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Safety Sécurité

CONTENTS

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About this Newsletter

The 2008 SAFEX Congress is now history. Hopefully the lessons that delegates shared and the insights they obtained are not. We summarize some aspects of the Congress in this Newsletter mainly for the benefit of those readers who were unable to participate in it. In our *Meet the Governors* feature we are happy to introduce Enrique Barraincua who is one of four new Governors appointed by members at the Ordinary General Meeting during Congress. This is followed by *Our Incident Reporting Performance* which is a dominant measure on the SAFEX dashboard. After the *2008 Congress Review,* which we mentioned earlier, the popular feature *From CERL's Research Notes* appears. In this article Phil Lightfoot picks up on the Alert we recently distributed regarding the hazard of glass windows in an explosives environment. The new feature *Our Regulatory World* discusses the regulatory implications of desensitized explosives. The Newsletter concludes with a *Special Feature* on the IMESAFR technology to which members were introduced in the SAFEX Training Session at Congress. We have received inquiries about conducting an IMESAFR training course for SAFEX members and we would like to know how many members would be interested in such an event.

Meet the Governors

Enrique Barraincua

Enrique has a Degree in Industrial Engineering Mechanical) from the University of Bilbao. He also has three post graduate diplomas in OHS and has successfully completed the Bureau Veritas IRCA course for OH&S Auditors.

After an assignment in construction research and employment with two other companies, he joined MAXAM in 2001 as the OH&S manager for the Initiation Systems Business Unit. At the beginning of 2007 he was charged with reorganising the OH&S structure of the MAXAM Group reporting directly to the Corporate Director. He belongs to a new generation of managers in the MAXAM Group that are leading the Group's international consolidation efforts. Notwithstanding his management duties, he believes in the importance of contact with the factories. "It is vital to be where things take place. It is the only way to get to know whether the theory of the meeting rooms apply to the real world."

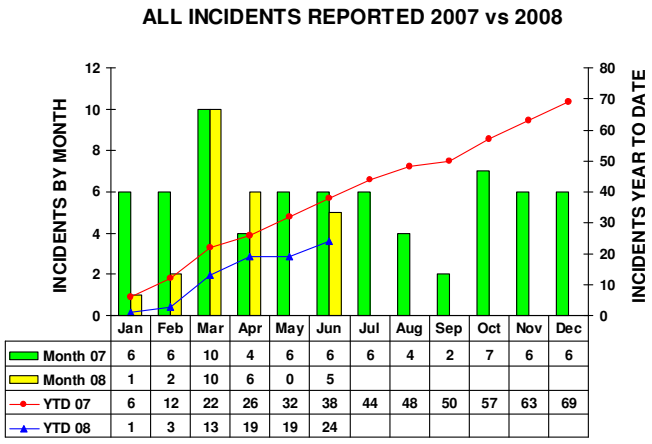
His first direct contact with SAFEX took place during the Geneva Congress in 2005, in which he presented a paper on the ergonomic side of safety.

Enrique, aged 42, is married to Carmen and lives near Bilbao, not far from MAXAM´s oldest factory. He enjoys the privilege of working in the middle of one of the best preserved forests of the region. "With regard to my hobbies, my wife and I love taking long walks in the countryside with our dog, especially when the weather is good (which is not so often in the north of Spain as people think). From time to time we go skiing or trekking in the nearby mountains."

Incident Reporting

Monitoring our Reporting Performance

Incident Reporting is key to SAFEX and the services it offers. Businesses measure what is important to them and we try to measure our reporting performance by way of the following charts:



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Month 07	6	6	10	4	6	6	6	4	2	7	6	6
Month 08	1	2	10	6	0	5						
YTD 07	6	12	22	26	32	38	44	48	50	57	63	69
YTD 08	1	3	13	19	19	24						

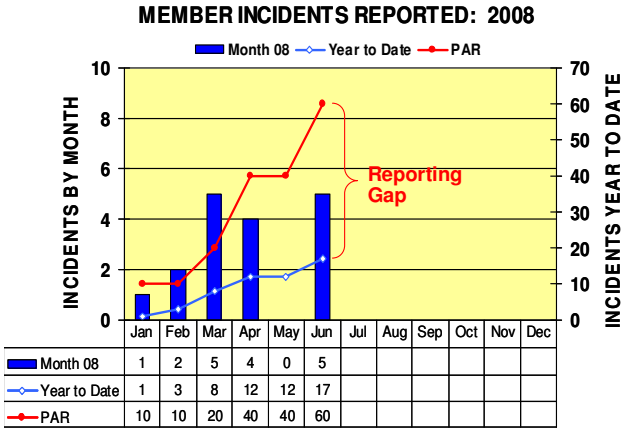
All the incidents reported. This chart compares the sum of non-member and member incidents reported to SAFEX every month this year to those of the previous year.

As you can see we are lagging behind last year. Is it because we are experiencing fewer incidents from which we can learn? Or is it because we are not as diligent in reporting them? If it is the latter we are missing learning opportunities which, as an industry, could cost us dearly.

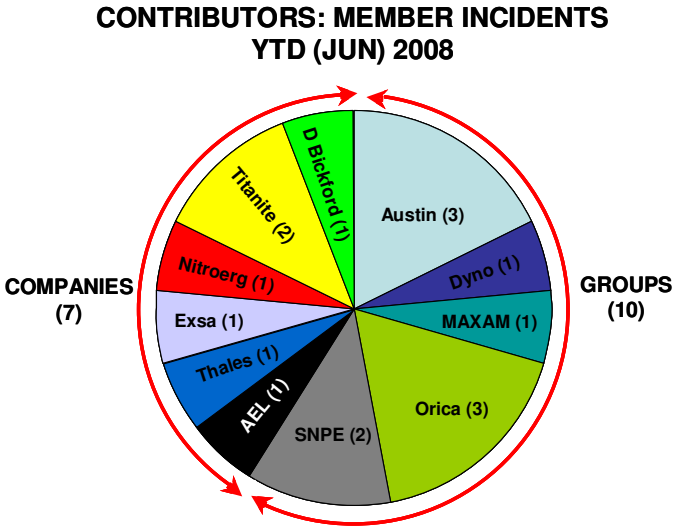
Please check to see that all incidents from which we can learn have been reported. It could just save a life!

