

“Capacity Building and Strengthening Institutional Arrangement”

Workshop: Quantitative risk assessment of oil and gas plants“

# **EU and Italian Standards for Oil and Gas Major Hazards**

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## Industrial Risk

The concomitant presence of industrial activities and the use of dangerous chemical substances may originate accidents with high consequence for human health and environmental features

Event	Consequence
Fire	Heat, toxic and corrosive gases diffusion;
Esplosion	Pressure, Heat, toxic and corrosive gases diffusion; generazione di proiettili
Toxic substances release	environmantal contamination

Consequences with higher magnitude are generally located near source of event but dangerous effect occur also outside the establishment in the neighboring areas.

## Industrial risk

All Modern Countries have applied, in the past, regulation aimed to ensure major hazard industrial activities to be performed satisfying as more as possible safety conditions for human health and environment in all its components. (European Ref. : Directives n. 82/501 and n. 96/82/CE)

Italian regulations (Legislative Decree 1999 nr. 334 Seveso-II) provide industrial activities operators with a strictly rules system aimed to risk assessment and reduction.

Operators of industrial activities which might generate accidents with high consequences must communicate to authorities a sheet in which information on risks, caution, and prevention actions are described.

## EU Directive “Seveso II”

It provide rules to all those subjects that storage a certain amount of dangerous substances overriding well-fixed thresholds.

Two Threshold levels have been identified whose overriding involve two different procedure to be carried out by operators Articles Nr. 6/7 and article Nr. 8

All the operators involved are required to send notification, implement an effective Safety Management System and explicit their Major Accidents Prevention Policy.

Those operators subjected to Article Nr. 8 are required to produce a Safety Report (SR) to submit to competent authorities for verification.

## EU Directive “Seveso II”

Give more importance to management system factors as cause of major accidents to be occurred.

Local Authorities are required to enforce controls on urban development in areas close to the establishments by means specific tools aimed to limit land-use inside impact areas.

Give a specific “role” to people involved in decisional processes regarding the location of new establishment or modification to existing ones.

## The legislative decree 1999, Nr. 334.

Italy has completely implemented the directive 96/82EC in its regulation, integrating it with the pre-existent one. The Italian reference rule is the legislative decree august 17, 1999, n. 334.

In this rule quotation is made to Annexes I, II, III, IV and VI to the directive 96/82/EC (without any modification), as minimum criteria. With regard the Annex V “ *Items of information to be communicated to the public as defined by article 13 (1)*” the Italy implementation provides for the “Information sheet regarding the relevant risk hazards for the population and the workers”, as an operational tool, edited by the managers and distributed by the mayors.

Moreover, in the implementation the following specific features are included:

- industrial ports;
- establishments subjected to the previous regulation but not included in the annex I;
- areas with high concentration of establishments.

## The enforcement decrees

The Italy implementation calls for the issue of a series of enforcement decrees, fixing criteria and procedures to be followed in fulfilling the relevant obligations and in putting into effect the control measures.

Specifically, the following enforcement decrees are actually in force, stating:

- criteria for the drawing up of the MAPP and actuation of the SMS;
- criteria for the identification of the modifications increasing the risk;
- link with the procedures for fire prevention;
- criteria for land-use planning;
- criteria for the application of the regulation to the industrial ports;
- criteria for the drawing up of the Safety Reports (at present, issued in accordance to Seveso I);
- criteria for the drawing up of the EEP (at present, issued in accordance to Seveso I).

## Enforcement decrees in preparation

For the time being, awaiting the relevant enforcement decrees, technical guidelines are provided, indicating the criteria for the inspections on MAPP and SMS, and the general criteria for integrated safety studies in the areas with high concentration of establishments (for instance, the Syracuse area).

