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Guidelines for Site Risk Communication

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Foreword

These guidelines were developed by the Canadian Chemical Producers' Association (CCPA) (Now Called The Chemistry Industry Association of Canada or CIAC) for assistance of the association's members and Responsible Care® a partners in site acute risk communication (i.e., communication of risks from sudden events resulting from site operations and their implications for the surrounding community; other aspects such as risks to the population or environment at large from ongoing emission control or downstream product distribution, use and disposal are also covered by Responsible Care, but are addressed by other guidance).

The guidelines are intended to help sites understand the expectations of Responsible Care regarding site risk communication, including the handling of "worst case" scenarios. They should be considered as guidelines, and not as a definitive description or checklist of what to do. CCPA has kindly made these guidelines available for general use through the Canadian Society for Chemical Engineering Process Safety Management Division, subject to the disclaimer at the end of this document.

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[a] Responsible Care is a registered trademark of the Canadian Chemical Producers' Association.

1. INTRODUCTION

Site risk communication is probably best considered from three aspects: (a) understanding what the hazards and risks[b] are in the first place, then getting them under proper control; (b) advising and assisting responders in ensuring that the community is appropriately prepared; and (c) soliciting and demonstrating sensitivity and responsiveness to community concerns via some form of dialogue process.

The result should be a protected, informed community, having both an awareness of the chemical industry's presence and a reasonable comfort level that hazards and risks are under competent control.

2. RISK ASSESSMENT AND MANAGEMENT

2.1 Obligations of the site operator

The site operator clearly needs to know and understand what could go wrong

[b] In this document the terms hazard and risk have the following meanings: **hazard** is the inherent characteristic of a material, condition, or activity that has the potential to cause harm to people, property, or the environment, while **risk** is the combination of the likelihood and the consequence of a specified hazard being realized, and is a measure of harm or loss associated with an activity. A large tank of propane is inherently a hazard, but its risk depends how it is designed and operated, whether it is in an isolated or vulnerable location, etc. Although the title of this document refers to risk, the risk communication process typically involves consideration of both hazard and risk.

through site operations, and what the off-site implications are. The knowledge of who could be affected and what those effects might be is essential for community preparedness.

This is why CCPA's *Community Awareness and Emergency Response* (CAER) code stresses the need for site managers to identify and evaluate those situations where company materials, processes or equipment could have an impact on the site and/or the community in the event of an emergency.

It is important to consider what *could* go wrong rather than what is expected to go wrong, because of the danger of overlooking hazards whose significance is not obvious. ***If a hazard is not identified, subsequent control methods may not be adequate!*** Guidance on how to identify hazards and assess risk is outside the scope of this document which is concerned primarily with risk communication. However, some references are given in the endnotes[1].

For offsite impact the result of the analysis should be a range of scenarios describing potential incidents according to their possible consequences rather than their causes.

The site should then take action to correct any situation posing an unacceptable level of risk to employees, the public or the environment. What is acceptable to the community is the subject of section 3(b) below, but general guidance on the technical basis for this can be found in the *Quick Guide Methodology* available on the CIC's PSM Division website[2] and the land use planning guidelines issued by the former Major Industrial Accidents Council of Canada (MIACC) and now available from the Canadian Association of Fire Chiefs[3].

Control measures should then be put in place to ensure that risks of release, etc. are kept within the established limits or better still, further improved. Mitigation measures should also be used to reduce the effects of any incident which does occur.

2.2 Prevention is not enough

While the above activities focus on prevention, however, incidents cannot be entirely prevented. Despite the improvements made under Responsible Care, CCPA members continue to experience occasional serious incidents or near-misses, though fortunately the circumstances have been such that none of these incidents has caused an off-site disaster – yet.

When we consider that these incidents are occurring in companies at or close to full Responsible Care implementation, it becomes clear why the CAER code contains such a strong emphasis on preparedness. Since 1986,

in both Canada and the US, chemical site managers have been committed, via CAER, to inform neighbouring communities of hazards and risks arising from their operations, and to do their utmost to ensure that appropriate preparedness measures are in place should such a situation ever occur.