Member incidents reported We track separately the number of incidents which members themselves experience and report. These incidents are the subject of an investigation from which we obtain valuable learning points. For this reason they are very important to us.

A significant indicator in this chart is the gap between the number of incidents we receive and those we believe are occurring but go unreported. According to this chart the Reporting Gap has increased in the last quarter from 2 out of 3 explosives incidents being reported by members to 1 out of 3. It means we are losing out on 66% of the possible learning opportunities.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Month 08	1	2	5	4	0	5						
Year to Date	1	3	8	12	12	17						
PAR	10	10	20	40	40	60						



Contributors of member incidents. This chart identifies those members who have taken the trouble to report their incidents. It shows the number of incidents each of those members reported relative to the total number of reports received.

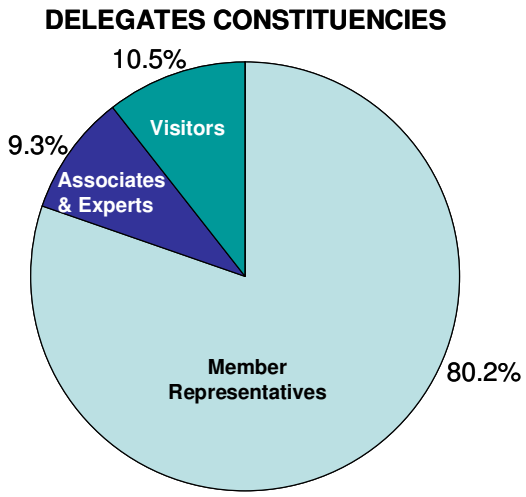
The chart distinguishes between Groups and Companies merely to indicate the performance of the two membership categories. Each category has about the same number of operating units. In contrast to last year, Group members have reported marginally more incidents this year than Company members.

XVI Congress in 2008, Madrid

Who attended the Congress?

172 delegates registered for the Congress and pre-Congress activities. This was much better than we anticipated as there were only 135 at the previous Congress in Geneva. For this superb turn-out we thank those members and visitors who responded to our invitation. While the total numbers tell a story, the actual composition of the delegates are also interesting. Let's examine two questions:

1. How representative was the Congress?



The delegates represented Members (both Companies and Groups), Associate Members and Visitors. The chart alongside shows the ratio in which these categories were represented at the Congress.

You may recall this is the first Congress to which we invited visitors from organizations that are not associated with SAFEX but involved in the HS&E performance of the explosives industry. The Standards Authorities of the various countries, the International CIE Conference and IGUS-EPP are examples of such organizations.

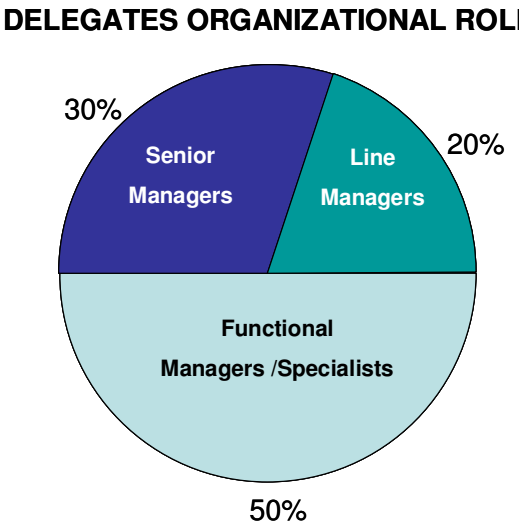
All the Group members and 44 of the Company members (79%) were represented at Congress

2. What organizational roles were represented?

We considered three categories: Senior Managers; Line managers; and Functional Managers and Specialists.

People agree that Senior Management commitment is essential to the safety performance of a company. Therefore Senior Manager participation in our Congresses is important to SAFEX. Line managers carry the responsibility for the safety performance of their units. However, Functional Managers and Specialists are essential to the safety management effort.

The chart alongside shows the ratio in which these categories were represented at the Congress.



What happened at the Congress?

There were essentially three parts to the Congress:

- The pre-Congress activities which comprised the Training Session and Workgroup Sessions;
- The Congress itself which started with the Welcome Reception on the Wednesday evening, continued with the Open and Closed Days on the Thursday and Friday before concluding with the Gala Dinner on the Friday night. During the Open and Closed Day, Exhibitors of specialist equipment and services with an impact on explosives HS&E performance exhibited their products;
- The Social Programme which entailed a Partners Programme on the Thursday and Friday and an Excursion for delegates and their partners on the Saturday. The following photographs give a pictorial summary of some of the Congress activities.

The Training Session on Risk Assessment in full swing

An Emulsion Safety Workgroup syndicate discussing their assignment

Delegates networking during the Welcome Reception

Delegates listening attentively to an Open Day Plenary Session

Display informing delegates about the Board of Governors and Panel of Experts

The Chairman thanking Mr Sanchez-Junco (MAXAM) for hosting the Gala Dinner

The Casino de Madrid - a splendid venue for the Gala Dinner; a fitting climax to the Congress

What feedback did we receive?