Some enforcement decrees are actually in preparation, regarding:

- update of criteria for the drawing up of the Safety Reports;
- update of criteria for the drawing up of the EEP (external emergency plans);
- criteria for the identification of the domino effects;
- criteria for the drawing up of integrated safety studies in the areas with high concentration of establishments;
- regulation of charges to be applied for the control activities

## The enforcement decree regarding the Safety Management System.

As laid down in article 7 of the directive, the regulation requires *inter alia* the operators to set up in a specific document their “Major Accident Prevention Policy” (MAPP) and to properly actuate the “Safety Management System” (SMS).

This measure contains a guideline to be satisfied in implementing the SMS, with a structure consistent with the indications in Annex III to the directive.

Concerning the technical elements of the SMS, inspiration has been drawn from the national technical codes (UNI), representing in this field an already properly structured and consolidated precedent.

## Major accidents prevention policy.

The decree is subdivided in:

“Major accident prevention policy”, outlining the content of the document in a general way, while the actual formulation has to be set up by the operator, as a full representation of its own culture and attitude to the safety. Anyhow, the decree indicates the following as minimum content:

- the operator’s goals with respect to the prevention of major hazards;
- the general principles of the establishment policy;
- the eventual commitment to comply with technical standards, specific agreements, initiatives, etc.;
- the commitment to actuate and maintain a SMS, in accordance with the declared principles and able to assure the achievement of the declared safety goals;
- the criteria and programs followed in actuating the SMS.

## Structure of SMS and its general requirements.

“The structure of the SMS and its general requirements”, specifying the requirements to be fulfilled by the structure of the implemented SMS, in order to comply with the general indications in Annex III to the directive. The outline of this structure has been drawn up in order to fit also with ISO standards:

establishment management and policy;

organization;

planning;

measure of performances;

verification and re-examination.

The structural consistency with ISO standards enables the SMS to be thought up as a part of an Integrated Management System, taking up other different scopes: prevention of major hazards, safety at work, quality, environmental protection, etc.

## Technical contents of safety management systems.

“Technical contents of the safety management system”, extensively indicating the minimum requirements for all the specific technical elements in the SMS subdivision, as indicated by Annex III to the directive. The indications represent an outline of the problems to be dealt with, and in any case will not represent specific solutions; the operator shall decide by himself the best technical and organizational solutions.

## The decree concerning the modifications increasing the risk

An enforcement decree has been issued, in relation to the requirements laid down in article 10 of the directive. This decree indicates the criteria for the identification of the modifications of plants, deposits, industrial process or quantities and substances that may cause the increasing of the pre-existent level of the risk. Specifically, the following has been included:

criteria for the identification of the relevant modifications;

the procedures to be followed and the activities to be undertaken before a modification with increase of the risk may be actuated;

the procedures to be followed and the activities to be undertaken before a modification without increase of the risk may be actuated (essentially a link with fire prevention procedures).

## The decree concerning the modifications increasing the risk

To schematise, according to this decree, a modification may be considered in principle as increasing the risk if it involves an increase of:

- quantity of the single specified substances stated by Annex I, part 1;
- quantity of substances or dangerous preparations or addition of substances or dangerous preparations with the same classification from Annex I, part 1 and 2;
- greater than 25% of the plant or deposit hold-up, or greater than 20% on the single equipment or tank;
- the use of a dangerous substance not previously present, exceeding the threshold quantity in Annex I to the directive;
- the introduction of new typologies of possible accidents or a relevant increase of the consequences (likelihood and/or impact distances) of a possible accident, already quoted, with effect on the external emergency plan and/or on the information to the population;
- deactivation or reduction of functionality of auxiliary and safety systems.

## The decree concerning the link with the procedures for fire prevention

This decree has been thought up in order to simplify the obligations arising from the existence of a dual procedure: one in accomplishment of the "Seveso" directive and one more general for the fire prevention, applying to all establishments and industrial activities.

## The decree concerning the land-use planning.

This enforcement decree has been issued in order to provide criteria and procedures in accomplishment to article 12 of the directive.

According to the decree, the regions shall ensure the co-ordination of all the regulations regarding the land-use-planning and the relevant administrative actions, specifically linking these with the requirements set up by the enforcement decree.

