

# TRR

## ENVIRONMENT AND SAFETY



*Industrial risk  
Analysis  
Seveso Directives*

*Safety and  
Health at  
work*



*ATEX  
risk analysis  
for explosive  
atmospheres*

*Fire prevention  
Firefighting engineering*



*Environmental  
Impact Assessment*



*IPPC Integrated  
Pollution Prevention  
and control*



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## TRR ACTIVITIES

### Risk Analysis

- ⇒ Risk indices analysis, failure mode and effect analysis (FMEA), hazard and operability analysis (HAZOP), fault and event trees analysis, individual and social risk analysis (Quantitative Risk Assessment-QRA)
- ⇒ Safety Report issue according to the present regulation (Seveso Directive) for Companies related to Major Accident Risk
- ⇒ Reliability, Availability, Maintenance and Safety
- ⇒ Safety Management Systems
- ⇒ Authorization for modification of industrial activities
- ⇒ Risk analysis for substances dangerous for the environment
- ⇒ Risk analysis for the design of a liquefied hydrogen storage inside a major accident hazard area
- ⇒ Risk management for the evaluation of the acceptability of potential risk or the need to increase safety level

### Land Planning

- ⇒ Planning Maps for the definition of new productive installations and identification of new urban areas in hinterland and industrial areas that generate major accidental risks
- ⇒ Territorial analysis of rail and road transport of dangerous substances
- ⇒ Risk analysis tied to navigation in ports or canals
- ⇒ Consultancy for the setting-up of technical studies of major accidental risk regarding territorial planning

### Fire Prevention

- ⇒ Design of fire fighting systems and nets for industrial sites, storage of dangerous materials, commercial buildings, public building
- ⇒ Evaluation of the real amount of extinguishing and cooling water needed for each accidental scenario
- ⇒ Designs water barriers or water walls
- ⇒ Theoretical simulation and verification of fire fighting nets by using US EPANET Software
- ⇒ Measuring of real flow rates in pipes by using Controlotron 1010 instrument
- ⇒ Engineering approach to fire fighting design

### Training

- ⇒ Safety procedures to be followed in normal and emergency operations
- ⇒ Special safety interventions (gas free operations, confined spaces, etc.)
- ⇒ Courses for Safety Management Systems
- ⇒ Courses for risk analysis for technicians that operate in private and public sectors
- ⇒ Courses for public authorities regarding application of new or incoming regulations and European directives

### Health and Safety at Work

- ⇒ Developing and applying a Prevention and Protection system
- ⇒ Emergency Response Plan
- ⇒ Evacuation Plan
- ⇒ Evaluation of Fire Risks
- ⇒ Evaluation of potentially Explosive Atmospheres risk (AtEx)
- ⇒ Evaluation of chemical and biological agents risk
- ⇒ Evaluation of Temporary construction site risk
- ⇒ Preparation of safety plan manual and HSE Manuals for construction and operations, SIMOPS manual for commissioning (international activities)
- ⇒ Coordination procedures in design and construction activities
- ⇒ Support during inspection by authorities

### Environment

- ⇒ EIA (Environmental Impact Assessment)
- ⇒ IPPC (Integrated Pollution Prevention Control)
- ⇒ Study of soil reclamation of contaminated sites
- ⇒ Environmental Management System and Auditing
- ⇒ DAPHNIA; identification of the level of risk generated by the use of dangerous substances in the environment

### Software

- ⇒ TRANSIT © Modelling of risk related to the transportation of dangerous substances
- ⇒ SAFESTARE © Simulating of physical effects of incidental scenarios
- ⇒ TANKFIRE © Design of fire fighting sprinkler systems for the protection of storage tanks
- ⇒ EFFECTS 7.5 Calculation of the undesirable release of hazardous substances (TNO Software)
- ⇒ COLLISION© risk analysis of transportation of dangerous substances in ports, canals and rivers
- ⇒ Others US EPA, SHELL Research, RM Consultant

# TRR

## ***ENVIRONMENT, HEALTH & SAFETY***



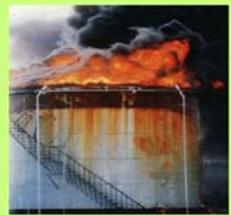
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TRR has been operating since 1984 in the fields of Industrial Safety, Reliability, Occupational Safety, Environment Protection, Land Planning and Use.

