

HEALTH AND SAFETY EXECUTIVE			
CONSTRUCTION INDUSTRY ADVISORY COMMITTEE (CONIAC)			
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**Managing risks with catastrophic potential - report on the work of CONIAC's  
Catastrophic Events Working Group**

**A paper by Mike Cross, HSE's Construction Division**

**Purpose of the paper**

1. CONIAC members will recall establishing a "task and finish" working group (WG) in July 2010 in anticipation of to the publication of HSE Contract Research Report RR834 "*Preventing Catastrophic Events in Construction*" (Paper M2/2010/3 refers).
2. This paper: (i) reports on the activities of the WG; (ii) discusses the issues on which the WG focused; (iii) and suggests where further work is required to strengthen the construction industry's effectiveness in managing risks with catastrophic potential.

**Background**

3. Over the decades a number of incidents, both in GB and worldwide, have demonstrated the potential for catastrophic incidents to occur during the active phases of construction projects. In 2009 HSE contracted with the Construction Industry Research and Information Association (CIRIA) to explore the topic in more detail. The research report – RR834 was published in February 2011 and HSE was keen that momentum was maintained to ensure the findings and conclusions are acted on leading to the proposal to CONIAC to establish a WG.
4. Eight key issues were identified in the research report – these are set out in the Executive Summary of the report at Annex 1.

**Working Group activities**

5. The Terms of Reference of the WG as agreed by CONIAC are set out at Annex 2.
6. The WG is comprised of CONIAC main board members – Richard Ash, Kevin Fear, Kevin Minton and Susan Murray - as well others drawn from across the industry including representatives from the ICE Temporary Works forum, designers, sub-contractors and small firms. Several members had served on the steering group during the original research work undertaken by CIRIA including the research manager Alan Gilbertson. A full list of members is set out in Annex 3.

7. The WG has held 4 meetings between February 2012 and April 2013 and this paper was then developed and cleared by correspondence.
8. One of the early actions of the WG was to conduct a stock take of the status of each of the 8 issues identified in the report with a view to determining priorities for action. This was used to shape the agenda for future meetings.
9. The WG also wanted to gauge the extent to which the report was being considered within the industry so a survey of the Top 100 construction businesses was conducted in August 2012. CIRIA hosted the survey on their website and invited the Top 100 companies in a letter addressed to their Directors of Health and Safety to complete a short on-line questionnaire.
10. Surprisingly, there were no responses to the survey request - poor targeting of the addressees may have been a factor. Consequently, the survey was re-run in September 2013 – this time 46 people viewed the questionnaire but only 5 went on to complete it. It is not therefore possible to say how industry has responded but the low levels of returns may indicate the issue has still not fully entered in to the minds of the industry's leaders to the extent decisive action has been taken.
11. In a number of areas the WG concluded there were some signs of progress or members felt systems were available already which, if more widely adopted, would prove effective. These were: (i) Communication and interface management (Issue 4); (ii) Effective management of temporary works (Issue 6) and the use of independent reviews (Issues 7).
12. In particular the WG noted the considerable amount of work being undertaken to improve temporary works management (which had featured in over 50% of the case studies included in the research report) including the creation of the Temporary Works forum, HSE inspection programmes and development by C Skills of a training module for temporary works coordinators.
13. In relation to Issue 1 (improving industry recognition of the need to address catastrophic risk potential), the WG concluded that continued promotion of the topic from publication of the report (and complementary CIRIA guide C699 launched in April 2009), through the activities of the WG and HSE's programme of engagement with larger employers had raised awareness. However, the WG concluded that, without further effort, this was likely to diminish over time.
14. The WG decided to focus its efforts on 4 key areas which are discussed in the next section of the paper "Key considerations".
15. At the final meeting of the WG the status of all eight issues was re-assessed in order to inform CONIAC of the measures required to drive forward improvement on this important topic. The results of this analysis are presented in Annex 4.

## **Key considerations**

### *Refining and developing understanding of the characteristics of catastrophic events*

16. WG members were concerned that, without sufficient clarity about what catastrophe might mean in the context of construction activities, inappropriate or disproportionate approaches might be employed to manage risks. However, improving on the definition of a catastrophic event provided in the RR834 proved extremely challenging.

17. Eventually the approach adopted was to produce a set of factors which individually or collectively might help in determining whether a given activity has catastrophic potential – these are set out in Annex 5.