In particular, the Authorities in charge to draw up the Provincial Territorial Development Plan and to implement it by the urbanistic tools shall verify in advance the compliance with the minimum safety requirements indicated by the decrees

The technical information necessary to perform this evaluation shall be indicated by the operator, in accordance to the safety analysis carried out in the safety reports (for upper tier establishments) or, in any case, as a part of the actuation of the SMS.

## The decree concerning the land-use planning.

This information includes the topographical representation of the areas of impact, relating to the four different standard levels of damage, indicated by the decree, and to the four standard ranges of likelihood in exceeding the threshold values.

Basing on such information, the competent Authorities shall:

- represent the site (establishment *plus* adjacent territory) on the technical and cadastral charts and identify the territorial and environmental vulnerable elements and eventual areas subjected to specific regulations;
- represent the geometrical overlay of the areas of impact level of damage and range of likelihood on technical and cadastral charts;
- analyse the overlay of the representations of the site and of the areas of impact;
- acquire the advice of all the interested parties;
- pronounce a decision about the compatibility, with eventual prescriptions;
- modify, if necessary, the territorial plan and/or the urbanistic tool.

## The decree concerning the industrial ports

Implementing one of the premises of the directive, concerning the activities linked with the transport to docks and piers, a decree has been issued with the aim of assuring for the industrial ports the same safety level as for "Seveso" establishments.

In particular, according to the decree, the Port Authority shall:

identify the establishments subjected to the directive and localized in the industrial port and the plants for the loading, discharge, tranship and deposit of dangerous substances;

draw up an Integrated Port Safety Report, with indication of the following:

- the major hazards due to the identified activities in the port area;
- accident analysis;
- the accidental scenarios for each identified top event;
- the technical systems, operational procedures and managerial provisions adopted in order to reduce the major accident hazards;
- the planning of eventual further interventions.

## The decree concerning the industrial ports

Carriers, as such, are considered in the study only as possible sources of hazard, being otherwise regulated and controlled.

Moreover, the Port Authority shall draw up a specific Port Emergency Plan, in accordance to the competent Authorities for the external emergency planning.

## Oil and gas storages ministerial decrees

**Criteria for analysis and evaluation of safety reports related to LPG and flammable liquid storages (related to “Seveso” I and to be up-dated)**

M.D. 15th May 1996 – LPG

M.D. 20th October 1998 – Flammable and/or toxic liquid

## M.D. 15th May 1996 – LPG

### **Art. 1**

Annex at this decree defines LPG Safety Reports analysis and evaluation criteria, which are guidelines for “istuttoria” activities ....  
Further analysis and details shall be realized, if necessary, during the authorities control procedure called “istruttoria” ....

## M.D. 15th May 1996 – LPG

### **Art. 2**

With successive official order by general directors, representative of Ministries in the Services Conference, further directives will be issued for regional technical Commettess...

## M.D. 15th May 1996 – LPG

ANNEX - Criteria for analysis and evaluation of safety reports related to LPG storages

APPENDIX I - Analysis of completeness and adequacy of the information included in Safety Report