As the delegates who attended the Congress know too well, we attach enormous significance to the feedback we receive from delegates about the Congress. It shows two things:

- SAFEX's commitment to ongoing improvement of its services including the Congress
- Recognition that the Congress belongs to the members and they should guide the organizers about what they want

Delegates were urged to complete the Congress Evaluation Form. One part of the Form concerned the Congress logistics and administration while the other focused on the content of the Congress programme. We will focus on the evaluation of the Content only and give feedback on the logistics and administration at a later date.

Delegates were asked to rate the various activities (Welcome Reception, Open Day, Closed Day, Exhibition, Gala Dinner and Excursion) in terms of 4 levels:

- "Poor",
- "Disappointing",
- "Met Expectations" and
- "Exceeded Expectations".

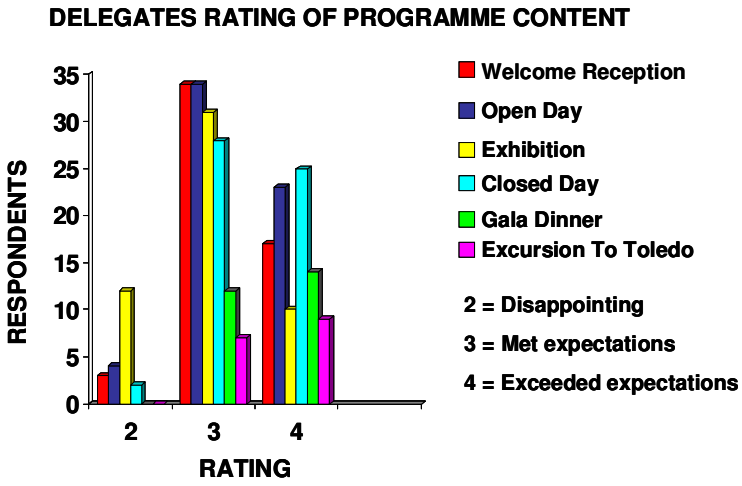
61 Evaluation Forms were returned i.e. 35.5% of the delegates responded. The consolidated results for the Content ratings are shown in the chart below.

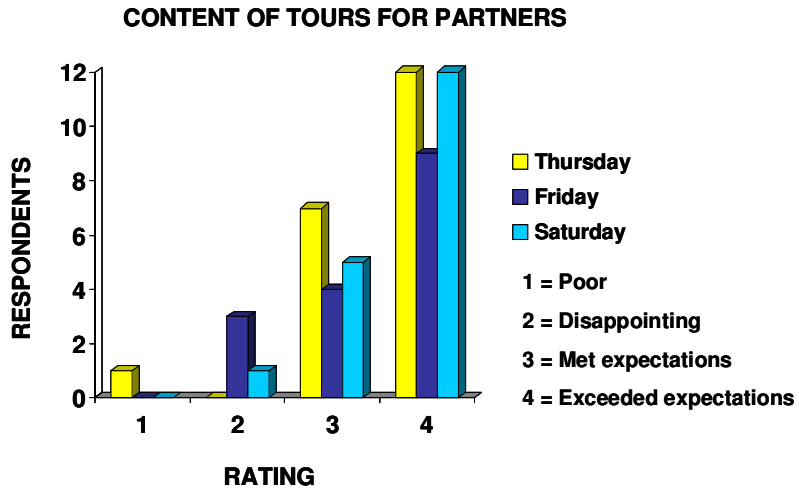
There were no "Poor" ratings for which we are grateful. A few delegates felt that the Welcome Reception, Open and Closed Days did not meet their expectations. Unfortunately there were no reasons given for these ratings. The one activity that attracted significantly more "Disappointing" ratings was the Exhibition.

Most respondents felt the activities met their expectations and we value the useful suggestions that some gave us for further improvement. As the chart indicates there were a significant number who felt the activities exceeded their expectations. The organisers appreciate this rating and see it as encouragement for the next Congress rather than a reason for resting on their laurels.

The partners that accompanied delegates also gave us useful feedback on the Partners Programme. We received 21 responses from the 47 partners that participated in the Programme i.e. a 44.7% response. They also rated the logistics and administration separately from the programme content using the same "scores" as the delegates.

The rating for the activities, which in this case comprised the tours on the Thursday, Friday and Saturday, is shown alongside. While one of the partners rated the Thursday tour as poor, most felt the programme exceeded their expectations. Not only was this response very encouraging but also most gratifying to MAXAM's Communications Department who was responsible for many of the arrangements. We did note that the Friday





activity was less popular and many of the ladies asked for an opportunity to do more shopping. We will certainly bear this in mind for future Congresses.

We are most grateful to everyone who responded and value, in particular, the honest feedback and constructive suggestions we received. The Board will be considering delegates' feedback when they meet in February.

What about members who could not attend Congress?

While it is still our ideal to have every member represented at Congress, we realize this is not always possible. We have, therefore, made arrangements as best we can to provide those members with some of the Congress input. By now members who were not at the Congress should have received the CD we issued to all member delegates with the Proceedings of both the Open and Closed Days. (Visitors received a CD with the Open Day Proceedings only). With the exception of the St Lambrecht presentation, we are also adding to our Database the Closed Day presentations that were given. Once the St Lambrecht investigation has been concluded we will receive a full Investigation Report that will cover the presentation delegates received. We will also be incorporating all the presentations onto our website as part of the Intranet which can only be accessed by members.