TRR keeps constantly updated its methodologies, procedures, software, data-base, at high innovative content in compliance with the development of European regulation and technical innovation.

Our experience gained in this fields over the years put us in a position to cooperate with Public Authorities and Companies to satisfy any exigency.

Founded in 1984. In 1991 it changed its denomination into "TRR S.r.l." (Technology, Risk, Research); President is Alfredo Romano.

“Risk analysis” includes:

- ⇒ Risk assessment: identify sources of potential harm/damage, assess the likelihood and the consequences it may cause.
- ⇒ Risk management: evaluates the acceptability of potential risk or the need to increase safety level; identifies and implements strategies to be taken for controlling risks.
- ⇒ Risk communication: involves an interactive dialogue between Company management, authorities, risk analysts and citizens.

Risk Analysis is of main importance during life cycle of plants: Design, Authorization process (for example in safety report required by Seveso Directives), Construction, Operation (Operational Manuals and Safety Procedures) Emergency Plans and Procedures, Land planning.

TRR experience covers the following fields:

- ⇒ Hydrocarbons extraction, refining and elaboration in petrochemical plants
- ⇒ Organic and inorganic chemical plants
- ⇒ Storage of dangerous materials
- ⇒ Transport of dangerous goods (i.e. LPG, LNG, Ammonia, hydrogen, and so on) by road, railway, pipeline, ship, ...
- ⇒ Combustion plants and waste incineration
- ⇒ Foundries, ferrous and non ferrous metal processing
- ⇒ Pulp and paper industries

The techniques TRR uses for risk analysis are:

- ⇒ Risk Indices Analysis
- ⇒ Reliability, Availability, Maintenance and Safety
- ⇒ Failure Modes and Effects Analysis (FMEA)
- ⇒ Hazard and operability analysis
- ⇒ Fault and Event Tree Analysis (FTA)
- ⇒ Individual and Social Risk

The instruments used by TRR for the evaluation of accidental scenarios consequences are:

- ⇒ TNO Effects 7.5
- ⇒ EPA Aloha 5.4.1 (Areal Locations of Hazardous Atmospheres)
- ⇒ EPA HSSM (Hydrocarbon Screen Spilling Model)
- ⇒ SHELL HGSsystem (Heavy Gas dispersion)

#### Liquefied Hydrogen storage

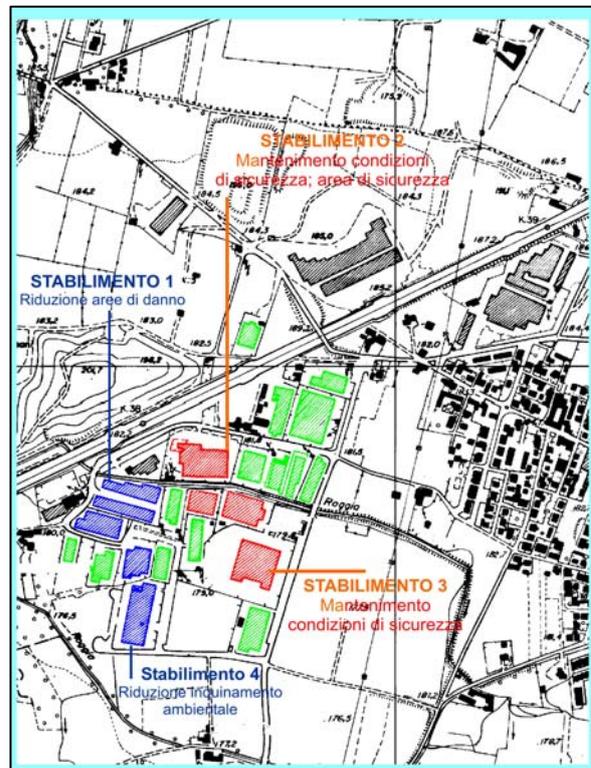
TRR has applied risk analysis to the design of a liquefied hydrogen storage inside a major accident hazard area according to NFPA 50B; French technical norms and international standards.

TRR activities include territorial planning for the integrated development of the environment and risk analysis for airports, railways, motorways and shipping networks.

TRR long experience in risk analysis and in transport of dangerous substances, allows TRR to offer consultancy services for local Authorities regarding the territorial planning, where major accident risks are present in plants and in transportation.