## M.D. 15th May 1996 – LPG

APPENDIX II – Index-linked method for the categorization of LPG storages

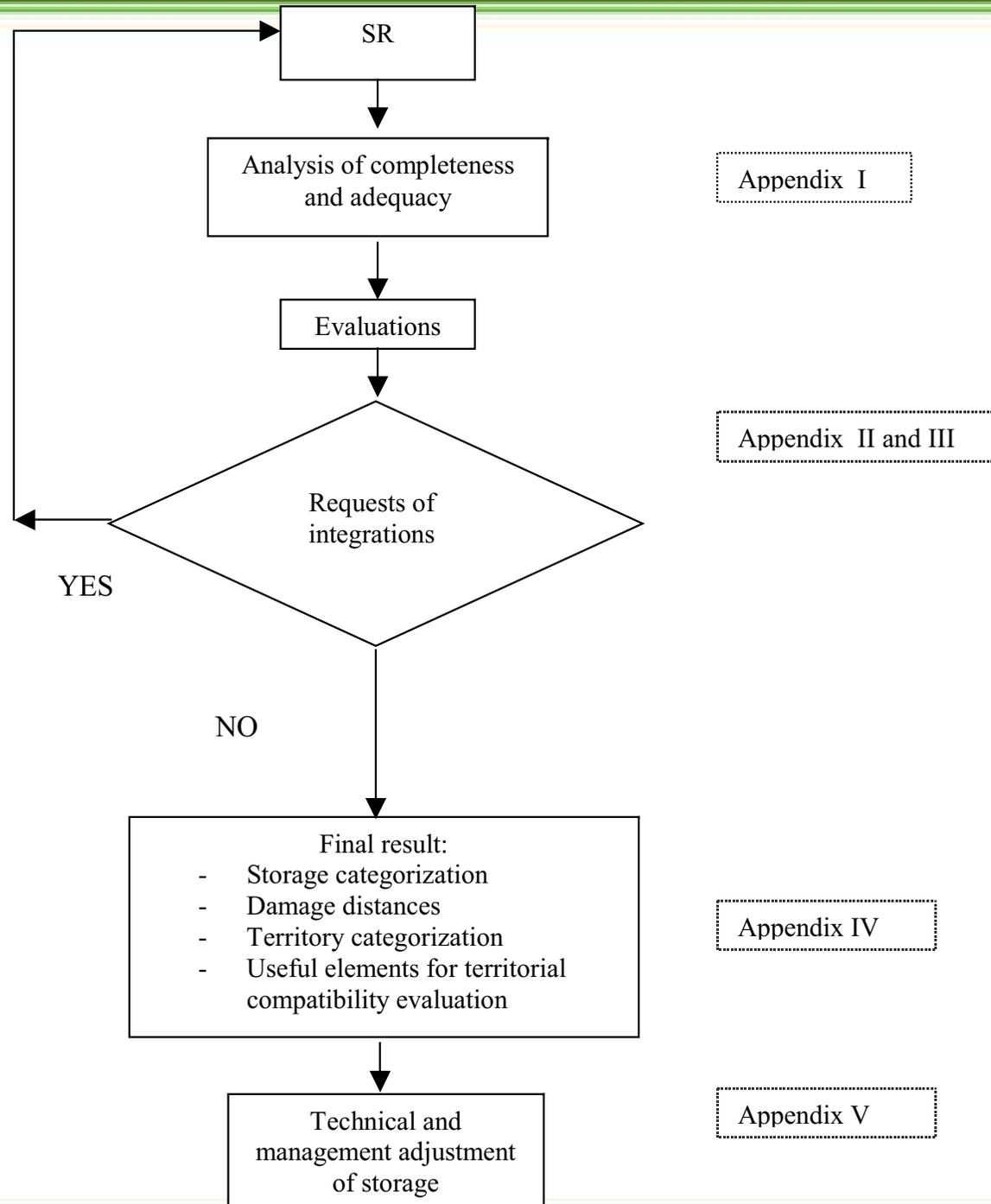
APPENDIX III – Method for analysis and evaluation of accidents in LPG storages

## M.D. 15th May 1996 – LPG

APPENDIX IV – Categorization of LPG storages and useful elements to evaluate their territorial compatibility

