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Subrogating Catastrophic Industrial Accidents: Finding the Holes in the “Swiss Cheese”

I. Introduction

A fire or explosion occurs at an industrial facility. What results is a crisis, a catastrophe for the property owner, their employees, the local community and all stakeholders in the event. Everyone connected to the accident is manifestly touched in their business and economic interests, insurance consequences, and by those suffering bodily injuries or fatalities. Needless to say, a major fire or explosion is an extraordinary event that forever changes the psyche of those impacted. Plainly, the bigger the scale of the fire or explosion, the bigger the challenges to move forward, and to develop viable recovery claims. It is a dilemma that requires sophisticated leadership and seasoned subrogation counsel, forensic consultants and loss adjusters.

Immediately, many questions arise: How did it happen? Was it avoidable? Will it happen again? How will the entities harmed overcome the many difficult challenges to stay robust and engaged in their regular course of business? Will it devastate the enterprise? Who is at fault? Who should compensate the victims? Are there legally viable recovery claims to pursue against third parties? How are those tortfeasors identified? Can sufficient evidentiary proof be established? How should the media be addressed? The government? Where do we begin? These are just a few of the many challenges, inherent in the crisis, which must be managed and overcome to maximize the recovery opportunities of the property insurers and their insured.

The scope and depth of the recovery investigation depends on the dollars at stake, the severity of the property damages and business interruption, the complexity of determining the root cause, the loss site conditions, and the interests of government agencies and third parties. Managing the recovery investigation and pursuit requires developing near and long term objectives and a practical plan of action (POA) to make the recovery opportunity a tangible reality. Your recovery team must be proactively energized and engaged. After all, ultimately, the jury seeks to know: (1) What caused the incident? (2) How do we know that was the cause? (3) Are alternative failure modes credibly eliminated? In short, the “but for” causation analysis remains alive and kicking.

This handout provides valuable discussion on navigating the complex challenges and practical strategies for effectively developing viable recovery claims from a catastrophic industrial incident. It is a treacherous sea to sail. The fog of the crisis creates great pressures and dangers. But, every crisis is an opportunity, as the Old Chinese proverb says. Upfront, the crisis must be addressed for what it is – a crisis. Embrace it – it is the only way. The damages are likely severe and the insurance exposure big. The \$64,000 question is to subrogate or not. To decide what to do, an effective, efficient and strategically focused recovery investigation is vital. A provable claim, if possible, needs to be developed, based on facts, credible witnesses and good science.

Your subrogation team needs to avoid jumping to quick causation theories. The root cause must be thoughtfully investigated. A long haul often arises. Getting through the “eye of the storm” is not easy, nor quick. You don’t want an answer on the fly. Your recovery team needs to get in the mud, perform their dig-out, and then step-back, and thoughtfully analyze the evidence.

Understanding Process Safety Management (“PSM”) is critical for identifying the potential recovery causation theories to develop.

PSM is vital for controlling the risk of major accidents. It focuses on identifying foreseeable hazards and preventing accidents, like a fire or explosion event, that originates from the process hazards. The PSM standard was issued by the U.S. OSHA, 29 C.F.R. 1910.119 in 1992. PSM requires an initial process hazard analysis (“PHA”), to be repeated at least every five years, to identify, evaluate, and control the hazards in its process. 29 C.F. R. 1910.119(e). The PHA can entail many methods, including: what-if; hazard and operability studies (HAZOP); failure mode and effect analysis (FMEA); fault tree analysis; and others. The PHA must address: the equipment in the process; hazards of the process; previous accidents; engineering and administrative controls; consequences of failure; human factors; consequences of deviation; and steps required to correct or avoid deviations, etc.

The goal of PSM is to prevent unwanted releases of hazardous chemicals. To achieve an effective PSM program, a systematic approach to evaluating the entire chemical process is necessary. Under this approach, the entire process is continuously evaluated: the process design, process technology, process changes, operational and maintenance activities and procedures, non-routine activities and procedures, emergency preparedness and procedures, training programs, and other process activities. In short, PSM is the identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failure in processes, procedure or equipment.