#### *Type of intervention*

- Planning Maps for the definition of new productive installations and identification of new urban areas in hinterland and industrial areas that generate major accidental risks
- territorial analysis of rail and road transport of dangerous substances
- risk analysis tied to navigation in ports or canals, in order to optimize the routes and thus minimize the risk of ships collision
- Environmental Impact Assessment and Risk analysis of industrial ports and maritime terminals
- consultancy for the setting-up of technical studies of major accidental risk regarding territorial planning.

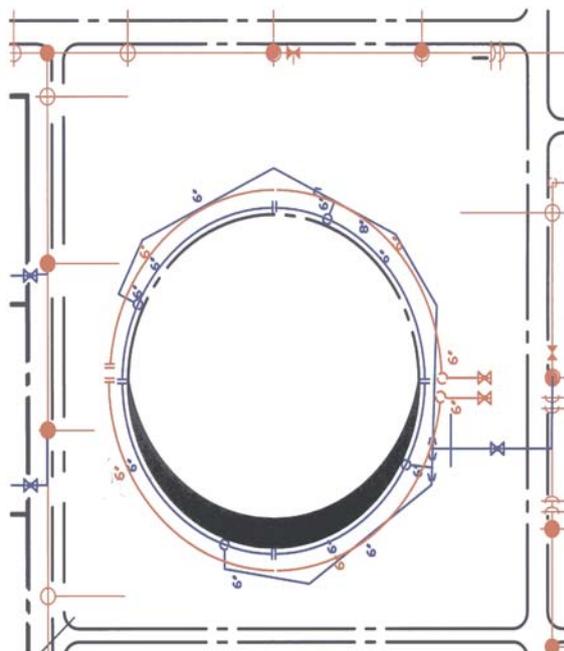


TRR designs fire fighting systems and nets for industrial sites, storage of dangerous materials, commercial buildings, public building such as hospitals, schools, offices and so on according to international standard, technical regulations and local laws.

During design TRR takes into account the results of risk analysis to evaluate the real amount of extinguishing and cooling water needed for each accidental scenario.

TRR also designs water barriers or water walls in order to prevent the diffusion of flammable or toxic gases, such as LPG, HF and so on.

TRR uses US EPANET or other specialized software to theoretically simulate and verify fire fighting nets; the model can then be tuned in by measuring real flow rates in pipes. The instrument used for these measurements is a modern Controlotron 1010.



*Engineering approach to fire fighting design*

TRR, using specific software, can realize a 3D simulation model for the development of a fire in a closed space (rooms, buildings, warehouse, etc.). On this basis it is possible to:

- ⇒ design structures in compliance with real fire exposure
- ⇒ check the adequacy of existing structures
- ⇒ design protection and extinguishing systems



TRR gives support to management for the development of Human Resources, with special emphasis on Safety procedures to be followed in normal and emergency operations.

Special skill is acquired by training on the job as well as managerial skills which require an up to date knowledge of all existing laws in force.

TRR thanks to the collaboration of experts in the Safety sector of Petrochemical Plants organizes courses for:

- ⇒ Fire fighting techniques
- ⇒ Emergency Procedures
- ⇒ Special safety interventions (gas free operations, confined spaces, etc.)

TRR also organizes courses for risk analysis for technicians that operate in private and public sectors.

Special attention is paid to risk analysis on the company plant.

TRR also organizes training courses for public authorities regarding application of new or incoming regulations and European directives (for example Seveso and IPPC directives).

## HEALTH & SAFETY AT WORK

Directive 89/391/EC (and successive modification and integration) gives criteria for assuring health and safety of workers and working environment for both private and public sectors.

TRR helps Companies in developing and applying a Prevention and Protection system geared to identify, evaluate and constantly reduce and control risk factors for the health and safety of workers.

Several companies with different level and kind of risk are dealt with. For example: chemical industries, refineries, LPG storage, workshop, hospitals, schools, municipal buildings, hotel complex and multi- storied buildings.

Safety in manufactories activities. TRR offers among other services:

- ⇒ Emergency Response Plan
- ⇒ Evacuation Plan
- ⇒ Evaluation of Fire Risks
- ⇒ Evaluation of potentially Explosive Atmospheres risk (AtEx)
- ⇒ Evaluation of chemical and biological agents risk

### *Emergency response and evacuation plan*

TRR is perhaps the only company in Italy that uses personnel with over 30 years of first hand experience in chemical and petrochemical plants, that allows us to take into account the real and not only the hypothetical risks.