It seems to be part of human nature, however, to discount low frequency catastrophic events resulting from our own actions (though not from someone else's actions, which tend to be viewed differently). It has been pointed out that most chemical plant managers rarely experience a disastrous incident in their lifetime, and hence often do not recognize the full extent and nature of hazards and risks posed by their operations. It's not that they consciously intend to mislead the public – they sincerely believe that the risks are low – yet they may well be wrong. According to several reports, the rate of major incidents has stayed the same, despite the steady progress made in preventing minor incidents in the last two decades.

2.3 Technical basis for acute risk assessment

General guidance on assessment of hazards and risks is available to CCPA members through other guidelines and also from the sources given in ref 1. This guidance does not usually indicate the upper limits or “worst case” to be considered, but leaves this to the judgement of the user.

However, the CCPA's process safety management committee suggests that the technical basis for determining worst case scenarios can be based on the following two base cases which are described in detail in Appendix 1. Their application is explained below.

(a) Worst imaginable case

This is the worst that could conceivably occur, but goes beyond what the community could reasonably be expected to plan for. The worst imaginable case is most relevant in demonstrating that the company has indeed considered everything before coming up with what it considers to be the credible worst case.

(b) Credible worst case

"Don't tell me all the things that *might* happen – tell me what to plan for" is a typical viewpoint of emergency responders when discussing worst-case scenarios. The credible worst case is just that – a scenario that is not expected to happen, but which nonetheless is something which should be taken into account when developing community emergency plans.

Emergency plans and prevention measures inside the site should of course consider not only the credible worst case, but also the range of scenarios that could occur, up to and including the worst case. (It makes no sense to avoid discussing tank trucks of flammable liquid with the community, simply because there is a large LPG sphere on the site). Most of these less-critical

scenarios will by their very nature be more frequent than the worst case, and are likely to feature more prominently in the community's experience of the company.

Also, after identifying and analyzing their credible worst case, people can sometimes fall into the trap of thinking that it is the worst event that could happen to the site, which is not necessarily true. The credible worst case is simply a basis for developing emergency plans – a worse event may perhaps be possible, but the response would be based on plans developed for a lower level incident.

2.4 Limitations of technical analysis

It is important to realize that, whatever method is selected, technical risk analysis has both advantages and limitations. Some of the limitations involve the assumptions made in the method, the difficulty of obtaining truly representative data especially for low frequency-high consequence events typical of most worst cases, the effects on exposed populations and the effects on the environment.

However, a major advantage is the ability to examine the relative influence of various factors, and it is these relative rather than absolute results which should be borne in mind when analyses are done. For example, it matters less that the risk of fatality is 1 in 100,000 per year than that it can be reduced by ninety percent with a few simple precautions.

It is also important to avoid getting so preoccupied with calculations that the human and social consequences are overlooked. An event may have less than a one in a million likelihood of killing somebody, but could well lead to injuries, environmental damage and public concern at much more frequent intervals. Giving serious thought to consequences, regardless of cause, can be a useful way to keep the community in mind.

3. COMMUNICATING WITH THE COMMUNITY

There are two primary aspects to communicating with the community.

The first is to ensure that all those who may need to take action to protect themselves and others, in the event of an incident, are aware and prepared. This obviously applies to responders and community officials, but it will also affect members of the public if they may be called on to shelter inside or to evacuate the area. They need to be informed about what to expect – for example, who will tell them what to do when emergency action is needed, and how will this be communicated?

The second aspect involves identifying and responding to community concerns. It goes well beyond the previous aspect, but should build on it rather than being viewed as a separate item.

3.1 Emergency preparedness

(a) Responders have a broader scope

So far, site risks, including "worst case", have been discussed entirely from the *site* viewpoint. For responders, however, the worst case may involve a natural disaster, or perhaps a hazardous materials incident arising from some other site, from materials being transported through the community or possibly even from a malicious act such as sabotage or mischief.