If any member not represented at Congress has still not received the CD with the Proceedings, please contact the Secretariat at secretariat@safex-international.org

Goodbye and Thank you Jose Ayensa and Frank Barker

With the appointment of a new Board of Governors for the period 2008 to 2011 at the Ordinary General Meeting, we also had to say goodbye to two Governors: Jose Ayensa (MAXAM) and Frank Barker (Orica). They are retiring form the Board after serving SAFEX long and well. The Chairman noted that both of them were leaving on the crest of a wave having made a significant contribution to the 2008 Congress. Jose orchestrated the magnificent support SAFEX received from MAXAM in organizing the Congress and Frank convened the Open Day Plenary sessions.

Jose and Frank in conversation at the Congress

We will long remember their commitment to SAFEX and our industry and they will be sorely missed. Thank you, Gentlemen, you have done us proud!

SAFEX Ordinary General Meeting

The Ordinary General Meeting is an important event in the SAFEX calendar and members were sent the Meeting Papers and Board Report tabled at the Meeting. We were delighted to have 73 member representatives present at the Meeting, the Minutes of which have been distributed to all members. If you have not received this information please contact the Secretariat at secretariat@safex-international.org .

From CERL's Research Notes

Protecting Windows against Blast

Introduction

The explosion at the Austin Powder GmbH dynamite facility in St. Lambrecht, Austria on March 11 of this year [1] resulted in the shattering of much of the window glass in the plant buildings and offices. In the process buildings, scattered glass severely hampered the clean-up operation; in some office buildings, entire window frames were blown into the building. This incident clearly demonstrated the need to consider window protection in explosives operations, not just for the process buildings, but also for nearby offices. At CERL, we have a long-standing interest in the effects of accidental explosions. In recent years, we have also become involved in the protection of civilian infrastructure against deliberate explosives attack. As a result, we have developed expertise in window protection. The purpose of this short article is to outline the major methods that can be used to mitigate the effects of blast on windows.

Blast waves

The detonation of a bare explosive charge placed on the ground typically results in five major effects: a short-lived fireball, ground motion, crater formation, fragment throw (from the crater formation) and a blast wave. The focus of this article is on the effect of blast waves. Figure 1 shows a schematic of a blast pressure profile remote from the source of the explosion. The time, t_a, denotes the time of arrival of the shock front at the point of measurement. The incident overpressure is denoted as P_{so} while the duration of the positive phase and negative phase are denoted as t_d^+ and t_d^-, respectively. The area under the curve during the positive phase is known as the specific impulse. When the blast wave encounters a structure, it is reflected. The reflected overpressure, P_r, is higher than the incident overpressure; it is the reflected pressure and reflected impulse that the structure needs to withstand.

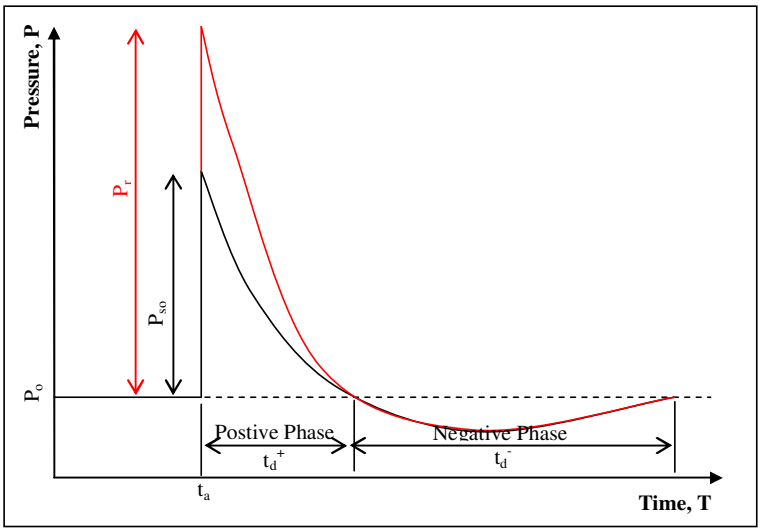


Figure 1. Blast Pressure Profile

Accidental explosions and terrorist bombings are extreme events with a very low probability (for most locations around the world) of occurrence for most structures. Thus, most building codes do not treat this subject. For new buildings, the blast design and blast load mitigation technologies can be fairly easily incorporated in the overall building design. For existing buildings, the blast design team needs to work within the framework of the existing structure.

On the façade of the structure, windows are the weakest components. During an explosion, the windows typically break into "knives and daggers" and are responsible for most of the injuries. For example, about two-thirds of injuries suffered in the Oklahoma City bombing were attributed to flying glass (see Figure 2).

Figure 2. Glass shards from an unprotected window

Windows performance

Annealed glass, the most common type of glass used for glazing today, has a low tensile strength and easily breaks into sharp pieces, resulting in a high capacity for injury. Glazing testing standards have been developed by various countries, with the GSA and the ISO standards being the most common [2,3]. These standards quantify the performance of glass windows under specified blast loads and classify the response based on hazard and/or protection level. This classification is based on where glass fragments end up inside a 3-m deep test cubicle (coloured areas in Figure 3). Actual test cubicles can be seen in Figure 4 on the next page.

Table 1 which also appears on the next page presents the protection and hazard levels associated with the performance conditions shown in Figure 3.

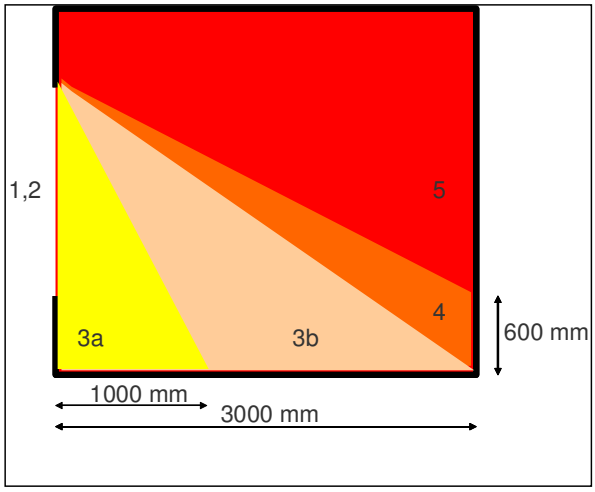


Figure 3. Vertical cross-section of a GSA standard test cubicle. The blast wave approaches from the left, where the window is located.