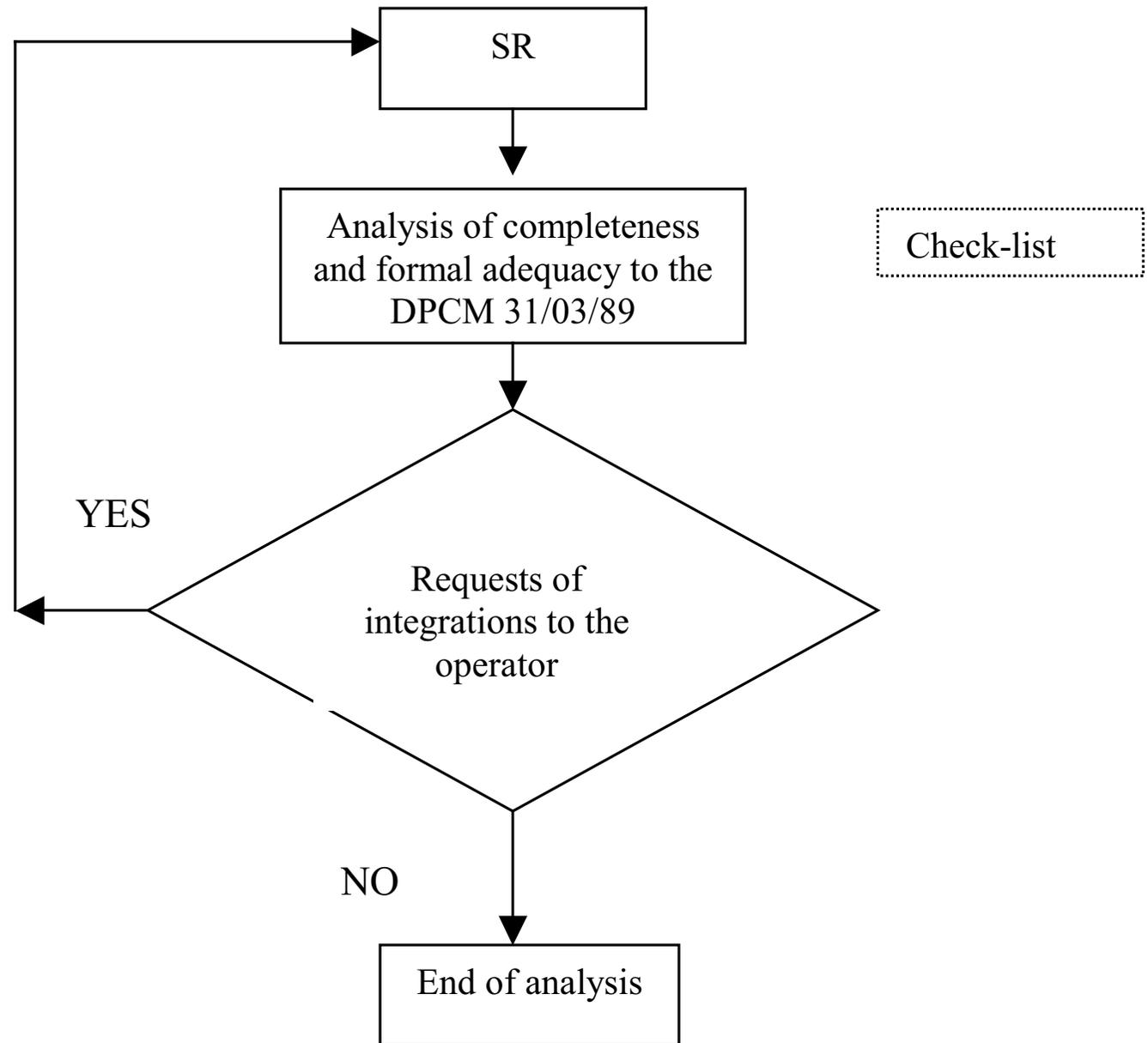
APPENDIX V – Adjustements of the storages

ANNEX:  
Criteria for  
analysis and  
evaluation of  
safety reports  
related to LPG  
storages  
*Analysis and  
evaluation  
conducted by  
Competent  
Authorities*