Even where your site is concerned, responders may agree with your interpretation of credible worst case and range of likely scenarios, or they may not. Differences of opinion should be considered carefully to ensure that all valid points have indeed been taken into account.

(b) Build relationships before you need them

Communication with responders and others enables the company to build working relationships well in advance of a possible emergency. These relationships normally strengthen through the company's "advise and assist" role in the development and testing of community emergency plans. The company should persist until satisfied that community preparedness is at an acceptable level for the hazards involved. Suggested criteria for community preparedness were developed by MIACC and are now available from the Canadian Association of Fire Chiefs' *Partnerships Toward Safer Communities* website (or through Emergency Management Ontario, as the same criteria form the basis for that province's regulation of emergency preparedness)[4].

(c) What about security?

While the situation has become more sensitive since the September 11, 2001 attacks on the US, the principles are still the same. If the site has a large storage vessel of compressed toxic gas, for example, those living in the area that could be affected obviously still need to know how to protect themselves, and responders still need to know what action to take if an emergency occurs. However, risk communication may now call for more discretion, and CCPA suggests that sites think of communication to three primary target audiences – the general public (here meaning those without a special interest in emergency preparedness), responders and interested citizens.

(d) Different messages for different groups

(i) The Public

As mentioned above, this group needs to know, and should know, enough to understand what to expect in an emergency – how they'll be alerted, steps to take to protect themselves, etc. They may need to know the hazards of chemicals they could be exposed to, so they can take appropriate protective or first aid measures, but this doesn't require them to know the actual amount of material on site or where on site it is located. Detailed chemical names also are probably not necessary as they can be confusing to the public, especially if misspelled. They can easily be confused with other materials having properties that are quite different, and even common chemicals such as ammonia or hydrogen peroxide may have very different properties at industrial strength than householders are familiar with. Note that these comments do not apply to members of the public with a strong interest in this subject, who we'll come to in a moment.

(ii) Responders

These obviously need much more knowledge, including quantities of materials on site and where located, protective measures that could be deployed to mitigate the effects of an emergency situation, etc.

However, since the terrorist attacks of September 11, 2001 on the United States, concern has arisen that if this information is given to municipal responders in actual physical or electronic documents, the municipality could be compelled to make it available to the public under an access-to-information request, and this could lead to a possible dangerous security situation in the case of a high-hazard site.

After discussion with the Canadian Association of Fire Chiefs and government security authorities, CCPA therefore suggests that such information be conveyed to responders through a dialogue process so that the responders are made aware of what hazards, etc. are present and that the parties – site operator and response agency – agree on:

- key information to be kept on file by the response agency;
- how responders will access detailed information in case of an emergency (e.g., provided by personnel by a site in 24/7 operation, or in a lock box for a site unmanned on weekends, etc.).

CCPA also recommends that the site operator invite responders to the site so the responders can satisfy themselves that they have any necessary information and are familiar with the site and its personnel.

During the discussion with responders, caution may be needed where responders claim that they have everything well in hand to meet such scenarios and no special measures are needed. Unless the worst case is a

straightforward one, such as a “wood and paper” fire at a corporate or sales office, the company should ensure that appropriate preparedness measures are actually in place in the community, rather than taking this on faith. Employees who reside in the community are a useful source of feedback, to verify whether the community has done its part in communicating what to expect if an emergency occurs.

(iii) Interested Citizens

These are people with a strong interest in hazards in their community and measures being taken for public protection. CCPA encourages dialogue with these citizens, who should be given access to more information than the general public. Such citizens may wish to know the actual materials on site and approximate quantities, measures for assessment and control of risks, etc. CCPA considers these to be legitimate concerns, and supports – and encourages – the principle of community right-to-know. This position has not changed in principle since 9-11, but is applied with more caution.

CCPA suggests that such persons – who are typically known within their communities – be invited to participate in a dialogue process involving site operators and responders in the community, where typically this process will consider risks facing the community and measures being taken to address those risks.