Table 1. GSA glass hazard classification (Refer to Figure 3 on the previous page)

Performance Condition	Protection Level	Hazard Level	Description of Window Glazing Response
1	Safe	None	Glazing does not break. No visible damage to glazing or frame.
2	Very High	None	Glazing cracks but is retained by the frame. Dusting or very small fragments near sill or on the floor are acceptable.
3a	High	Very Low	Glazing cracks. Fragments enter space and land on floor no further than 1000 mm from the window (yellow zone in Figure 3).
3b	High	Low	Glazing cracks. Fragments enter space and land on floor no further than 3000 mm from the window.
4	Medium	Medium	Glazing cracks. Fragments enter space and land on floor and impact a vertical witness panel at a distance of no more than 3000 mm from the window at a height no greater than 600 mm. above the floor (orange zone in Figure 3).
5	Low	High	Glazing cracks and window system fails catastrophically. Fragments enter space impacting a vertical witness panel at a distance of no more than 3000 mm from the window at a height greater than 600 mm above the floor (red zone in Figure 3).

In order to mitigate the hazards associated with the breaking and throwing of glass in an explosion, a multitude of retrofit schemes have been devised, including, but not limited to: anti-shatter film, tempered glass, polycarbonate sheeting, laminated glass, blast curtains systems, and glazing catch cable/bar retrofit. Figure 4 shows full-scale arena testing of some window systems that we carried out in Canada.

Figure 4. Arena testing of the blast resistance of retrofit windows mounted in test cubicles

Examples of each system are described below. As might be expected, the cost increases significantly with the level of protection.

Method of increasing Window Protection

1. Anti-Shatter Films

The most common retrofit scheme for existing buildings is to apply anti-shatter film to the exterior windows. There are a number of application methodologies in use today as illustrated in Figure5.

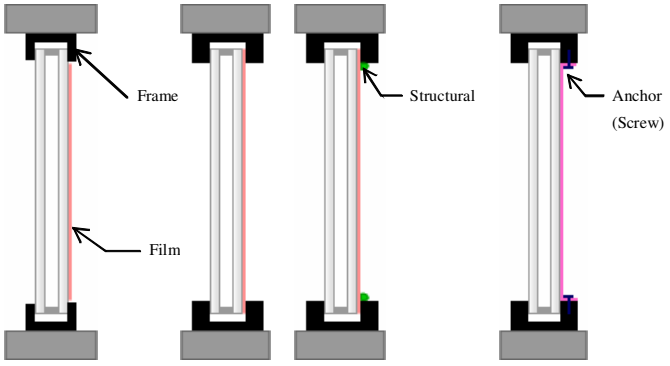


Figure 5. Anti-shatter film applications. From left to right: Daylight, Edge-to-Edge, Wet Glaze, Mechanical Anchor

Anti-shatter films consist of tough, transparent films or multiple layers of films that are adhered to the surface (usually interior) of glass. Daylight application consists of filming the visible area of glazing with the film terminating at the window frame or mullions. The primary objective of using daylight application of anti-shatter film is to hold together the glass fragments (shards), in a single unit, in the event of an explosion. The anti-shatter film and fragments, however, still have the potential of being driven into the occupied space and causing blunt trauma to the occupants (Figure 6).

Figure 6. Failure of daylight film application

To mitigate against this hazard, daylight application is often used in conjunction with blast curtains or a catch cable/bar systems designed to catch the filmed glazing when it fails (Figures 7a and 7b).

Figure 7a: Catch-bar system

Figure 7b: Use of blast curtain

An edge-to-edge application, where the anti-shatter film extends to the edge of the glazing, provides some additional protection depending on the depth of the bite. However, edge-to-edge application means removing the glazing unit from the frame with an associated cost.

The wet-glaze application system improves on the daylight filming by anchoring the anti-shatter film to the frame with a bead of structural silicone. Wet glaze is more expensive than daylight or edge-to-edge applications. Mechanical anchorage of the anti-shatter film on the other hand requires that the anti-shatter film be mechanically fastened to the window frames with screw pressure bars (battens). In both the wet-glaze and mechanical anchorage application methods, the window frames should have sufficient capacity to resist the blast loads or transmit the loads to other members of the façade. Failure to anchor the frames to a structural member with adequate capacity to resist the blast loads can result in the retrofitted glass together with the window frame being driven into the interior of the structure, as apparently occurred in the St. Lambrecht explosion.

2. Tempered Glass

Tempered glass is an annealed glass that has been toughened (tempered) to increase tensile strength. Though tempered glass offers a higher tensile strength than annealed glass, it also shatters under high blast loads into many small cubical fragments with much less capacity for causing bodily injury. Tempered glass is used for car windows (other than the windscreen which is a laminated glass), for example. There are two methods of toughening annealed glass: heat treatment and chemical strengthening. In the heat treatment process, a monolithic sheet of annealed glass is heated to about 680°C and afterwards rapidly cooled in a controlled fashion. Depending on the rate of cooling, tempered glass strength can be up to four times that of annealed glass. In chemical strengthening on the other hand, annealed glass is submerged in a chemical solution (molten salts) at temperatures below normal annealing temperatures to increase mechanical resistance. Chemically strengthened glass has similar properties to thermally treated glass, but is rarely used in the manufacture of window glazing.