One of the key PSM elements involves “management of change.” (MOC). Under PSM, changes cover all modifications to equipment, procedures, raw materials and processing conditions other than “replacement in kind.” These types of changes must be properly managed by identifying and evaluating them prior to making the changes. By doing so, a facility can ensure that the changes do not unknowingly introduce new, or increased hazards in the process.

The Swiss Cheese Model recognizes that multiple factors often lead to accidents. Under the Swiss Cheese Model, each slice of Swiss Cheese represents a layer of safety protection and the holes represent failure opportunities in the protection layers. These failure holes can be failures arising from human error, equipment failure, head management decisions, knowledge failure, inadequate hazard analyses or failures to control known hazards. A robust PSM program would mitigate or limit the number and size of the holes in the Swiss Cheese. When that occurs, the failure likelihood decreases dramatically.

The Swiss Cheese Model can be useful when analyzing an accident that involves a process with an overarching PSM system. In the model, the hazard or energy source (chemical, mechanical, electrical, etc.) is identified, as well as the target (people, equipment, or the environment) that needs to be protected from the hazard. Then, each element of the PSM program can be evaluated as a barrier between the hazard and the target. By systematically evaluating each element, and identifying potential holes in the protection layer the element represents, causation theories can be developed. The site's process safety culture and operational discipline as they relate to process safety issues can also be characterized and understood based on the personnel's dedication to the PSM elements. Are the operators familiar with key concepts of each PSM element? Do the supervisors follow through on action items related to generated in PSM activities? Does management hold the site accountable for process safety metrics? These questions can help focus the investigation on key issues and identify weaknesses that may be present in the PSM program at a facility. These vulnerabilities can then lead the investigation team to unveil critical evidence that explain how an incident occurred when so many protection layers were in place to prevent it.

The Swiss Cheese Model can also help frame the contributions of several causal factors to the root cause of an incident. While a key finding may related to improper design, or a faulty piece of equipment, digging deeper into multiple PSM elements can expound upon the issues that caused the error to be made, and persist through the operation of a facility. Was information related to the design properly documented? Was the system evaluated with a process hazard analysis as required? Was the mistake the result of a change that had not been properly evaluated prior to implementation? Were procedures out dated or poorly written? The Swiss Cheese Model, like many investigation tools, assists the investigation team in approaching causation with a wide lens and ask broad questions to fully understand a variety of contributing factors. This way, the investigation does not become inherently biased, or overly focused on a particular theory while the facts of the case are still being gathered.

II. Catastrophic Fire or Explosion: Crisis Management – What do you do?

As subrogators, we must explain to the insured what's involved, the importance of their support, and that the subrogation team is committed to finding out what happened. With strong, confident leadership, your recovery team will be able to navigate the crisis to calm waters, and hopefully a recovery from the wrongdoers.

a. Who do you immediately inform?

Notification of interested stakeholders is critical. The following is a list of those stakeholders to be considered immediately following a fire or explosion:

- Risk Manager
 - Involved in managing risks that can endanger a business's assets and earnings capacity. The risk manager will be responsible to ensure the company's insurers are notified of the loss, and assist in managing the crisis.
- Insurers –the insured should contact its broker to ensure all applicable insurers – liability, property and worker compensation – are promptly notified.
- Corporate Executives & Officers
 - Proper crisis management requires that these individuals promptly receive accurate information and learn how to proceed positively on the organization's efforts to manage the crisis.
- Corporate Spokespersons - The corporation should ensure that only authorized spokespersons speak for it.
- Governmental Agencies:
 - Emergency Services (Police, Fire)
 - Local Municipal Authorities
 - Fire Marshall
 - Occupational Safety & Health Administration (OSHA)
 - Center for Disease Control (CDC)
 - Environmental Protection Agency (EPA)
 - National Transportation Safety Board (NTSB)
 - Chemical Safety Board (CSB)
 - Federal Emergency Management Agency (FEMA)
 - ATF
 - FBI
 - State Emergency Agencies

b. Assembling the Right Team: Who You Gonna Call?

