

**PROMIS branch solution and services  
Chemical Production Occupational Safety**

**Author: Richard Gowland**

The names "PROMIS®", "myPROMIS®", "deployPROMIS" and "PROMISLingua" are Europe wide protected brands

# Copyright

**PROMIS®**

The author, Richard Gowland, owns the copyright of information, content and methodology/ies contained in this pyramid which is being used under contract by PROMIS@Service S.a.r.l.

The authorised user is not permitted to make any alterations to the content contained in the Chemical Process Safety solution.

No part of this publication may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), without prior written permission of PROMIS@Service S.a.r.l.

Requests for permission to reproduce all or part of this PROMIS@Service document (as well as request for copies from PROMIS@Service) must be addressed to:

PROMIS@Service S.a.r.l., 21, Rue de Nassau, L- 2213 Luxembourg

Tel: 00352 273510 1

Fax: 00352 273510 28,

Email: [crehm@promisatservice.eu](mailto:crehm@promisatservice.eu)

# Chemical Production Occupational Safety



The PROMIS® Occupational Safety Pyramid contains elements for Occupational Safety Management which are useful for meeting operator and regulator needs for industrial activities. The contents have in some cases been created from industrial experience and are specific to PROMIS®, Others have been produced by e.g. The United Kingdom Health and Safety Executive as requirements and good practice. In these cases, the information is provided as a link to the relevant web sites.

## **Contents include:**

- Safety Culture
- Guidance on permit to work systems,
- Confined space entry
- Management of Change
- Basic occupational risk assessments
- Workplace task analysis systems such as Job Safety Analysis
- Occupational Safety Questionnaire for self assessment
- Audit systems and protocol
- Root Cause Incident Investigation

Important principles such as the involvement of operators to write Job Safety Analyses for themselves and ratification by supervision are included. The need to check such vital systems as Management of Change, Permit to Work systems is covered in relevant workbooks and guidance. Further assistance and updates are available from the author Richard Gowland ([Rtgowland@aol.com](mailto:Rtgowland@aol.com))

# Examples

## 1) Job Safety Analysis format:

### Job Task Unloading Caustic Soda tanker into T101

Task Step	Hazard	Control method	Protective Devices	PPE	Sign/Comments
Check instructions and receiving tank level on receiving tank	<ul style="list-style-type: none"> <li>• Overflowing tank</li> <li>• Wrong tank being filled</li> </ul>	Physical check volume available versus known quantity in tanker.	<ul style="list-style-type: none"> <li>• Individual unique connections</li> <li>• High level Alarm</li> <li>• High – High level inlet trip</li> </ul>		
Position tanker	Tanker moves when connected – leak	Immobilise tanker	Barriers and wheel immobilisers		
Connect loading arm (s) (fill and vent return)	<ul style="list-style-type: none"> <li>• Leaks</li> <li>• Fall from top of tanker?</li> </ul>	Use safety cage as protection against fall	Safety Cage	Chemical suit, Safety helmet, chemical goggles. Chemical gloves.	
	Pinch points	Design features for easy handling	Counterbalance	Heavy duty gloves	
	Wrong materials being unloaded	Check and sign off consignment paperwork			

# Examples

2) Extract from Occupational Safety Questionnaire:

## OCCUPATIONAL SAFETY QUESTIONNAIRE

Type: Existing Facility/New Project

Date:

Site:

Operation: (Insert name of area being analysed)

Process Owner: (Insert Production Manager's name)

3.00 (Insert names of team present for Occupational Safety questionnaire)

e.g. Hot Work

2.01	Is 'Hot Work' treated specially within the Permit to Work programme?
	Has 'Hot Work' been defined so that activity including work which could produce a source of ignition such as -use of electric tools, welding and cutting, mechanical abrasion etc. will be classed as Hot Work and special precautions taken?
2.02	Are Hot Work permits issued only after tests are carried out for the presence of flammable atmospheres? (e.g. not greater than 10% of Lower Explosive Limit)
2.03	If Hot Work is required in DSEAR or ATEX Zone 1 or Zone 2 areas, are enhanced precautions applied?
2.04	
2.05	

Hot Work

3.01	Is 'Confined Space Entry' treated specially within the Permit to Work programme?
3.02	Are the following considered within a formal check:
3.03	a) provision of means of escape?
3.04	b) trained attendant outside Confined Space?
3.05	c) provision of safe breathing air for person entering?
3.06	d) provision of safe breathing air for any rescue?
3.07	e) isolation of all process connections (via disconnection or 'spade')?
3.08	f) decontamination of the confined space?
3.09	g) monitoring of the atmosphere of the confined space before and during the operation? (Oxygen levels, potential contaminants)