3. Polycarbonate

Polycarbonate is a high-performance thermoplastic sometimes used in place of glass in window glazing. Polycarbonate has a high shatter resistance, heat resistance and toughness, but scratches easily. Polycarbonates have found a wide-scale use in diverse industries and have been used in blast and bullet resistant applications in window glazing.

4. Laminated Glass

Laminated glass is a composite glass product manufactured by bonding together two or more glass sheets with one or more layers of polyvinyl butyral (PVB) or other resin under pressure and/or heat. The sheets of glass are held with a cavity between them. The cavity is then filled with the resin and heat and/or pressure is applied until the resin cures. When

laminated glass breaks, the inner layer of PVB or resin holds the fragments together and continues to provide resistance to impact or pressure. Different types of glass and/or polycarbonate can be used for the production of laminated glass. The strength, toughness, impact and heat resistance of the laminated glass are dependent on the type of glass (or materials) bonded together, but generally greatly exceed that of annealed, filmed and toughened glass.

Conclusions

There are many methods to enhance the protection of windows against blast. The method chosen will depend on the expected blast pressure and impulse, and the degree of protection required. Cost will of course also be a consideration. This short article naturally only provides a brief overview of the subject. There are a number of much more detailed publications (see, for example, References 4-6).

In closing, we would offer two thoughts:

Firstly, it is important to remember that a window that resists a blast load will transmit the load to the frame and in turn to the main building structure, all of which need to be sufficiently robust in order to provide adequate protection. When properly anchored, filmed windows can resist quite high blast loads (Fig. 8)

Secondly, it is important that any window protection system has been tested against recognized standards and properly designed and installed by competent professionals. With the huge increase in security concerns over the last few years, the market for blast mitigation products and services has expanded very rapidly. As a result, there are now "blast protection" products on the market that have not been properly tested and companies claiming expertise in blast protection where they have little.

Figure 8. Anchored film response under high blast loads

References

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2. US General Services Administration Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings, http://www.protectiveglazing.org
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4. Longinow A. and Mniszewski K. R., "Protecting Buildings Against Vehicle Bomb Attacks", Practice Periodical on Structural Design and Construction, Vol. 1, No. 1, February 1996
5. FEMA Risk Management Series, "Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings, FEMA 426, December 2003. www.fema.gov
6. Whole Building Design Guide, "Glazing Hazard Mitigation", www.wbdg.org/resources/glazingmitigation.php

The Explosives Regulatory World

This feature is written by Ben Barrett, an Expert Panel member, whose consultancy, DG Advisor, specializes in regulation of explosives. Ben is dedicated to participation in the development and modification of international dangerous goods regulations and helping clients comply with US and international regulations.

Classification of Desensitized Explosives

Desensitized explosives are currently re-classed from Class 1 into Class 3 flammable liquid or Class 4 flammable solid. The UN Model Regulations in 2.3.1.4 define liquid desensitized explosives as "explosive substances which are dissolved or suspended in water or other liquid substances, to form an homogeneous liquid mixture to suppress their explosive properties". Section 2.4.2.4.1 defines solid desensitized explosives to be "explosive substances which are wetted with water or alcohols or are diluted with other substances, to form a homogeneous solid mixture to suppress their explosive properties".

Currently the products re-classified from Class 1 include various specifications of nitrocellulose, nitroglycerin, ammonium picrate, dinitrophenol, dinitrophenolates, dinitroresorcinol, nitroguanidine, nitrostarch, trinitrophenol (picric acid), silver picrate, sodium dinitro-o-cresolate, sodium picramate, trinitrobenzene, trinitrobenzoic acid, trinitrotoluene (TNT), urea nitrate, zirconium picramate, barium azide, dipicryl sulphide, isosorbide dinitrate, 2-amino-4,6-dinitrophenol, pentaerythrite tetranitrate (pentaerythritol tetranitrate; PETN), trinitrochlorobenzene (picryl chloride), 4-nitrophenylhydrazine, 1-hydroxybenzotriazole (anhydrous), and generic entries for miscellaneous other solid or liquid desensitized explosives.

In 2006 the UN Committee on the Transport of Dangerous Goods (TDG) and the Globally Harmonized System of Classification and Labeling (GHS), hereafter called the "Committee", identified that GHS does not address desensitized explosives. The GHS regulations in "2.1.2.2, Note 2" acknowledge that transport may treat desensitized explosives differently than explosives, but GHS has no exception. This could result in labeling and safety data sheets referring to the product as an explosive, and in this author's opinion, potentially excessive storage regulations in the future for these products. Accordingly, the TDG Explosives Working Group, which serves both the TDG and GHS sub-committees for technical issues on explosives, was tasked with addressing the issue. In their report of July 2006 entitled UN/SCETDG/29/INF.65, they stated:

"In GHS, explosives wetted with water or alcohols, or diluted with other substances to suppress their explosive properties, are dealt with in the Chapter on explosives. It is recognized that they may be treated differently for some regulatory purposes, e.g. transport. However, the storage regulations for these substances in most of the countries represented in the Working Group treat them as flammable liquids or solids."

The report continued to state that it was not appropriate for GHS to treat these products as flammable liquids or solids since they may not have flammable properties. The Committee considered the following options to address this anomaly:

1. make no changes (leave it to national legislation)
2. create a new chapter in Part 2 of the GHS document, dealing with desensitized explosives; or
3. create a new Division 1.7 for these substances.