#### *Developing leading indicators*

18. The research showed clearly that large construction firms, while being proficient at measuring their health and safety performance with reference to lost time injury rates, do not have equally well developed means of assuring themselves their risk management systems are dealing adequately with low probability, high consequence events. This is a difficult area and one that major hazard sectors have wrestled with for many years. Helpfully, ECIA have published guidance on the leading indicators but the WG felt this did not tackle, specifically, measures directed at managing catastrophic risk potential.
19. The WG therefore developed and piloted a methodology that might provide one viable approach to producing meaningful indicators. The basis for the approach was drawn from guidance prepared for the chemicals sector which suggested that indicators could be derived from examining effective compliance with safety critical processes, i.e. measuring whether the process was delivering the right safety outcome.
20. It was decided the effective management of temporary works (TW) might be a suitable proxy measure of effective management of catastrophic events so an audit methodology was developed and this has been piloted by UKCG members. It has reached the “proof of concept” stage but a lot more work is needed to develop it in to a fully useful tool.

#### *Competence*

21. The research identified competence (which includes appropriate knowledge and skills of safety risk management) as a key factor and the WG considered whether there were particular aspects of this very broad topic that might need particular consideration in the context of preventing catastrophic events. Discussions in the WG have focused on the attributes of key supervisory staff (those with direct management responsibilities of site activities). The WG has concluded that competence in this regard, if appropriate technical knowledge and experience is assumed, is about key personal characteristics and behaviours. This includes critical thinking skills and the ability to challenge when things are going wrong or might go wrong. It is also about knowing your competence level and where you are and recognising your incompetence, i.e. when you need to stop and seek further professional advice, in particular when something changes.
22. This is not about developing some sort of new separate ‘qualification’ rather it is about assembling project management teams with appropriate competence profiles.

### *Improving the sharing of information from incidents*

23. Learning from previous catastrophic events is, self-evidently, an important process. The WG has debated how information is shared currently, acknowledging some of the practical constraints around the dual role of regulators (principally HSE) in preventing recurrence while ensuring criminal proceedings are not jeopardised.
24. The WG has also noted the reluctance of individual companies to share information, driven largely by legal constraints arising out of protracted criminal proceedings and civil claims. The WG has noted other models, similar to RAIB in GB, such as the Dutch Accident Board which is able to produce reports relatively quickly and may provide a model for improving the situation in GB.

### **Next steps**

25. Distilled from the detailed analysis in [Annex 4](#) CONIAC will wish to consider the following potential next steps:
  - The set of factors developed by the WG (see [Annex 5](#)) could be publicised to assist companies to determine where to focus their efforts
  - The construction industry could be encouraged, as a matter of urgency, to develop leading performance indicators that are appropriate to credible events with catastrophic potential in construction
  - Discussions could be held with UKCG, CECA, CITB and others to provide a way of rectifying current systemic deficiencies in the awareness and knowledge of catastrophic risks in the industry and how they can be managed. Discussions with the design community on their role might also be useful
  - The construction industry could be invited to consider how to drive forward with the progressive uptake of BIM with a specific focus on maximising its potential to improve the identification and mitigation of risks at the design stage.
  - UKCG could be invited to promote understanding among its members of the critical importance of ensuring personnel in key supervisory roles have the appropriate knowledge and experience to be able to identify events with catastrophic potential and the strength of character to take the right action.
  - Building on recent successes there are two areas of temporary works management where further progress might be possible: (i) development of recognised competencies for key personnel, e.g. TwCs; and (ii) reduction or elimination of the need for TWs through improved design and construction processes.
  - Representations could be made to relevant bodies to stimulate increased use of independent review.

- The views of the Professional Institutions and HSE could be sought on how further improvements in to the release of information about incidents and near misses can be taken forward.

### **Action**

26. CONIAC is asked to:

- a) accept this report of the work of the Catastrophic Events WG.
- b) discuss how the issues raised in this paper and the further measures identified in the analysis of issues (Annex 4) and summarised in paragraph 25 are taken forward.
- c) agree the WG has fulfilled its Terms of Reference (Annex 2) and should be discharged.

### **Contact**

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## HSE CONTRACT RESEARCH REPORT RR834

### PREVENTING CATASTROPHIC EVENTS IN CONSTRUCTION

#### Executive summary

The construction industry recognises the hazardous nature of its activities, which manifests itself in the high toll of accidents its workers suffer compared with other industries. These range from lost time injuries to fatalities. There is also a high incidence of ill-health among construction workers including fatal diseases such as cancer arising from asbestos exposure. However, the industry may not be sufficiently aware of the potential for it to be associated with more major events (those involving multiple deaths and/or significant damage to property and infrastructure). These major or catastrophic events may have wide implications such as extensive delay or project failure, significant business impact, loss of money and loss of reputation for all concerned.