### *Explosive Atmospheres risk (AtEx)*

TRR developed a methodology to assess the risk level connected to the potentially explosive atmospheres and to evaluate the acceptability of such risk for workers exposed, according to European directive 99/92/EC and European technical standard EN 60079-10.

### *Chemical and biological risk*

TRR developed a methodology to assess the chemical and biological risk and to evaluate the acceptability of risk according to European directive 98/24/EC and 93/88/EC.

### *Temporary construction site*

The services relating to safety analysis in temporary and mobile construction sites, industrial and similar, are accomplished by adhering to European Directive 92/57/EC and its local application.

The peculiar characteristic of the workplace, the relevance of the normal risks present around the site, the special different activities in the same area, the exigencies and necessities to handle

the personnel and specialists in compliance with the owner – imply the necessity to utilize the service of consultants, as those furnished by TRR which offers specialized training and constant up-dating of procedures for the quality of services. Such consultancy is furnished by making reference to models, algorithms, procedures, documents, informatics support – developed and improved by TRR taking as a base the experience and expertise matured in over 25 years of activities in the field of safety.

### Type of interventions

- ⇒ Preparation of safety plan manual
- ⇒ Coordination procedures in design and construction activities
- ⇒ Support during inspection by authorities

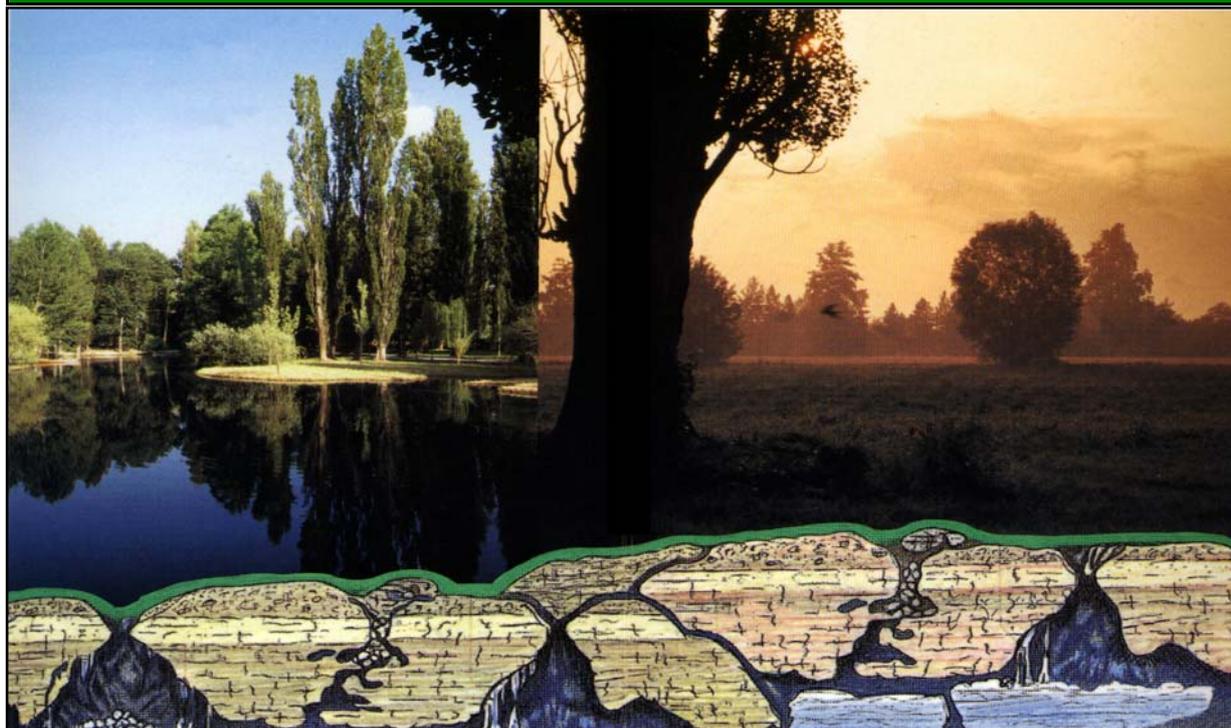


### *International activities*

TRR carries out also activities for international companies, such as Shell, ExxonMobil, AirLiquide, ABB, Eni; for example we quote the most recent activities for Eni IRAN BV, which are:

- HSE Manual for Construction and HSE Manual for Operations for On-shore installations;
- SIMOPS Manual for Construction, Operations and Commissioning activities for On-shore installations;
- HSE Procedures for Off-shore installations.