The UN Committee decided to set up an Informal Working Group on Desensitized Explosives. This working group of government and industry representatives met first in Berlin in December 2007 and again in March 2008. The group issued a proposal on April 17th, 2008, entitled ST/SG/AC.10/C.3/2008/39 that the Committee considers establishing a new Division 4.4 to house all desensitized explosives, which would be removed from Class 3 and Class 4. Secondly the group proceeded to write a section on classification for desensitized explosives and recommended a new test classification flow chart (Figure 1) for determining whether a material qualifies to be a desensitized explosive.

The chart has 4 outcomes, which are:

1. Fail the tests, remain as Class 1
2. Classify as Desensitized Explosive Type C - package limit 150kg or less (still under debate)
3. Classify as Desensitized Explosive Type E - package less than or equal to 400 kg
4. Classify as Desensitized Explosive Type F - package greater than 400 kg

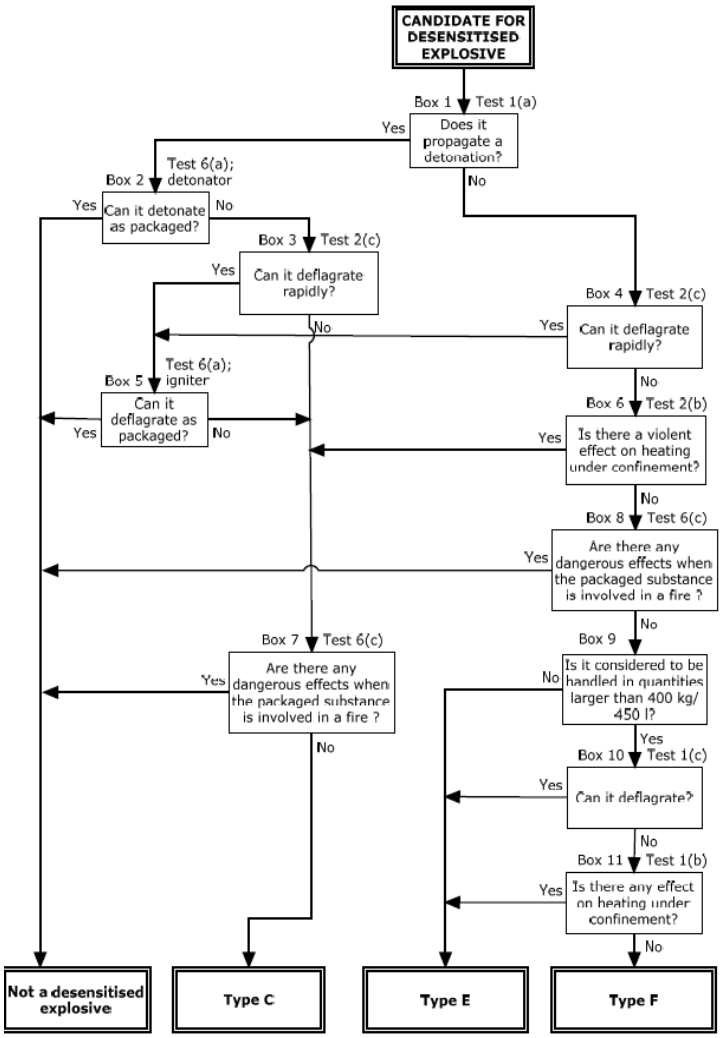
This proposal relates to the GHS, but is likely to be simultaneously integrated into the transport regulations.

The Working Group is asking at the July 2008 meetings for "the sub-committees on GHS and TDG to comment and, if possible, agree on the basic principles for the classification of desensitized explosive as reflected in this document. Especially on:
(a) Having a separate category for desensitized explosives;
(b) Creating three types of desensitized explosives; and
(c) The basic hazard properties of these three types."

A final solution is not likely this biennium, which ends after the meetings in December 2008. The Committee will need time to consider the details of the proposal. Hazard communication (e.g. label design) has not yet been addressed and there will a large number of consequential amendments in the Model Regulations. Government and industry experts must have ample time to assess the impact of the proposed text and flow chart. The likely course is for the Informal Working Group on Desensitized Explosives to meet later in 2008 to address the comments which will be received in July 2008 and to further develop the proposal. Another report would be made to the Committee, which would likely be reviewed by the Explosives Working Group in July 2009. The system would either be approved or sent back for more work, and eventually amended into the GHS and TDG regulations.

Bear in mind that this issue relates to transport, storage as well as other situations. If any changes are necessary from any of these perspectives, now is the time to be shaping this new classification procedure. If the Committee eventually agrees with the proposals, these materials will be classified as Hazard Division 4.4 for transport.

Figure 1: Decision logic for desensitised explosives



In many cases the manufacturer has been allowed to self-classify the material for years, and may not have sufficient data to determine the potential classification if the proposed flow chart is applied. Manufacturers of these materials must assess how the proposed test scheme will affect them, and contact their industry associations to formulate strategy. In some cases it makes sense to perform testing on the affected product according to the proposed flow chart to determine what the classification would be.

Additional test data would be welcomed by the Informal Working Group to influence and support the work so that the proper decisions are made to ensure that safety is maintained and that industry is not over burdened beyond the maintenance of a reasonable level of safety.

The author wishes to thank Mr. Ed de Jong, Chairman of the Informal Working Group on Desensitized Explosives, and Chairman of the Explosives Working Group, for his contributions to this article.

Special Feature

IMESAFR Training: Are you interested?

40 Participants from member companies attended the Training Session on Risk Assessment which SAFEX presented as part of the Congress. IMESAFR was one of the topics discussed. A number of participants approached SAFEX afterwards and expressed interest in attending an IMESAFR Training Course. SAFEX is willing to arrange such a Course (possibly in Europe) if there is sufficient interest from members. The first step is to assess the level of interest in such a course. Thereafter, we can establish costs, timing, etc if it is worthwhile to proceed.