Health and safety risk management in the industry has traditionally focused upon preventing accidents arising from the most significant hazards such as falls from height (the biggest killer on site) but more recently there has been a welcome growth in the understanding of latent health problems, which can emerge years after exposure.

And increasingly, larger construction organisations have been applying 'holistic' risk management techniques to manage project risk and low probability but high-consequence issues will have been included in these considerations. Many of the issues addressed have had purely commercial consequences e.g. sudden loss of a major contract or customer. However, some have health and safety implications -this project has examined these 'low probability but high-consequence' safety hazards.

In even more hazardous industries such as the chemical, oil and gas and the nuclear and rail industries, major hazard scenarios are required to be examined in depth. These potentially catastrophic events are sometimes referred to as 'Top Events'. It is appreciated that they can have a disastrous impact on a company's reputation and well-being and upon society. The process of examining the risk of a catastrophic event requires that a 'safety case' is prepared, based upon a safety risk assessment. This project has looked at the risks of 'Catastrophic Events' in the UK construction industry as follows:

- The types of catastrophic event which have occurred or which might occur during construction
- The reasons for occurrence when there have been (or could have been) catastrophic events during construction, including an examination of the underlying factors
- The controls which should contribute to an avoidance of a catastrophic event
- Where the UK construction industry could improve.

To examine these issues the following approach was taken:

- Review the literature
- Find out what people thought, by consultation and by means of an on-line survey and focus group events

- Examine a number of ‘case study’ events which were, or could have been, catastrophic
- Review all the information gathered and suggest where the industry should focus its attention to make improvements.

It was clear that there have been Catastrophic Events with major consequences. Their importance was recognised by the industry, although it is considered that in their day-to-day work few people realised the severity of what might happen. Examples of Catastrophic Events are given in the report.

Certain issues emerged which require attention from the industry: these are discussed in detail in the report and are summarised as follows:

**Issue 1: The industry should recognise that catastrophic events need further attention**

We found that Catastrophic Events are a significant cause for concern and have not received the attention they deserve. Accordingly they should be considered in an appropriate manner and preventative action should be taken as an inherent part of normal construction activity.

**Issue 2: Corporate risk management systems should be improved**

We found that many events had occurred which had significantly impacted at board level upon both construction organisations and upon clients. In order to respond to obligations imposed by legislation and The Turnbull Report, companies’ organisational risk management should include consideration of how well Catastrophic Event risks are being managed. The use of industry-relevant indicators should be explored to support such activity.

**Issue 3: Knowledge, skills and experience of safety risk management should be raised**

The case studies frequently demonstrated a failure among project personnel at all levels to adequately identify the full extent of hazards and address the risks arising; other sources demonstrated a considerable degree of uncertainty and a lack of confidence in the industry’s knowledge, skills and experience of safety risk management. This suggested that more emphasis needed to be given to:

- Education of those who will be entering the industry
- CPD and on-the-job training
- Development of more effective safety risk management systems.

**Issue 4: Communication and interface management should be improved**

The research emphasised the need for effective communication about hazards and particularly the importance of effective management of risk at interfaces between and within organisations. The report explores areas where improvements can be made. This issue underpins the improvement of performance in other issue topics and involves all stakeholders.

**Issue 5: Competence is key**

As expected, the issue of competence (which underpins CDM 2007) was seen to be important. In particular the competent fulfilment of the role of Principal Contractor on site was identified as central to avoiding Catastrophic Events. The industry should develop proposals for ensuring that inappropriate Principal Contractors (or more accurately inappropriate persons) do not become responsible for sites where there are risks which could lead to Catastrophic Events; all stakeholders need to be consulted on how this might be achieved.

**Issue 6: Effective management of temporary works is crucial to success**

It was apparent from many case studies that insufficient consideration was being given to the management of temporary works in its widest sense. This work must be taken seriously and include all temporary works aspects, including issues relating to cranes and scaffolding. The potential impact of failures of temporary works needs to be considered carefully to reduce the likelihood of a Catastrophic Event occurring and the industry needs to seek to improve performance in this vital area. All stakeholders should be consulted on how to achieve this improvement.

**Issue 7: Independent reviews should be employed**

Evidence was found that the effective use of independent review, from an early stage and ongoing, would have reduced the risk of a catastrophic event. Evidence was also found of projects where there was inadequate independent review of what was happening on site and there was concern in the industry that levels of effective supervision had been stripped away over recent decades. These issues need to be explored further and encouragement given for clients to seek independent authoritative advice.