This dialogue process would not necessarily be the same as that between an individual site operator and a response agency as under *Responders* above, but could involve discussions at a site where some more sensitive information is made available for discussion though not for removal from the site. Interested citizens may need to undergo some form of security clearance – this could be decided by the site operator and/or response agencies, depending on sensitivity of the situation, how well the citizen is known, etc.

3.2 Demonstrating sensitivity and responsiveness to community concerns

(a) The public's view may differ

When it comes to the public, it is most important to recognize that *the company's worst case may not be the worst case from the view of the public or of individuals in the community and could even be irrelevant to them*. Whether or not the community responders agree with the company's worst case is probably not significant, because responders consider what is in the interests of the community as a whole and in comparison with other communities. The public reference point is much more likely to be an individual one, and this can make a big difference.

For example, the company may have determined that a major fire or toxic gas release is the worst case, and the responders may agree. A mother whose child plays by the roadside leading to the site may feel that, for her, having her child hit by a truck is of much greater concern. Someone whose neighbour recently died of cancer from no obvious cause may suspect that something in the air or water is to blame, and may be suspicious of even minor releases with apparently insidious effects.

(b) They may be right!

These viewpoints are not necessarily wrong -- the mother's concern over the risk of a truck accident involving her child may justifiably be higher than that over a fire or toxic gas release. It's just that they are individual viewpoints, and are more difficult to address than the usual interpretation of worst case, because you need to talk to the individual first before you have an idea of what the real concerns are.

This is why CCPA also places so much emphasis on community dialogue to identify and contact those who see themselves as part of the plant community, or at least on reaching a reasonably representative cross-section of them.

(c) Work through community responders

When it comes to telling the public about site risks and worst case scenarios, it's usually best if this is done with the involvement of the designated community emergency officials, wherever possible. They can present the situation in perspective: for example, (a) here are the risks from tornadoes, earthquakes, etc., etc. and from chemical plants; (b) these are the preparedness measures we have taken; and (c) here's what you personally need to know about the public alert system, sheltering procedures and evacuation routes. It's important to work with your community officials, where possible, and to avoid blindsiding them by provoking concern without letting them know what you're doing. The same comment, of course, also holds true for the community advisory panel (or its equivalent, if you're using a different approach)[5].

(d) Follow up to find out about individual concerns

The company can then follow up with its own dialogue process to find out what concerns are out there in addition to those covered by the community emergency plan. The range of hazards and risks from the site, including the credible worst case, and if appropriate, the worst imaginable scenarios, together with a selection from the host of lesser events identified, can also be addressed, since by now the public will have the context provided by the community officials and the CAER or community emergency preparedness committee.

In addition, there's an opportunity to go beyond emergency preparedness and inform the community about positive steps which the company is taking in other areas, such as voluntary emission reductions or other concerns. Chronic hazards are not usually prominent in the minds of responders, but may easily be sensitive topics for residents, businesses and property owners in the area, as community concerns often relate more to the company's products or other operations than the site in question. This process can be invaluable in stimulating discussions which reveal not just surface issues, but the underlying concerns of participants, which they may not be able to express or even recognize at first thought.

(e) Involve your Community Advisory Panel in planning how to communicate

Involving members of the Community Advisory Panel (CAP) or participants in any other form of advisory process in developing plans for communicating to the community at large is likely to be well worthwhile. (Not doing so is hardly the way to build the image of an open, caring involvement process). Some judgement may be called for, though, in balancing the rate at which communications proceed with various stakeholder groups, to avoid putting key players such as responders in a difficult position if timing is sensitive on a particular issue.

(f) Look upon community dialogue as a continuing process

The situation can change much faster with individual concerns than with site hazards, where site management is more aware of developments as they occur. This is why community dialogue should be an ongoing process, to an even greater extent than community emergency preparedness. Details of community dialogue are beyond the scope of these guidelines, but are addressed in other CCPA publications and workshops.

