of non cellular plastics .....	1	2
06	Horn, mother-of-pearl, tortoiseshell, ivory, bone work Factories of objects made of these materials except buttons	1	2
07	Factories of spectacle frames, without manufacture of raw materials.....	1	2
08	Processing of natural or synthetic rubber, gutta-percha, ebonite (with the exception of synthetic rubber factories - tyres and inner tubes).....	2	2 <sup>1</sup>

<sup>1</sup> 3 if cellular rubber is used.

		Activity	Storage
09	Manufacture of synthetic rubber and latex (Buna, Perfuming, Neoprene, Butyl rubber, Thiokol, Hyperion, silicone or fluorinated lassoers, etc.) .....	RS	2 <sup>1</sup>
10	Envelope and inner tube for tyres factories.....	2	RS

## Section M

### Solid, liquid, gaseous fuels

		RISK CATEGORY	
		Activity	Storage
01	Fuel mines (surface installations). Hard-coal briquettes. Retort carbon or petroleum coke electrodes and brushes (without manufacture of raw materials). Graphite processing. Coal spraying. Peat.....	RS	RS
02	Wood carbonisation and distillation workshops. Storage.....	2	RS
03	Drill rigs. Collection centres, production centres, wells in use .....	RS	RS
04	Petroleum refineries.....	RS	RS
05	Hydrocarbon, acetylene, combustible liquid and gas warehouses, stores and supplies .....	RS	RS
06	Synthetic gasoline. Mixtures, processing of heavy mineral oils. Regeneration of used mineral oils .....	RS	RS
07	Alcohol warehouses, stores and supplies.....	SO	RS
08	Aerosol container filling and storage workshops.....	RS	RS
09	Coal gas plants, coke ovens, water gas. Coal tar distillation .....	RS	RS
10	Processing and/or mixture of tars, bitumen, asphalt and emulsions for roads.....	RS	RS
11	Production and filling of acetylene cylinders. Town gas or natural gas compression stations .....	RS	RS

## Section N

### Chemical products not classified elsewhere

		RISK CATEGORY	
		Activity	Storage
01	Tanning and dyeing extracts .....	RS	RS
02	Starch mills and starch manufacture. Dextrin plants. Glucose industries..	1	1

<sup>1</sup> 3 if cellular rubber is used.

		Activity	Storage
03	Black powder, smokeless powder, etc. factories Explosive factories. Manufacture of fulminate, lead aside, primers, detonators, blasting caps. Cartridges for portable firearms factories .....	RS	RS
04	War ammunition loading workshops, fireworks factories.....	RS	RS
05	Aromatic plant and flower scent extraction .....	RS	2 <sup>1</sup>
06	Perfume industries (manufacture and packaging) .....	RS	2 <sup>1</sup>
07	Pharmaceutical products manufacture laboratories .....	RS	2
08	Film, sensitive plate, photo paper factories.....	1	2
09	Factories of chemical products not classified elsewhere.....	RS	RS

## Section O

### Wood pulp. Paper and cardboard. Printing. Book industry

		RISK CATEGORY	
		Activity	Storage
01	Papermaking pulp factories without paper or kraft paper manufacture.	1	2 <sup>2</sup>
02	Paper mills .....	1	2 <sup>2</sup>
03	Cardboard mills.....	1	2 <sup>2</sup>
04	Paper shaping .....	1	2 <sup>2</sup>
05	Cardboard shaping .....	1	2 <sup>2</sup>
06	Manufacturers of asphalt paper or tarred felt, or of imitation linoleum.....	1	2 <sup>2</sup>
07	Photo-engraving. Photo-engravers for printing without photo-engraving	1	2
08	Printing works without photogravure or flexogravure .....	1	2 <sup>2</sup>
09	Printing works with photogravure or flexogravure .....	1	2 <sup>2</sup>
10	Assemblers, book binders .....	1	2

## Section P

### Show business

		RISK CATEGORY	
		Activity	Storage
01	Theatres: .....	see chapter ERP	
02	Scene docks or workshops, .....	1	2
03	Movie theatres:.....	see chapter ERP	
04	Development, printing laboratories, work on films .....	1	2

<sup>1</sup> RS if storage in tank.

<sup>2</sup> RS if paper reels are stored vertically

		Activity	Storage
05	Film studios, television and broadcasting studios, recording studios.....	1	2
06	Film renters and distributors.....	1	2
07	Photographers, with or without studios or laboratories.....	1	2

**Section Q**

Transportation industries

		RISK CATEGORY	
		Activity	Storage
01	Garages and car repair workshops.....	1	2
02	Parking garages.....	1	SO
03	Service station, accessories equipment spare parts and products store for the car industry.....	1	2
04	Transportation companies, forwarding agents, trucking and furniture removal.....	1	2
05	Depots, sheds and garages for streetcars and electrical railways, or trolleys buses.....	1	2
06	Hangars for aircraft, helicopters, etc. ....	RS	RS
07	Ship repair and construction yards.....	RS	RS
08	Sheds and garages for pleasure crafts with or without repair shop.....	1	2