**Issue 8: The industry should learn from experience**

Learning from experiences was not found to be well-rooted in the industry. There was lack of confidence that:

- Learning was shared rapidly
- Lessons were incorporated into the education and training process
- Information could be easily accessed

There was however activity which needed to be encouraged and supported:

- The work of SCOSS and CROSS (which needs to be more widely appreciated and publicised)
- The work of the various industry bodies and groupings that provide guidance. Ways to improve their effective performance should be investigated and their activities should be inclusive of all industry stakeholders.

**Conclusion**

Catastrophic Events in construction are real issues which require proper consideration by all stakeholders, led by directors and senior staff. There are opportunities for improvement of performance and all stakeholder groups should be involved in agreeing what should be done and making the necessary changes.

## **CONIAC – Catastrophic Events Working Group**

### **Terms of Reference**

#### **Purpose**

The purpose of the Working Group is to advise CONIAC on the steps that should be taken to respond to the findings and conclusions of the HSE Contract Research Report RR834 “Preventing Catastrophic Events in Construction”.

#### **Composition**

- 6-10 members
- Members to be drawn from a balanced group including:
  - Representatives of major contractors
  - Designers
  - Trade Unions
  - Technical experts
  - those who have expressed interest in being on the Steering Group
- The Chair is appointed by HSE
- The Secretariat for the Working Group is provided by HSE

#### **Tasks and responsibilities of the Working Group**

The tasks and responsibilities of the Working Group include:

- Confirming the Terms of Reference of the Working Group
- Receiving and reviewing the Contract Research Report, particularly the findings and conclusions
- Developing proposals for an industry-wide response to the report including identifying the “what, how, when and who” for taking forward workstreams to address the findings and conclusions
- Monitoring progress with the workstreams and reporting to CONIAC on progress and advising on remedial actions, if necessary

## CONIAC AC WG Membership

<b>Name</b>	<b>Organisation</b>	<b>Representing</b>
Richard Ash	Engineering Construction Industry Association (ECIA)	ECIA
Nick Boyle	Balfour Beatty Civil Engineering Ltd	Temporary Works Forum
Paul Bussey	Scott Brownrigg	DIOHAS (Designers & CDM-Cs)
John Carpenter	John Carpenter Consultants (Independent)	ICE
Neil Edmunds	Wates Construction Ltd	UKCG
Kevin Fear	Construction Skills	Training organisations
Alan Gilbertson	Construction Industry Research and Information Assoc (CIRIA)	CIRIA
Brian Hughes	William Hare Ltd	Sub-contracting businesses
Kevin Minton	Construction Plant Hire Association Ltd	Plant and equipment suppliers
Susan Murray	UNITE	Trades Unions
Simon Smith	Contractors Design	Designers (esp. minor works)
Denis Doody	UCATT	Trades Unions