# Examples

## 3) Management of Change system check

Management of Change Self Assessment — Audit Checklist									
		Facility/Plant:				Assessment/Audit No			
		Location:				:			
		Date:				:			
		Self Assessor/Auditor:							
						Number of MOC's generated in previous 12 months:			
<b>Performar Policy</b>		0							
Overview		0							
Procedures		0							
Permanent Changes		0				Clear all Checklist entries.			
Temporary Changes		0							
Employee Feedback		0							

<b>A — Policy</b>	1 Is there a written Management of Change policy or procedure? <i>You should be able to find a policy for the facility or the company Corporate policy in</i>
<b>B — Overview</b> <input type="radio"/> Yes <input type="radio"/> No	2 Have employees been trained on the company Management Of Change Requirement within the <i>The facility/plant Review should have records showing who has been trained in MOC.</i>
<input type="radio"/> Yes <input type="radio"/> No	3 Has the entity been conducting self assessments annually? • <i>Look in plant/facility Document Centre for records. (note that if this form is filled for a</i>
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	4 Is Follow Up action from Self Assessment and Audits recorded and acted on by agreed deadlines? • <i>Look in plant/facility Document Centre for records. It is advisable that this activity is</i>
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	5 Does documentation of previous self assessment or audit results and follow-up meet the following • <i>Company document retention and retrieval guidelines (in the absence of such</i>
	• <i>This facility - maintain last two self assessments/audits</i>
<input type="radio"/> Yes <input type="radio"/> No	6 Does evidence support the MOC process being used for all non 'like for like' changes? • <i>There should be examples of hardware, software and procedure (e.g. Operating</i>
<input type="radio"/> Yes <input type="radio"/> No	7 Are MOC documents filed and easily retrievable? • <i>Review where the MOCs are filed. This may be an electronic or paper system.</i>
<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	8 If the facility has a variance to a Company Guideline and/or a specific Standard, is the facility
<input type="radio"/> Yes <input type="radio"/> No	9 Has the facility based its MOC procedure on the Company MOC Standard?
<input type="radio"/> Yes <input type="radio"/> No	10 Does the facility MOC programme receive periodic reviews for its effectiveness?
	• <i>This can be as an outcome of a self assessment or an audit</i>
<b>C — Procedures</b>	
<input type="radio"/> Yes <input type="radio"/> No	Does the facility's actual practice of MOC:
	1 ...require the signature of the originator or change owner?

# Author

Richard Gowland  
Holy Lodge  
2, Lynn Road,  
HEACHAM  
Norfolk PE317HY  
England.

Email: [Rtgowland@aol.com](mailto:Rtgowland@aol.com)

## Curriculum Vitae

Richard Gowland graduated 1965 in Mechanical Engineering at the University of Durham, England. He is Technical Director of the European Process Safety Centre, which is an industry funded association dedicated to improving best practice in Process Safety in the Chemical, Oil and Gas industries. He also acts as an independent specialist in Chemical process and Occupational Safety. In this role he sets up Safety Management Systems, carries out risk reviews using techniques such as Process Hazard Analysis, Hazard and Operability Study and Layer of Protection Analysis. He also provides public training courses on these topics. His main career history covers the Steel Industry, Microporous Polymers and a long career in Engineering, Project Management, Production Management, new technology introduction and Process Safety leadership in the Dow Chemical Company. Since retiring from Dow he has carried out major risk reviews and Safety Management projects in the gas and mining chemicals industries in addition to regular specialist work on risk for Small and Medium Enterprises.

## Recent key landmarks:

- Awarded the Institution of Chemical Engineers Franklin medal for Inherently Safer Process Design.
- Award for collaboration to produce Dow company policy on Safety Instrumented Systems.
- Chairman (now retired) of the European Technology Platform for Industrial Safety (Supporting Framework 7 research)
- Chairman of the UK Health and Safety Executive Subgroup for proper application of Layer of Protection Analysis to fuel storage facilities (following the Buncefield major fire and explosion)