## ENVIRONMENT



The activities related to the Environmental carried out by TRR are:

- ⇒ EIA (Environmental Impact Assessment)
- ⇒ IPPC (Integrated Pollution Prevention and Control)
- ⇒ study of soil reclamation of contaminated sites
- ⇒ Environmental Management System and Auditing
- ⇒ DAPHNIA; identification of the level of risk generated by the use of dangerous substances in the environment.

### *Environmental Impact Assessment*

The specific fields covered by TRR experience are as follows:

- ⇒ Hydrocarbons extraction, refining and elaboration in petrochemical plants
- ⇒ Organic and inorganic chemical plants
- ⇒ Storage of dangerous materials
- ⇒ Transport of dangerous goods (i.e. LPG, LNG, Ammonia, hydrogen, and so on) by car, railway, pipeline, ship, ...
- ⇒ Combustion plants and waste incineration
- ⇒ Foundries, ferrous and non ferrous metal processing
- ⇒ Pulp and paper industries
- ⇒ waste disposal plants
- ⇒ railways and motorways

TRR simulates impacts on air and water by using EPA software ISC3 and Aquatox and map the results.

### *Integrated Pollution Prevention and Control*

TRR has been applying for several years the EC directive related to Pollution Prevention and Control, by supporting:

- ⇒ Public Authorities, with specific training courses
- ⇒ Companies, in the authorization procedure

TRR has defined and realized a specific methodology to sort out the "Best Available Techniques" (B.A.T.) and to reach the aims of the European Directive. This methodology involves three different kind of analysis:

- ⇒ Bottom-up analysis, which compares each device with the standard defined in BAT referring document (B.REF.)
- ⇒ Top-down analysis, which considers macro-systems and their effects on the environment
- ⇒ Benchmarking, with other similar plants in the E.C.

The skills required for specialists applying this methodology are:

- ⇒ specialization in process engineering
- ⇒ experience in environmental assessment
- ⇒ up to date with all existing and incoming environmental laws
- ⇒ awareness of local public opinion and complaints

## SOFTWARE

### TRANSIT

Software for modelling risk related to the transportation of dangerous substances, by means of probability and magnitude.

### SAFESTAR

Software for simulating physical effects of incidental scenarios:

- ⇒ heat radiation and vulnerability from fire and explosion
- ⇒ overpressure related to vapour cloud explosion
- ⇒ toxic gas dispersions
- ⇒ unconfined vapour cloud explosion
- ⇒ reliability of vessels and pipelines.



### TANKFIRE

Design of fire fighting sprinkler systems for the protection of storage tanks, based on real heat radiation, according to NFPA standard.



### The Netherland's organization for applied and scientific research

- ⇒ EFFECTS 7.5: TNO's practical software tool for calculating the undesirable release of hazardous substances



### US Environmental Protection Agency

- ⇒ 3DFATMIC: Three-Dimensional Subsurface Flow, Fate and Transport of Microbes and Chemicals Model
- ⇒ AirChief 12: emission factors, inventories and related software
- ⇒ ALOHA: Areal Locations of Hazardous Atmospheres
- ⇒ AQUATOX: simulating environmental fate and ecological effects in aquatic ecosystems
- ⇒ BIOCHLOR Natural Attenuation Decision Support System
- ⇒ BIOPLUME III Natural Attenuation Decision Support System
- ⇒ CAMEO® Computer-Aided Management of Emergency Operations software
- ⇒ EPANET computer program that performs extended period simulation of hydraulic and water quality behaviour within pressurized pipe networks
- ⇒ HSSM The Hydrocarbon Spill Screening Model
- ⇒ ISC III: industrial source complex dispersion models
- ⇒ NAPL2D: simulate the transport and fate of NAPLs in near surface granular soils

### US National oceanic and atmospheric administration

- ⇒ GNOME: General NOAA Oil Modelling Environment; simulation of floating hydrocarbons migration on sea surface

### Shell research

- ⇒ HGSYSTEM: suite of programs for assessing dispersion of vapour from gas, liquid or 2 phase releases including multi-component mixtures

### RM Consultant

- Wlogan 5.13: fault and event trees analysis