i. Counsel

Engaging legal counsel quickly during a crisis is imperative. Counsel will immediately advise on your legal duties while also protecting your interests and ensuring that you proceed in a manner that places you in the best position for future litigation – as a claimant or as an anticipated defendant. Choosing the right counsel is key.

Before hiring counsel, you should confirm counsel's competence in large loss events and complex subrogation. Counsel should effectively manage a crisis to your desired outcome. Do you need a gladiator to fight a contentious battle? Do you want counsel that will collaborate? Of course, counsel should be an effective communicator, and capable of wearing varied hats, as needed in the moment. Plainly, an explosion mandates sophisticated counsel.

Serious consideration should be given to how counsel will treat you as a client. Counsel should agree to follow your policies and guidelines, and then actually do so. As a client, you should expect and receive frequent and timely communications regarding the claim, as well as the prompt return of phone calls and e-mails. You should be comfortable asking questions of counsel and expect to receive straightforward answers. Counsel should be effective at managing budgets diligently.

Although many clients “hire the attorney and not the firm,” the firm supporting the attorney is important. Inevitably, the attorney you hire will require support of fellow attorneys and the firm’s staff. Clients should be aware if the attorney hired is working on the case or if the work is being assigned to associates and paralegals. If the work is being performed by associates and paralegals, clients should be aware of the qualifications of those individuals, the extent to which they are supervised, and whether their work is being managed by a senior attorney.

ii. Choosing the Right Experts

When choosing experts, a vital concern is whether they are qualified. Generally, in fire and explosion matters, both a cause and origin expert and one or more forensic experts may be necessary. A damages expert will likely be necessary as well. Beyond being qualified, other “intangibles” should be considered:

- What Type of Forensic Expert Is Right?
 - Electrical Engineer
 - Structural Engineer
 - Mechanical Engineer
 - Metallurgical Engineer
 - Fire Protection Engineer
 - Fire Safety Engineer
- Qualifications
 - Certified Fire Investigator through the International Association of Arson Investigators
 - Certified Fire and Explosion Investigator through the National Association of Fire Investigators
 - Familiar with NFPA 921 guidelines and recommendations for safe and systematic investigation or analysis of fire and explosion incidents, and meets those standards
 - Educational Background: Credentials and licenses
 - Publications: Has the expert contributed to the field of knowledge in the area of expertise relevant to the loss?
 - Has the expert written anything contrary to your position?
 - Have the publications been peer reviewed?
 - How important are publications within the field of expertise?
 - Experience: How many fires or explosions has the expert investigated and in what capacity?
 - Look for a balance of experience and academics

- Location, Location, Location
 - Unless the expert is the preeminent expert in the field—someone to whom all other experts in the field defer—or the “only game in town,” consider whether costs justify importing the expert from another state
 - The expert must be licensed, certified, or otherwise authorized to practice in the state, if required
 - Is the expert involved in peer or professional organizations? Are those organizations local?
- Has the expert’s work received honors or accolades?
- Vet the expert
 - Ask a lot of questions up front
 - Read the expert’s publications
 - Request and review the expert’s C.V.
 - Seek recommendations
- Intangibles
 - Will the expert play well in the local community?
 - Does the expert speak clearly?
 - Is the expert trustworthy and credible?
 - Is the expert confident in manner and in the position asserted?
 - Is the expert overconfident?
 - Can the expert withstand cross-examination?
 - Does the expert understand that his or her role is not to litigate the case?
 - Do you get along with the expert?
 - Is this expert someone with whom you can spend hours in a closed room or on the phone?
 - Would the expert boost the credibility of your team?
 - Can the expert simplify complicated concepts for a lay jury?
 - Does the expert write well, so that reports are clear and concise?
 - How well does the expert understand and embrace the legal goals?
 - Does the expert exhibit bias toward certain positions or unsettled theories?
 - Conflicts of interest?
 - Does the expert testify for only the plaintiff’s side/defense side?
 - Is the expert cost-sensitive?
 - Does the expert set a budget at reasonable and appropriate rates by anticipating costs and expenses and stick to it?
 - Experiences of other counsel