**Birth date:** 3/12/1943

**Education:** Bachelor of Science, Durham University U.K. 1965

**Work experience:**

Mechanical Engineering in Steel Industry 1961-8  
Project Engineering in Polyurethanes Industry 1968-71  
Mechanical Engineering and Projects Dow Chemical Co. 1971-5  
Project Management Dow Chemical Co. 1975-7  
Major Plant Construction project (Pesticides production and formulation)  
Production Management of Pesticides synthesis and formulations (Dow) 1977-1984  
Production Management of all Agricultural products in U.K. for Dow Chemical Co. 1984-7.  
Chlorpyrifos  
Chlorpyrifos-Methyl  
Fluroxypyr  
Formulation and packing of all above  
Technology Centre Project Manager Dow USA 1987-9  
Scale up production for new molecules. (Developing from lab scale to market launch quantities)  
Technology improvement for Formulating and Packing Agricultural products.  
Successful project to upgrade the U.S. Agricultural Chemical Industry's management of public warehousing and distribution.  
Process Safety Manager Dow Europe 1989-95  
Built and managed the EHS audit process for Dow Europe  
Set up HAZOP training for Dow Europe. Acted as training resource.  
Revised and operated Project Hazard Analysis for Dow Europe  
Process Safety Associate, Dow Global Process Safety Management Core. 1995- 2004.  
Author and owner of Responsible Care® Process Safety element, Process Safety Technical Standards, Risk Analysis Software tools (Fire and Explosion Index, Chemical Exposure Index), HAZOP standard, compliance checking software and Process Safety audit protocols, Process Safety Auditing Training course.  
Member of team designing and launching Layer of Protection Analysis (LOPA) for Safety Instrumented Systems. (Received company award).  
Set up basic analysis for Overpressure effects from Vapour Cloud explosions in confined and semi confined structures.  
Process Safety Technology Leader for Dow Agrosiences. PHA and Risk Management for all European, Indian and South African operations. Author of protocol for contract manufacturing of Dow Agricultural products at third party supplier facilities. Evaluation of Process Safety at contractors making unstable molecules.(Nitration processes).  
Trainer for Layer of Protection Analysis, HAZOP study, Basic Risk Analysis, Process Safety Auditing, Inherently Safer Process Design.  
Member/delegate on European Commission Technical Work Groups for guidance on implementation of the Seveso Directive. (Risk Assessment and Land Use Planning) and meetings of the Committee of Competent Authorities.  
Process Safety Lead Auditor  
Due Diligence leader for Process Safety on acquisitions

**Current Activity:**

Technical Director of European Process Safety Centre (EPSC) 2004 (50 days per year commitment)...  
Founder member of Technology Platform for Industrial Safety (European Commission support) – now chairman of Management Board  
Institution of Chemical Engineers Director of training course on Layer of Protection Analysis (LOPA)  
Major Layer of Protection Analysis Studies for STATOIL Norway (2006-ongoing)  
Layer of Protection Analysis Studies for Eli Lilly Ireland (2007)  
Consultant for Process Safety Management System creation at BHP Billiton (Chemicals div.) Australia 2005/2006  
Consultant for Process Safety Management System creation at SASOL (South Africa)  
Member/delegate on European Commission Technical Work Groups for guidance on implementation of the Seveso Directive. (Risk Assessment and Land Use Planning) and meetings of the Committee of Competent Authorities.  
Chairman of team sponsored by the U.K. Health and Safety Executive to produce good practice guidance on LOPA (Working Group 3) <http://www.hse.gov.uk/comah/buncefield/fuel-storage-sites.pdf>

**Other:**

EPSC Founding member  
EPSC Board member 1996 – 2003

CEFIC (Federation of European Chemical Industry) Major Hazards Group Chairman. Interface with European Commission on pending legislation (retired 2004)

Winner of Institution of Chemical Engineers Franklin Medal for work and publication in the field of Inherently Safer Process Design.

Accredited member of National Fire Protection Association committee (U.S.) 704 (classification of Hazardous Materials – health, flammability, instability)

Member of advisory groups for the European Commission on the Seveso 2 Directive (Major Chemical Hazards)

Leader of U.K. Health and Safety Executive study group on overfill protection for large gasoline storage tanks. (Buncefield follow up)

Member of EPSC study group on Leading and Lagging Performance indicators

**Papers Published:**

Reviews of Implementation of Seveso Directive in different E.U. Member States  
In:

The Chemical Engineer (Institution of Chemical Engineers)  
Journal of Hazardous Materials  
European Commission Committee of Competent Authorities

Experience in the use of Layer of Protection Analysis in meeting the requirements of IEC 61511.  
(ICHEAP – Italian Federation of Chemical Engineers, Palermo 2004)  
A large Layer of Protection Analysis study for a gas terminal (2000+ cases)

Experience in applying the EPSC report on Design of Buildings in hazardous areas:  
(Loss Prevention Symposium of the European Federation of Chemical Engineers – Prague 2004)

Inherently Safer Process Design:  
(Plant Operations Progress (American Institute of Chemical Engineers))

Design of Buildings in hazardous areas:  
Guidance on applying the ATEX Directives:  
(EPSC member only technical reports.)