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## Human Factors in Environmental Issues Relevance to the Gases Industry

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### Introduction

EIGA's Working Group 5 - Environment has compiled this environmental newsletter to provide information on environmental issues relevant to the Industrial Gases Industry. These guidelines are intended to help assist people understand how human factors can influence positive and negative environmental outcomes.

Human factors play a significant role in environmental incidents and in maintaining legal compliance. As with safety incidents, eliminating or minimising human factor causes can be achieved by design and by using behavioural techniques.

This newsletter provides examples and guidance for the gas industry on the use of human factors tools and their application to environmental issues. It provides some examples of where these tools can be applied in addressing conditions with human factors causes, for example during deliveries of materials, loading/unloading, filling.

Tools and techniques include:

- critical systems audits;
- awareness materials including tool box talks;
- site exercises including aspects of mitigation (spill containment and clean up) and emergency actions;
- workplace design.

Environmental incidents, with human factors causes, can arise from site conditions driven by the actions of people that are not aware of the correct behaviour. In many circumstances it may be possible to design out the conditions that present a risk.

Dynamic environmental conditions, which can change at any time can be managed using behavioural tools and techniques, but constant vigilance is required to spot conditions that could lead to incidents.

### Human Factors

Human factors refer to environmental, human and individual characteristics, organizational and job factors that influence behaviours at work in a way which can affect health, safety and environmental performance.

More detail on Human Factors is given in EIGA Info HF-01 Human Factors – an Overview and other related Human Factor publications referenced in Info HF-01.

In summary, human factors identify what people are being asked to do (the task and characteristics), who is doing it (the individual and their competencies), and where they are working (the organisation and its attributes). A good management system includes human factor assessments in a similar way to any other risk management programs, categorizing human failure with the different causes and influencing factors, as well as prevention strategies to reduce the failures.

Managing poor human behaviour and promoting good behaviour is essential to preventing incidents both minor and major, preventing environmental damage and maintaining the reputation of the organisation.

### Case studies relevant to the Industrial Gases Industry

The following examples illustrate the concept of assessing impact of human factors on conditions of compliance when reviewing safe environmental storage of chemicals on site.

Human Factors particularly impact dynamic conditions - conditions that can be changed at any time - such as whether drums or containers are within spill containment devices. Drums and containers can be moved out at any time and it requires operational discipline to make sure they are put back within the spill containment after they have been used. Improved workplace design can be used to make sure the storage is close to where the product is used to encourage good behaviour.

Other examples include whether activities such as washing, deliveries are taking place in the right place and whether storage of machinery, vehicles and substances is away from drains.

Spotting evidence of good behaviours and good practices and recognising them is key to motivating people and to ensure that they will continue to carry out the task correctly.



Figure 1: Drums in containment with additional drip tray and absorbent material to hand.



Figure 2 Drums stored outside of containment



Figure 3 Overloaded container in incorrect area



Figure 4 Incorrectly mixed waste



Figure 5 Hazardous mixing of waste materials in incorrect area



Figure 6 Properly labelled and segregated waste container

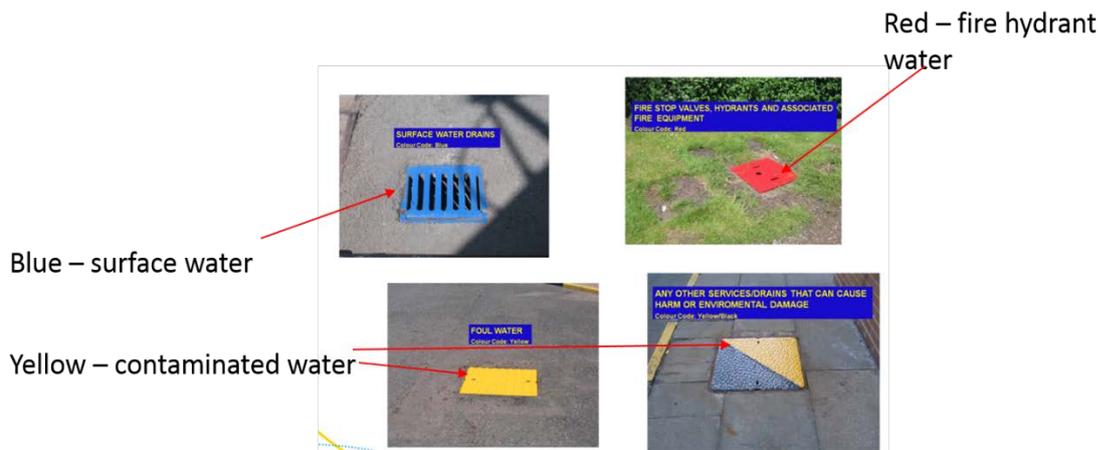
### Useful tools and techniques

The following examples illustrate the use of tools and techniques in work place design such as:

- easy to use-colour codes for waste, drains.;
- use of visual indication of the risks. If its easy...people will do it!

Use pictures like these below and above to communicate good and bad practices.





A good practice is to conduct ‘What if’ exercises. The template below shows how this can be accomplished to look for the risk of spills of different liquids and to make sure everyone on site knows what to do in the event of an incident – more details can be found in EIGA’s Environmental Newsletter ENL 19 *Site Spill Prevention Plans*.

What can we do if ...?	Environmental impact	Solution
... oil or another hazardous substance has been spilled during handling and there is a risk that this reaches the rainwater collection pits or the sewage system?	Cleaning the spillage of hazardous substances with water increases the risk of land pollution and generates a greater amount of wastewater	
... we do not know whether the spilled substance is hazardous?	This may damage the environment and harm ourselves if the right measures are not taken	
... we detect a water leak during the process that contains potentially hazardous substances?	This may pollute the land and water if it reaches the drainage system	

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