

ANNEX 5 to CONIAC paper M3/2013/1 - Managing risks with catastrophic potential -report on the work of CONIAC's Catastrophic Events Working Group

CATASTROPHIC EVENTS IN CONSTRUCTION - FACTORS DETERMINING CATASTROPHIC POTENTIAL

Catastrophic events are characterised by two key features – (i) the low probability of their occurrence; and (ii) the potential or realised level of damage that can be caused when they do occur. Tempting though it might be, it would be very difficult and potentially overly simplistic to provide a list of the types of events that fall within or outside any given definition of a catastrophic event.

However, those involved in construction need to be able to identify those projects and activities where catastrophic potential might exist so it can bring to bear appropriate risk management techniques above and beyond the normal systems employed to manage risk.

Engineered safety is the focus of engineering and management skills on preventing catastrophic incidents and near misses, particularly the uncontrolled release of energy or dispersion of contaminants sufficient to cause or risk significant harm. All sources of energy must be considered, even if not under the direct control of the operational management, and must be considered throughout the project life-cycle. The skills required exceed those needed for managing workplace safety, and must embrace the ability to apply engineering science in practice. Particular hazards to consider include structural stability and integrity, behaviour of heavy moving objects including vehicles, electrical power isolation and containment, errant and unthinking behaviour, fail safe design, redundancy and time-related degradation.

This document sets out factors tending towards or away from events with catastrophic potential in order to ensure attention and resources can be focused where they are most needed. A single factor may be sufficient to indicate catastrophic potential but, equally, it may arise from a combination of factors when applied together.

Ultimately, construction companies will have to make appropriate judgements on a project by project basis.

Factors tending towards	Factors tending away
<p>High potential energy within system:</p> <ul style="list-style-type: none"> • Multi-storey buildings or structures liable to complete collapse • Release of flammable gases under high pressure • High fire risk – multi-storey timber frame buildings undergoing construction 	<p>Limited potential energy in system:</p> <ul style="list-style-type: none"> • Low rise buildings or structures where failure is likely to be limited to only parts of the structure • Release of flammable gases from low pressure systems • Fireloading similar to that when building is in occupation
<p>All potential energy released instantaneously:</p> <ul style="list-style-type: none"> • No early warning signs likely to be detectable before failure commences • Complete collapse of the building or structure is likely to occur • Energy release will be uncontrolled and unpredictable in terms of distribution and direction • Instantaneous explosion potential high • Fire could spread rapidly and uncontrollably with insufficient time to respond to alarms or other warning signs 	<p>Potential energy could be released progressively:</p> <ul style="list-style-type: none"> • Signs of distress or failure evident before collapse commences • Collapse likely to be restricted to only relatively small sections of building or structure • Energy release likely to occur in a predictable way • Instantaneous explosion potential low <p><i>Fire could start relatively slowly triggering alarms or providing other warning signs which give sufficient time for safe evacuation</i></p>

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Factors tending towards	Factors tending away
<p>Potential domino effect:</p> <ul style="list-style-type: none"> • <i>Adjoining buildings, structures, services and transport corridors in close proximity</i> • <i>Plant and materials likely to be ejected as far as adjoining structures</i> • <i>Interdependence of one structure on another</i> 	<p>Low potential domino effect:</p> <ul style="list-style-type: none"> • <i>Adjoining buildings, structures, services or transport corridors a considerable distance away</i> • <i>Any ejected plant or materials unlikely to reach adjoining structures</i>
Factors tending towards	Factors tending away
<p>High off-site casualty potential:</p> <ul style="list-style-type: none"> • <i>Ejected plant or materials likely to breach site boundary</i> • <i>Site in close proximity to major railway lines or high speed roads</i> • <i>Site in close proximity to densely populated areas or buildings, e.g. in town or city centres</i> • <i>Vulnerable groups in close proximity, e.g. hospitals or schools</i> 	<p>Low off-site casualty potential:</p> <ul style="list-style-type: none"> • <i>Site away from densely populated areas</i> • <i>No transport corridors in close proximity to site</i> • <i>Ejected plant or materials likely to be contained within site boundary</i>
<p>Innovative materials/ techniques involved</p> <ul style="list-style-type: none"> • <i>New materials being used or traditional materials being used in new ways</i> • <i>Structures of this type never previously constructed (internationally or by UK contractors)</i> • <i>Novel construction methods employed</i> • <i>Last minute changes</i> 	<p>Standard materials and techniques involved</p> <ul style="list-style-type: none"> • <i>Traditional materials being used in traditional ways</i> • <i>Structures of this type widely constructed</i> • <i>Standard construction methods employed</i> • <i>No last minute changes</i>
<p>Poor escape options</p> <ul style="list-style-type: none"> • <i>Limited means of escape for workers due to factors such as restricted alternative means of escape, e.g. tunnels</i> • <i>Method of escape relatively slow, e.g necessitating use of limited capacity plant such as hoists or via. specialist equipment, e.g. airlocks</i> • <i>Distance to place of safety long</i> • <i>Large numbers of workers might require to evacuate simultaneously</i> 	<p>Good escape options</p> <ul style="list-style-type: none"> • <i>Alternative means of escape available for workers</i> • <i>Distance to place of safety short</i> • <i>All workers can evacuate quickly</i> • <i>Escape possible on foot</i>
<p>Poor processes</p> <ul style="list-style-type: none"> • <i>Lack of adequate risk management Lack of independent checks and reviews</i> • <i>Inadequate time</i> • <i>Lack of team competency</i> 	<p>Good processes</p> <ul style="list-style-type: none"> • <i>Good risk management</i> • <i>Competent team</i> • <i>Adequate time to consider and implement</i> • <i>Suitable independent advice and review</i>