4. THE IMPORTANCE OF A MANAGEMENT SYSTEM

Following the advice given in these guidelines should help with communication of site acute risks, but more is needed to be truly effective. The activities should also be part of the company's management system, thus ensuring that they are performed using a "Plan-Do-Check-Act" cycle where the planned results are supported by an appropriate organization and resources to carry them out, complete with monitoring for effectiveness and management leadership to inspire continual improvement[6].

For more on the management system, community dialogue, or for questions on any of the points outlined in these guidelines, please contact the CCPA's Responsible Care office at (613) 237-6215 or info@ccpa.ca. We'll be glad to help you.

Appendix 1

TECHNICAL BASIS FOR CALCULATION OF "WORST CASE" SCENARIOS

Please note that this document is meant for implementation by those with expertise in hazard assessment and emergency preparedness. Its purpose is to provide a detailed methodology, while still allowing leeway for an individual company to use judgement in developing and communicating worst case scenarios.

Worst Case Scenario Calculations

CCPA recommends the following approach for its members in developing worst case scenarios:

1. Each facility should identify the worst imaginable scenarios and determine the potential impact on the surrounding community. An instantaneous release from the largest vessel is a reasonable worst imaginable scenario.

2. Each facility should identify worst credible scenarios and determine the potential impact on the surrounding community. The American Chemistry Council (ACC)[7] method with passive controls, e.g. diking in place, or the method developed by the former Major Industrial Accidents Council of Canada (MIACC) are reasonable methods for determining these. However, for toxic substances, the consequence criteria must match the release scenario. Dispersion modelling should be carried out only by those properly trained and qualified, since considerations such as local topography and building wakes can have a significant effect on hazardous concentrations. Care is also needed when considering scenarios which do not behave as a simple release, such as those where a chemical reaction is involved.

Discussion

The following definitions are suggested:

Worst Imaginable Case - The release of material with the greatest potential adverse consequence, available from a single vessel or process system, under the most adverse weather conditions. Generally, the release would be modelled as an instantaneous release under low wind speed/high stability (2 m/s, F stability) conditions. No credit would be taken for control or mitigation measures.

Worst Credible Case - The release of material with the greatest potential adverse consequence which could be expected as a result of failure of an internal system. This is generally modelled as the release of the contents of the largest vessel over a given period of time, using the weather conditions which could be expected to occur in the area. Generally, the release would be modelled as a continuous release of the largest vessel, over a set period of time, e.g. 10 minutes, under moderate wind speed/neutral stability (3 to 5 m/s, D stability) conditions.

There are several proposed methods for determining worst case scenarios.

The **EPA definition**[8] is "the loss of all of the regulated substance from the process in an accidental release that leads to the worst off-site consequences." This definition is more extreme than the worst imaginable scenario given above since it includes all material, including that in storage and that being processed. It's equivalent to saying that if there are five one-ton chlorine cylinders on site, they will all rupture at exactly the same time, under the most severe weather conditions. Statistically, this approach cannot be supported.

The **ACC definition** is "the release of material from the largest storage vessel in ten minutes with coincident failure of all mitigating and control measures." This approach lies between the worst imaginable and worst credible scenarios due to the failure of control and mitigation measures, other than passive measures such as a dike or drainage.

The **MIACC definition** is "the release of material from the largest storage vessel in 30 minutes." This is the definition presently being used for determining individual risk to the public for land use planning and is identified as MIACC's worst credible case.

Whichever methodology is used, it is important to match the release criteria to the consequence criteria.

For an **instantaneous release of a toxic substance**, the exposure time of a receptor will be finite. The concentration downwind will increase as the cloud approaches and drop once the cloud has passed. Ideally, the modelling will calculate the dose to which the receptor was exposed, to determine adverse consequences – discomfort, injury, or death. If the modelling is less sophisticated, it will be necessary to choose a concentration, above which the receptor should not be exposed. If the speed of the cloud indicates that it will be present for less than three minutes, it makes no sense to use one-hour exposure criteria (US EPA Emergency Response Planning Guidelines - ERPG) to set response distances.