No	Issue	Current position	Assessment of adequacy of position	Further measures required
1	<p><b>The construction industry should recognise that catastrophic events need addressing</b></p>	<p>The research revealed that at industry and company level the potential for a catastrophic event occurring was underestimated and that the position needed to change if improved preventive measures were to be identified and implemented.</p> <p>One of the key drivers for initiating the research was to engage with industry in order to stimulate discussion and raise awareness. Through the diverse make up of the steering group and the publicity generated during the project, principally by NCE, the position has clearly improved.</p> <p>Publication of the research report alongside the complementary CIRIA publication C699 with a high profile launch event that was widely reported at the time served to raise awareness of the topic but, as always, the effective has been temporary. To determine the impact of the publication and launch events, the WG initiated a survey in 2012 of the Top 100 construction companies asking them to say (via. an on-line survey package provided by CIRIA) what action they had taken (if any) in response to the report. Disappointingly, this produced no responses from all the companies surveyed – this may indicate a worrying lack of interest or understanding in the topic.</p> <p>The response to the 2012 may have been, in part, the result of poor targeting and lack of clarity about what was required from responders. Consequently, the survey was repeated in September 2013. Although 46 people viewed the questionnaire, only 5 people completed it, perhaps indicating the industry has yet to engage decisively with the topic.</p> <p>The WG has identified that defining potentially catastrophic scenarios is very challenging given it is a subjective process and has to be considered on a project by project basis. To assist industry the WG it has developed a set of factors (Annex 5) which industry can use as a prompt when evaluating the need to manage risks with catastrophic potential for specific processes and projects.</p> <p>HSE has adopted a new approach for engaging with large employers and a “mandatory” item for board level discussions has been catastrophic events. Those companies approached have been asked (when not undertaken already) to systematically review their policies and procedures in light of the issues raised in the report.</p>	<p>Since the research report was published events with catastrophic potential have continued to occur - examples include pile augers penetrating a live underground tunnel, a major gas escape in a city centre department store undergoing refurbishment, a quadruple fatality when a heavy duty reinforcing bar cage collapsed during construction and the collapse of a steel frame building during construction.</p> <p>The WG recognises catastrophic events need a different approach in terms of their identification and analysis – that is the next step change required. There is only limited evidence that awareness has turned to action or that awareness is sufficiently widespread to be self-sustaining. And, the awareness and action that has been seen is confined to the PC community – clients and designers are further behind.</p> <p>At a time when there are many other pressures on the construction industry it is not difficult to envisage, catastrophic risks might not be at the forefront of organisations’ minds. It is likely therefore that even the levels of interest seen in the last 2-3 years might be on the wane.</p> <p>Overall, it is the considered opinion of the Working Group, that construction industry as a whole has yet to demonstrate it is taking the topic sufficiently seriously</p>	<p>A satisfactory position will only have been reached when knowledge and understanding of catastrophic potential is widely accepted by the construction industry to the point that management of risks with catastrophic potential is improved</p> <p>The WG recognise there is not a silver bullet that will instantly raise levels of awareness. However, the WG advise that urgent action is required.</p> <p>All the players in the health and safety risk management system have a role to play in this endeavour. For its part HSE will continue to reflect the subject in its intervention plans including its work with large employers and as an important element of proactive inspections.</p> <p>To assist industry, the set of factors developed by the WG (see current position) should be publicised to assist companies to determine where to focus their efforts.</p> <p>CONIAC is asked to consider what other measures might be taken to raise and sustain awareness.</p> <p><b>ACTIONS FOR CONIAC TO CONSIDER:</b></p> <p><i>The set of factors developed by the WG (see Annex 5) should be publicised to assist companies to determine where to focus their efforts.</i></p>

No	Issue	Current position	Assessment of adequacy of position	Further measures required
2	<b>Corporate response should be at the highest level</b>	<p>HSE has the long term objective of improving self-regulation across all industry sectors including construction. In addition to ensuring the right regulatory framework is in place, in the 1990s HSE increased the focus on health and safety management systems including publication of HS(G)65. HSE has also worked with the Institute of Directors to develop guidance for business leaders and Boards to help them discharge their responsibilities</p> <p>More recently the Health and Safety Strategy for GB which was launched in 2009 has emphasised the importance of effective leadership the management of health and safety risk.</p> <p>The Turnbull Report should have stimulated Boards to address risk management holistically. However, it was not possible through the research project to identify the extent to which this has happened nor how effective it has been.</p> <p>The WG has piloted the development of leading performance indicators (based on HS(G)254) to help construction organisations improve their corporate risk management systems. The limited scale of the work undertaken has provided only “proof of concept” and more work is needed to develop approaches that are more sophisticated.</p> <p>HSE, through its new large employer programme has challenged a small number of construction organisations to examine their corporate risk systems taking in to account the research report findings</p>	<p>Corporate risk management is an evolving process. However, it is not clear whether the construction industry has factored catastrophic event potential in to their systems in a way that will help them manage those risks.</p> <p>HSE’s limited engagement with large employers has revealed a range of approaches but it would appear that health and safety risks are widely expressed as potential “compliance failures” which seems to under-rate the potential catastrophic events might have on commercial and financial risk management for both moral and commercial reasons.’</p> <p>The embryonic work on leading performance indicators undertaken by the WG demonstrates the potential value of the approach but a lot more work is required to take this forward. Without meaningful indicators corporate risk systems are largely measuring health and safety performance via lagging indicators (LTAs etc.) which are inevitably poor predictors of the extent to which low probability/ high consequence risks are being managed.</p>	<p>Developing leading performance indicators is a priority in the view of the WG.</p> <p>The WG propose that further research is required to develop a suite of suitable indicators. This might be something UKCG would wish to take forward. One option would be to commission help with the development of the performance indicators to see how easily the concepts studied by the WG can be worked up in to something more sophisticated and usable.</p> <p>In the meantime larger organisations should review their corporate risk registers adequately reflect potentially catastrophic events. Audits of projects could include peer review to ensure hazard recognition has been conducted effectively.</p> <p><b>ACTIONS FOR CONIAC TO CONSIDER:</b></p> <p><i>The construction industry could be encouraged, as a matter of urgency, to develop leading performance indicators that are appropriate to credible events with catastrophic potential in construction.</i></p>