## Appendix I

**Analysis of completeness and adequacy of the information included in Safety Report**

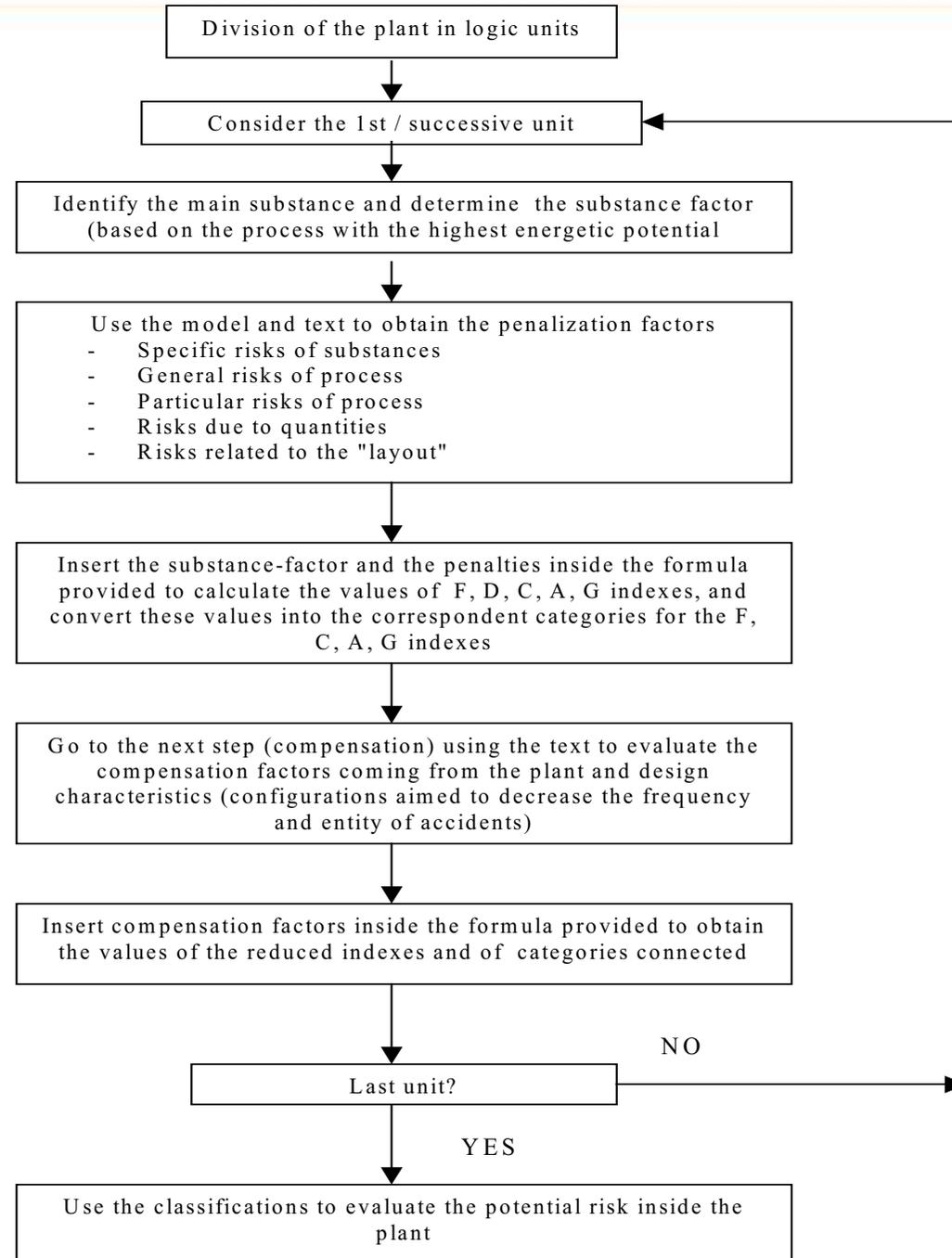


## Appendix II

### Index-linked method for the categorization of LPG storages

Initial evaluation

compensation



## Appendix III - Method for analysis and evaluation of accidents in LPG storages

Substances	Critical event	Initiating events	Accidents (*)	Localization/Components involved	Safety devices	Comments
LPG	Catastrophic rupture, instantaneous leak	Thermal collapse, thermal radiation exposure	BLEVE	Vessel	Underground or covered with tumulus tanks; fire resisting coating, according with specified law requirements	Not to be considered if vessel is: - underground, or covered with tumulus, tanks or - covered with fire resisting coating
LPG	Catastrophic rupture, instantaneous leak	Thermal collapse, thermal radiation exposure	BLEVE	Truck tank, wagon tank	Possible safety system: rapid remote interception system either in loading/unloading ramp or in truck/wagon tank.	Negligible even if loading/unloading ramps: - have fire resistant walls to protect truck/wagon tank from fire sources (fire resistant walls can be avoided if the operator can demonstrate that the thermal radiation load, caused by fire in nearby units, is $< 20\text{kW/m}^2$ ); - have a fixed cooling system (sprinklers); - do not have weight devices with spaces not provided of good ventilation systems and gas detectors; - rapid remote interception system either in loading/unloading ramp or in truck/wagon tank
LPG	Catastrophic rupture, instantaneous leak	Criogenic embrittlement, leak, ...	CVE	Vessel	Gas detectors, safety valves, operators supervision	To be considered in case BLEVE is avoided.
LPG	Catastrophic rupture, instantaneous leak	Criogenic embrittlement, leak, ...	CVE	Truck tank, wagon tank	Gas detectors, safety valves, operators supervision	To be considered in case BLEVE is avoided.
LPG	Leak, stationary thermal radiation	Major rupture	Jetfire Poolfire CVE	Vessel, pipe, pump, loading/unloading hose	Tanks, pipelines and pumps protection from impact of mobile vehicles;  Valves, gas detectors, operators supervision  for vessels: water injection system in emergency case	Negligible even if equivalent diameter is $> 4"$ in case all the following conditions are satisfied: - tanks, pipelines and pumps are completely protected from impact of mobile vehicles; - restriction