Likewise, for a **continuous release of a toxic substance** over ten minutes, it is unreasonable to use ERPG values to determine consequences, since the toxic material will not likely remain for the one hour required for it to cause physical stress to the individual. Pairing unreasonably conservative consequence thresholds with reasonable toxic release scenarios produces unreasonably conservative consequence distances.

For **release of flammable/explosive substances**, the time dependence is much less critical, since the duration necessary to cause discomfort, injury, or fatality is very short. If a person is within the flammable vapour cloud at the time it ignites, the person will almost certainly sustain some form of serious injury or death. For releases of the same quantity of flammable/explosive substances, the shorter the release time, the greater the consequence distance. Delayed ignition will also result in longer consequence distances than immediate ignition.

3. When identifying the worst case scenarios, every attempt should be made to identify the expected frequency at which the scenario could occur, thereby identifying the potential risk to the public. This will allow the responders to prepare for emergencies without putting excessive and unrealistic demands on the community.

4. Each facility should meet with the local emergency responders to discuss both worst imaginable scenarios and worst credible scenarios. The discussion should include a discussion of the risk, (expected frequency and consequences) rather than simply focusing on the consequences. Responders should at least be prepared for worst credible scenarios.

5. In conjunction with the local emergency responders, applicable scenarios should be shared with the community. In all cases, this will include, as a minimum, the worst credible scenarios. Member companies should encourage communities to test their response plans against the applicable scenarios.

6. Where the local emergency response agency requests that worst imaginable scenarios be withheld from the public due to reasonable concerns about possible sabotage, the facility should respect these requests, as long as it is not an excuse to avoid developing proper preparedness measures. See the main text of this guideline for suggestions on how to handle communications where malicious acts are a concern.

7. If a facility has not shared worst imaginable scenarios with the community, as a general practice, the facility should be prepared to share the information if it is requested by members of the community.

8. Worst case scenarios should not be restricted to airborne releases. If a release to a water course or the ground water has the potential for a greater adverse effect, such scenarios should be identified and evaluated.

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[1] For guidance on how to assess hazards and risks, a useful work is *Guidelines for Hazard Evaluation Procedures, Second Edition with Worked Examples*, published 1992 by the US Center for Chemical Process Safety, ISBN 0-8169-0491-X. This 461 page book also contains in Appendix B an extensive checklist for those who prefer such an approach. This and other CCPS publications may be ordered toll-free from 1-800-242-4363 or via the web site www.aiche.org/ccps/. Major credit cards are accepted.

[2] The Process Safety Management Division website is www.cheminst.ca/divisions/psm/index.htm. For the Quick Guide methodology, free download of the *Process Safety Management* guide and site self-assessment tool, click on the *PSM Help* link.

[3] The document *Risk-Based Land Use Planning Guidelines* is available from the Fire Services Resource Centre, 1-800-668-2955 or fire@interlog.com.

[4] CAFC's Partnerships Toward Safer Communities website is www.ptsc-program.org/. The criteria for community emergency preparedness are in the document *A Framework For Community Emergency Management Programs*, available in English and French on the Starter Kit under the Program page of the PTSC website. They are also now part of Ontario's emergency management program – contact Emergency Management Ontario at (416) 326-5010 or www.mpss.jus.gov.on.ca/english/home/contact_us.html

[5] Under Responsible Care®, CCPA members are expected to reach out to citizens and others living or working near their plant sites and establish dialogue on any concerns; often this takes place via a community advisory panel, with regular meetings and minutes.

[6] CCPA's publication *Management System Guide* provides a brief explanation of what is meant by a management system – contact info@ccpa.ca for a copy. More detailed information is available from the International Organization for Standardization (ISO) at www.iso.org.

[7] The American Chemistry Council's website is www.americanchemistry.com/. Access to some information may be restricted for security reasons.
[8] For information on the US Environmental Protection Agency's Risk Management Program, see the agency's Office of Emergency Management website www.epa.gov/ceppo/. Access to some information may be restricted for security reasons.

Disclaimer

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