No	Issue	Current position	Assessment of adequacy of position	Further measures required
3	<b>Knowledge, skills and experience of safety risk management should be raised</b>	<p>The research suggests an underlying lack of appreciation of catastrophic event scenarios among many in the industry. Clearly it is inappropriate to rely on first hand experience of catastrophic events before competence is attained which suggests that the way the topic is approached from education through CPD needs to be re-considered.</p> <p>The WG noted that academic institutions do not see their primary role as providing training but rather education so it follows the primary responsibility for ensuring employees have sufficient skills, knowledge and experience rests with employers, supported by the professional institutions. The position on University education is thought to be that few take the subject of risk management seriously, despite the prevalence of the subject in most design office and workplace activities.</p> <p>There are a plethora of competence schemes within the construction industry but most are focused on operator level competence with the exception of site management. Competence is also developed and recognised by numerous assessment bodies from City and Guilds through the professional institutions and health and safety is becoming increasingly a mandatory assessed element.</p> <p>One significant development of note is the work of the Inter-Institutional Group on Health and Safety risk management. This group has recently proposed 3 key workstreams: (i) improving communication and understanding of risk among professional engineers; (ii) proposing life-long learning requirements in health and safety for engineers at all levels; and (iii) working to develop a business case for excellence in the management of health and safety in an engineering context.</p>	<p>This is a long-term and complex issue. There are positive signs that the professional institutions have recognised their role in improving competence in health and safety management in the engineering professions. However, this is at a very early stage and no actual product has been delivered. The higher education system, for the time being, appears to believe it does not have a role to play in raising levels of risk awareness in students.</p> <p>The desired position is one of having people in place who are constantly alert to the potential for catastrophic events, who expect the unexpected and who actively look for potential problems to ensure they are being addressed. It is also important that those who work in the industry understand the difference between what is planned in an office environment compared with the realities of site activity.</p> <p>Given the assessment of the current position for Issue 1 suggests limited penetration of understanding about catastrophic event potential at corporate level, an absence of understanding among key personnel is within organisations suggests this will compound the likelihood such events will not be detected in advance.</p>	<p>In the view of the WG, urgent action is required to create the necessary levels of knowledge and skill to support the improved management of risks with catastrophic risk in construction.</p> <p>The research revealed that current systemic deficiencies are present throughout the education and professional training/ CPD processes. Clearly, it would be desirable if the situation improved “across the board”. However, in the absence of serious activity in higher education and the current low levels of activity in professional Institutions, this seems for now to be a matter primarily for the PC community to address who must ensure their staff and key personnel in their supply chain have the necessary competence.</p> <p>There may also be a role for CITB in assisting PCs meet this challenge.</p> <p>Furthermore, designers have a critical role to play and the relevance of and relative significance to the architectural design community needs further consideration.</p> <p><b>ACTIONS FOR CONIAC TO CONSIDER:</b></p> <p><i>Discussions could be held with UKCG, CECA, CITB and others may provide a way of rectifying current systemic deficiencies. Discussions with the design community on their role might also be useful.</i></p>