of heavy loads lifting operations exists and access of crane trucks is allowed only after interception of interested pipelines; - specific procedures exist, in case of abnormal low temperature condition, that prescribe to put out of service the unit involved and to control all interested areas through radiographic, or equivalent, examination; - specific procedures exist to prevent excessive low temperature both during starting service and depressurisation conditions.  Jetfire, poolfire or CVE can occur depending on time of ignition
LPG	Instantaneous or continue leak, thermal radiation load	Major rupture, ignition	Flash-fire	Vessel, pipe, pump, loading/unloading hose		Impact area calculated according with cloud concentration $> 50\%$ LFL.

## Appendix III - Thresholds considered to evaluate the effects

Scenario	high lethality	starting lethality	irreversible lesions	reversible lesions	Damages to structures / domino effects
	1.	2.	3.	4.	5.
Fire (stationary thermal radiation)	12,5 kW/m <sup>2</sup>	7kW/m <sup>2</sup>	5 kW/m <sup>2</sup>	3 kW/m <sup>2</sup>	12,5 kW/m <sup>2</sup>
BLEVE/Fireball (variable thermal radiation)	fireball radius	350 kJ/m <sup>2</sup>	200 kJ/m <sup>2</sup>	125 kJ/m <sup>2</sup>	200-800 m(**)
Flash-fire (instantaneous thermal radiation)	LFL	1/2LFL			
VCE (overpressure)	0,3 bar (0,6 open spaces)	0,14 bar	0,07 bar	0,03 bar	0,3 bar
Toxic release (absorbed dose)	LC50 (30min,hmn)		IDLH		

## M.D. 15th May 1996 – LPG

APPENDIX IV – Categorization of LPG storages and useful elements to evaluate their territorial compatibility

Criteria to evacuate the territorial compatibility of the storage

## M.D. 15th May 1996 – LPG

### APPENDIX V – Adjustements of the storages

Illustration of general criteria to which Competent Authorities will have to refer in formulating of prescriptions and times, after the conclusion of SR evaluation (istruttoria). These criteria are oriented to obtain a gradual improvement of the general safety conditions leading the plant, as long as possible, to going on with its activity.

Specific indications for loading/unloadig procedure are included.

## **M.D. 20th October 1998 – Flammable and/or toxic liquid:**

Follow a procedure similar to LPG Decree.

It has been adopted for Release Tendency Index (RTI) set-up in the framework of environmental consequences assessment concerning hydrocarbons release in soil and ground water