**Section R**

Stores Warehouses and other sites

		RISK CATEGORY	
		Activity	Storage
01	Shopping centres with multiple shops.....	see chapter ERP	
02	shopping malls.....	see chapter ERP	
03	Drugstores.....	see chapter ERP	
04	Grocery wholesale or retail stores.....	see chapter ERP	
05	Wholesale and retail-wholesale merchant, without retail sale of fabrics, draperies, silk, velvet, hosiery, haberdashery, passementerie, embroideries, ribbons, tulle and laces.....	1 (see ERP for store)	2
06	Fur stores and warehouses.....	1 (see ERP for store)	2
07	Clothes stores, clothing accessories, lingerie, not including clothes making factories.....	see chapter ERP	
08	Dry goods stores and general stores, sports equipment stores, supermarkets.....	see chapter ERP	

	Activity	Storage
09 Furniture and home furnishings stores, with or without small repair workshops, but without any mechanical tools for wood work .....	1 (see ERP for store)	2
10 Rag merchant.....	1	2
11 Packing centres and stores, all types	1 (see ERP for Store)	2-3 <sup>1</sup>
12 Hardware and DIY stores and stores for light finishing materials....	see chapter ERP	
13 Wood merchants without log sale.....	1	2
14 Charcoal warehouses .....	1	1
15 Market stations .....	see chapter ERP	
16 Warehouses, public stores, general stores: .....	1 (see ERP for Store)	2
17 Refrigerated warehouses .....	2	2
18 Shows/Fairs .....	see chapter ERP	

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<sup>1</sup> 3 if cellular plastic packages.

## **APPENDIX 2**

### **Example**

The required flow rate in the case of a shop for the manufacture of toys by plastic injection is determined using table 3 below.

<b>SHORT DESCRIPTION OF RISK</b>				
Shop for the manufacture of toys by plastic injection (appendix 1 section L05) Shop surface: 6 000 m <sup>2</sup> - Storage: 5300 m <sup>2</sup> on 6m high – Fire resistance wall 2 hours between shop and storage – Around the clock reception- Sprinkler - Frame SF 30 minutes				
CRITERION	ADDITIONAL COEFFICIENTS	COEFFICIENTS CHOSEN FOR THE CALCULATION		COMMENTS
<b>STORAGE HEIGHT</b> <sup>(1)</sup> - Up to 3 m - Up to 8 m - Up to 12m - Beyond 12m	0 + 0.1 + 0.2 + 0.5	Activity  0	Storage  + 0.1	
<b>BUILDING TYPE</b> <sup>(2)</sup> - fire resistant frame ≥ 1 hour - fire resistant frame ≥ 30 minutes - fire resistant frame < 30 minutes	- 0.1 0 + 0.1	0	0	
<b>INTERNAL INTERVENTION TYPES</b> - round the clock reception (permanent presence at the entrance) - generalized DAI reported twenty four seven with remote monitoring or to the emergency set round the clock when there are call instructions. - fire safety service round the clock with suitable facilities second intervention team, in a position to intervene round the clock)	- 0.1  - 0.1  - 0.3 *	- 0.1	- 0.1	
<b>Σ coefficients</b>		- 0.1	0	
<b>1 + Σ coefficients</b>		0.9	1	
<b>Reference surface (S in m<sup>2</sup>)</b>		6000	5300	
<b>Qi = 30 x <math>\frac{S}{500}</math> x (1+ Σ Coef)</b> <sup>(3)</sup>		324	318	
<b>Catégorie de risque</b> <sup>(4)</sup> Risk 1: Q1 = Qi x 1 Risk 2: Q2 = Qi x 1,5 Risk 3: Q3 = Qi x 2		324	478	Section L 05
<b>Sprinkled risk</b> <sup>(5)</sup> Q1,Q2 or Q3 ÷ 2		160	238	
<b>REQUIRED FLOW RATE</b> <sup>(6) (7)</sup> (Q in m <sup>3</sup> /h)		<b>240</b>		
<p><sup>(1)</sup> Without other details, the storage height shall be considered as being equal to the building height minus 1 m (case of warehouses).</p> <p><sup>(2)</sup> For this coefficient, ignore the sprinkler.</p> <p><sup>(3)</sup> Qi: intermediate calculation flow rate m<sup>3</sup>/h.</p> <p><sup>(4)</sup> The risk category depends on the storage and activity classification.</p> <p><sup>(5)</sup> A risk is regarded as sprinkled if: - autonomous, complete and sized protection depending on the nature of the storage and actual activity under operating conditions according to good engineering practice and existing references; - regularly maintained and checked installation; - permanently in service installation.</p> <p><sup>(6)</sup> No flow rate may be less than 60 m<sup>3</sup>/h.</p> <p><sup>(7)</sup> The water quantity necessary on the pressure system (cf. § 5 paragraph 5) shall be distributed by fire hydrants located at less than 100 m from the entrances of each of the building cells with a maximum distance between them of 150 m .</p> <p>* if this coefficient is chosen, ignore that of the round the clock reception.</p>				