No	Issue	Current position	Assessment of adequacy of position	Further measures required
4	<b>Communication and interfaces management should be improved</b>	<p>Effective communication (aka coordination and cooperation) is at the heart of CDM 2007 in recognition of the complexities of managing activities where, more often than not, two or more firms are working together. In addition, CDM includes the concept of a coordinator to help manage interfaces, particularly between client, designers and principal contractors. The current review of CDM is considering, inter alia, how to improve communications by strengthening the various duty holder roles and eliminating unnecessary paperwork and bureaucracy.</p> <p>Interface management is something that industry is already aware of – e.g. via Association for Project Management and writers such as Peter Morris.</p> <p>There are further encouraging signs that the PC community has recognised the importance of ensuring supervisory personnel from senior management to site level have appropriate communications skills. Many now have well advanced behavioural safety programmes in place.</p> <p>This approach is supported by findings from research in to aspects of delivery of the London Olympics which demonstrated the importance of clarity, challenge, collaboration, communication and openness to successful project management. Crossrail have now identified this is critical to their success and have programmes in place to improve the leadership abilities of their staff down to front line manager level.</p> <p>Finally, Building Information Modelling (BIM) is starting to come to the fore in project design and management.</p>	<p>There is reason to be optimistic that there is a strong willingness to tackle bureaucracy in the industry and the CDM review provides a platform for taking this forward.</p> <p>There are also encouraging signs that employers within the construction sector understand the value of having staff with strong communications skills.</p> <p>Communications on managing risks with catastrophic potential should also receive further stimulation once the subject is more widely understood at corporate and individual level (see issues 1 – 3)</p>	<p>Continuing activity is essential by all involved in construction to improve skills and practice in safety risk management (including the management of risks with catastrophic potential) and both the Professional Bodies and Construction Skills should take the lead in an industry-wide initiative to crystallise and promulgate good practice.</p> <p>Lessons learned from the successful delivery of the Olympics should be adopted across the whole industry.</p> <p>BIM has clear potential for improving he key is to have a specific sequence methodology specified so the PC understand the designer's intent. As BIM becomes more widely used across the industry, its potential for risk management should be explored to the full.</p> <p>It appears that the professional bodies are actively engaged in BIM from a health and safety perspective.</p> <p>The use of 3D techniques to understand design intent and different methods of construction and potentially understand the residual risk associated with different methods also assists peer reviews to be more effective. Visuals done well are a common language to all as we live in a 3D world. "Federal" BIM allows us to see the interaction between different disciplines in its full and design out fundamental errors for future use.</p> <p><b>ACTIONS FOR CONIAC TO CONSIDER:</b></p> <p><i>The construction industry could be invited to consider how to drive forward with the progressive uptake of BIM with a specific focus on maximising its potential to improve the identification and mitigation of risks at the design stage.</i></p>

No	Issue	Current position	Assessment of adequacy of position	Further measures required
5	<b>Competence is key</b>	<p>The distinct point highlighted here is the importance of ensuring that those in charge of projects have the appropriate levels of hands on experience to enable them to manage site risks effectively (see also Issue 3). It challenges some of the current project management/ team models where the core team is primarily responsible for scheduling and managing packages of work rather than having direct professional engineering experience related to the type of project.</p> <p>The WG felt that a more appropriate expression of this issue is the personal characteristics of key personnel – ensuring that those selected for key roles not only have the right depth and breadth of technical experience but also the right behavioural traits. In particular the WG thought that key personnel need highly developed critical thinking skills combined with strength of character so that they make the right judgements and stand by them even if these might be unpopular at the time.</p>	<p>Concerns arise from:</p> <ul style="list-style-type: none"> <li>• the re-positioning of several large construction companies away from construction per se towards client facing project management</li> <li>• projects being managed as packages with each package delivered by specialist sub-contractors</li> </ul>	<p>Continuing activity is required by all construction companies to train and select staff for site management roles who are competent in safety risk management (including the identification and management of risks with catastrophic potential) This seems to be a matter primarily for the PC community to address who might seek assistance from CITB and the professional institutions.</p> <p>Improved designer skills are also needed to identify potential catastrophic risks early and then to manage the options in relation to all other factors as well as risk.</p> <p><b>ACTION FOR CONIAC TO CONSIDER:</b></p> <p><i>UKCG could be invited to promote understanding among its members of the critical importance of ensuring personnel in key supervisory roles have the appropriate knowledge and experience to be able to identify events with catastrophic potential and the strength of character to take the right action.</i></p>