If you are interested in finding out more about such a course please contact the Secretariat at secretariat@safex-international.org . For those who have not encountered IMESAFR before, we hope the following "article" will whet your appetite.

IMESAFR: A New Door for Managing Risk from Commercial Explosives Activities

At the last SAFEX meeting in Madrid, members were introduced to the Institute of Makers of Explosives' Safety Analysis For Risk (IMESAFR) software model. Following on the keen interest shown in the presentations at the Congress, SAFEX posed a series of questions about IMESAFR to Lon Santis, Manager of Technical Services for the IME and product manager for IMESAFR.

What is IMESAFR? IMESAFR is a Windows-based semi-empirical quantitative risk assessment software model designed for a wide variety of commercial explosives activities. It was created by modifying the U.S. Department of Defense's (DoD) software program SAFER V3.0 to apply to commercial settings. The model takes into account many more site-specific parameters than just quantity of explosives and distance to the exposed site. IMESAFR's basis is that risk equals the probability of an event times the consequences of that event.

Why was IMESAFR developed? IMESAFR was developed to provide a consistent method of managing risk in situations where the IME's American Table of Distances (ATD), the ubiquitous quantity/distance (Q/D) standard in the US, is not appropriate. Noticing the maturity and success of SAFER, IME seized an excellent opportunity for technology transfer while meeting the increasing demands of society for responsible care.

What kinds of situations are not appropriate for the ATD? The ATD was designed to protect the public from permanent storage of commercial explosives in rural settings. It does not apply to any other type of explosives storage such as in-transit or day-use and does not eliminate risk beyond the distance specified. The ATD may also be used for manufacturing but adherence is not required by federal regulations and does not account for differences in processes and materials that affect risk. Situations where ammonium nitrate is stored without explosives nearby are not covered by the ATD. Many other commercial explosives activities generate risk, but are not covered by the ATD.

Will IMESAFR replace the ATD? We don't think so, at least in the foreseeable future. IMESAFR provides another tool to manage the risk of an incident much in the same way seismographs have provided another tool for blasters to manage vibration for over 50 years. Just as scaled distance calculations still serve blasters today, we expect the ATD and Q/D to live on.

What kind of information does IMESAFR provide? IMESAFR supplies the highest individual and the cumulative annual probability of fatality, major injury, and minor injury for workers and the public around the explosives site. An uncertainty routine provides confidence and statistical data related to the scenario. Basic reports show which factors, projectiles or overpressure for example, dominate the risk. System log files can be reviewed to glean specific data from the program.

What consequence mechanisms does IMESAFR take into account? IMESAFR considers three injury severity levels (fatal, major, and minor) for four types of consequences from an explosion: direct blast (lung rupture, skull fracture, and whole body displacement); structural response

(glass hazards and building failure); horizontal/vertical debris (from package fragments, building break-up, and crater ejecta); and thermal environment.

How detailed are the inputs to the model? The inputs to the model are of the level of detail that a site manager would generally know or find them on site plans. With details at hand, a basic site with several potential explosion sites or exposed sites could be modelled easily in less than 30 minutes. The basic inputs are the type and amount of explosive, the type and size of structure housing the explosive, the activity taking place, attributes of a barricade (if any), distance to the exposed site, the type and size of the exposed structure, and personnel exposure frequency.

How did IME develop the probability of event [P(e)] factors? IME conducted a survey of its membership for the number of events (explosions) during certain activities and the number site-years for those activities in the previous 20 years. The survey provided enough data for the activities of permanent storage of explosives, manufacturing, and perforating gun assembly to compute an aggregate historical P(e) per site-year. Some activities such as ammonium nitrate storage and loading or unloading bulk materials had plenty of site-years reported in the survey, but no events to use in the numerator, so the P(e) were extrapolated from known data points. The P(e) used in SAFER were adopted for the remaining activities. The baseline P(e) in IMESAFR is adjusted by inputs such as the sensitivity of the material and physical conditions like elevated security threats.

Would IMESAFR be applicable to commercial explosives sites outside the U.S. or Canada? Yes. Although the types of structures and P(e) used in the model were developed specifically for U.S. and Canadian applications, the program is flexible enough to model almost any situation by making wise input choices when exact matches are not apparent.

What level of risk is IME recommending be maintained? IME has not adopted an acceptable level of risk but is working in this area. The U.S. DoD and several other national regulators, especially European, *have* established such criteria. A numerical acceptable level of risk and what unit of measure is used is an emerging issue for the U.S. government.

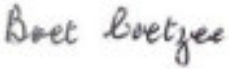
How is IMESAFR being used? Applications of IMESAFR are still being explored. One of the first reported uses was to self-assess the risk profile of existing operations and determine if operational changes were in order. The program has been used for planning new and expanded explosives site development. Industry is using IMESAFR to seek waivers and exemptions, showing that proposed alternatives are "as safe or safer than" the regulations. Manufacturing permits in Canada and port unloading permits in Alaska have been granted by government authorities on the basis of IMESAFR analyses.

Is there a metric version? Not yet, but the interest in a metric version is very high and IME will be giving this very serious consideration in the future.

How do I get more information? There is considerable information available through the IME website at http://www.ime.org/ecommerce/index.php. You may also contact the IME via e-mail at info@ime.org.

SAFEX International thanks the following for their contributions to this Newsletter:

- **Enrique Barraincua,** Governor of SAFEX
- **Dr Phil Lightfoot,** Manager, Canadian Explosives Research Laboratory
- **Ben Barrett,** member of the SAFEX Expert Panel
- **Lon Santis,** Manager of Technical Services for the IME



Boet Coetzee
Secretary General, SAFEX International