No	Issue	Current position	Assessment of adequacy of position	Further measures required
6	<b>Management of temporary works is crucial to success</b>	<p>Over the years there have been several industry led initiatives to target specific risk areas, e.g. responding to the Bragg report on formwork collapses leading to the development of BS 5975, and more recently, the response of the Construction Plant Hire Assoc. (CPA) and Strategic Forum for Construction to tower crane risks.</p> <p>And a lot of work done has been undertaken recently by industry and HSE to improve temporary works management including:</p> <ul style="list-style-type: none"> <li>• revision of BS 5975:2008 such that it forms a generic Code of Practice for the management of TW</li> <li>• establishment of the Temporary Works Forum to review what might be done to improve the management of temporary works. The Forum has made considerable progress on a number of fronts and produced guidance on key topics such as hoarding design and temporary demountable structures</li> <li>• publication by ICE of a best practice guide to TW management</li> <li>• revision of BS Code of Practice on demolition (BS 6187) which now includes guidance on partial demolition (which often requires TW to be provided during the process or to support the remaining structure)</li> <li>• TW management will continue to feature as a priority topic in CD's POW with the emphasis is 2012/13 to smaller sites and projects involving smaller contractors who do not have in-house expertise to manage TW.</li> </ul> <p>Increased demand for TwC training is now evident with talk of one University setting up a centre of excellence. And CITB have established a TwC that has been developed as a direct consequence of the work of this WG. Under the umbrella of the Site Safety Plus courses and working closely with the Temp Works Forum, trainers are being trained and tutor requirements finalised for the courses to start in Q3 2013.</p>	<p>There are encouraging signs that TW management has improved significantly in recent years – evidenced by inspection programmes undertaken by specialist inspectors.</p> <p>The professional institutions are involved already and through them principal contractors and designers are engaged.</p> <p>If momentum is sustained the decline in the importance and practice of TW management since the 1980s may well be reversed.</p>	<p>TW management has been revived in recent years but there are still significant challenges ahead:</p> <ul style="list-style-type: none"> <li>• Improving client understanding of the critical importance of temporary works in the execution of their projects and the need to be realistic about the costs involved.</li> <li>• Moving from the provision of training for identified key roles, e.g. the TWC, to a broad competence framework for all those involved in the design and execution of TWs.</li> <li>• Ensuring designers give equal weight to TW design in their work and consider how the permanent works can be planned and executed and how temporary works may be minimised</li> </ul> <p>Increased use of TW management audits (see Issue 2) will also help ensure the topic receives a higher profile and it is delivered more effectively.</p> <p>The role of Temporary Works Supervisor (TwS) as defined in BS 5975 needs further consideration, in particular the improved provision of training for the role.</p> <p><b>ACTION FOR CONIAC TO CONSIDER</b></p> <p><i>Building on recent successes there are two areas where further progress might be possible: (i) development of recognised competencies for key personnel, e.g. TwCs; and (ii) reduction or elimination of the need for TWs through improved design and construction processes.</i></p>

No	Issue	Current position	Assessment of adequacy of position	Further measures required
7	<b>Independent reviews should be employed</b>	<p>The UK tunnelling industry and its insurers have produced a joint guide to help ensure high safety standards and this included advice on the use of independent review. Crossrail have thus appointed an independent review panel to oversee the tunnelling specific risks arising from the project.</p> <p>SCOSS had proposed "Peer Assist" independent review of safety critical elements of high risk structures.</p> <p>However, it is not clear the extent to which formal independent review is widespread.</p>	<p>There is no evidence independent review is being widely used to inform project risk management</p>	<p>Action is required by ACE, UKCG and CECA and others to make it clear to Project Managers that consideration should be given to the commission of independent reviews when planning the management of risks with catastrophic potential.</p> <p>Independent reviews can also be used to improve corporate understanding of the risks arising out of particular projects (see issue 2).</p> <p><b>ACTION FOR CONIAC TO CONSIDER:</b></p> <p><i>Representations could be made to relevant bodies (as noted above) to stimulate increased use of independent review.</i></p>
8	<b>The industry should learn from experience</b>	<p>HSE has a long history of putting information in to the public domain in the form of investigation and enquiry reports, published guidance and safety alerts.</p> <p>Recently a new web-based safety alert system have been launched. However, the WG queried whether information could be provided more quickly despite the legal constraints on early release of information when criminal or civil proceedings are in play.</p> <p>Structural Safety (SCOSS and CROSS) exist for the very purpose of exchanging information to help others learn lessons concerning structural safety critical matters</p>	<p>Levels of information entering the public domain have improved in recent years. However, criminal and civil legal proceedings are still a significant issue in the timeliness and detail of information which can be released.</p> <p>The RIBA/architectural design community are looking into the provision of case studies to assist with this process</p> <p>The WG consider that the current position is inadequate and positive action is required.</p>	<p>Action is required by Professional Institutions to make it clear to their members who become aware of events of concern to them that consideration should be given to reporting the technical issues to CROSS, as part of their professional duty of care. The Institutions might also look at the way expert witnesses work and its relationship with their personal duty of care and codes of conduct.</p> <p>HSE might also explore whether further measures might be taken on information release (including greater use of the provisions under the Health and Safety at Work Act 1974</p> <p>More radically, there may be useful insights to be gained from a study of how other countries and other regulatory models approach the issue, e.g. CAA and RAIB in the UK and the Dutch Safety Authority.</p> <p><b>ACTIONS FOR CONIAC TO CONSIDER:</b></p> <p><i>The views of the Professional Institutions and HSE could be sought on how this topic can be taken forward.</i></p>

## 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.*

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

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