The roles of experts are many. Primarily, the forensic expert should use the scientific method and good forensic investigation techniques. The expert should identify possible pitfalls, define technicalities, evaluate the extent of damages, and help identify potentially responsible parties. The expert is critical in challenging and overcoming adverse theories, drafting opinion reports, and preparing demonstrative exhibits. Of course, experts must be capable of effectively testifying. Alternatively, experts can serve as a non-testifying consultant, should the loss involve unique technical issues and the cost of retaining the expert as a consultant is warranted.

Another significant role of an expert, especially at the beginning of a case, is to educate the client and counsel. The expert should explain the situation and all possible loss scenarios. Experts should assist counsel in evaluating the case to determine whether claims against other parties are meritorious, as well as assist in identifying culpable parties. When necessary, experts may be called upon to assist in locating other experts.

c. Crisis Management

Crisis Management is critical for an industrial accident event. The process by which a major, catastrophic event is handled is essential to maintaining the credibility and reputation of the corporate insured. All organizations experience crises. What sets them apart is how they handle the crises that arise. Improper handling of an event can irreparably harm the organization, its stakeholders, its customers, or the general public. Such events often involve the element of surprise and short decision-making times. It is during this time of general chaos and uncertainty that entities outside the control of the organization impose themselves upon the situation, each with its own agenda. Dealing with those entities is key in successfully weathering a catastrophe. Success involves the ability to anticipate worst-case scenarios while simultaneously offering numerous, reasonable solutions.

i. Interfacing with Media

In times of crisis, the media can be used to tell your story your way, if done properly. Keys to properly interfacing with the media include putting forth a consistent message, avoiding speculation, and embracing the facts even if (especially if) they are bad. Organizations that successfully handle the media during crises typically come across as cooperative and as transparent as reasonably possible. This helps diffuse the bad news before it takes on a life of its own. Below are several points to consider for effective media interfacing during a crisis and to manage the story.

Have a plan. Whether your organization is big or small, do not assume that it is immune from crisis. Whether the crisis is large or small, you must have clear objectives to be obtained through a planned reaction. A written plan should set out specific actions that should be taken when crisis strikes. Pre-planning should encompass broad-brush strategies, focusing on the most likely scenarios, but also preparing for the worst.

Consider in advance how to triage crises. What is the level or degree of the crisis? Can it be handled with the organization's existing resources? Can it be handled without outside help? If the industry involves high risk or the potential for catastrophic events that have a wide-impact, consider having one or more outside public relations/crisis management firms pre-selected before crisis strikes.

Select your crisis management team in advance, including back-ups. Before a crisis hits, everyone should have a designated role so that the team is not tripping over itself when the crisis hits. Not all of your "starters" are certain to be available for a variety of reasons when the unexpected strikes, so take a lesson from the NFL and know who is "next up," ready to enter the

game at a moment's notice. But when that person enters the game, the person should know what position to play.

The corporate team should have a clear decision-making hierarchy established. The person at the top must be given the authority to act quickly. The team should contain a "blitz" squad of a few select individuals who can operate quickly and efficiently without much oversight to manage the crisis. This team is no place for "yes men," so it should include those who are comfortable in the devil's advocate role.

The team should also include a ground team, which can be on site as quickly as possible. The purpose of this team is to immediately gather facts, secure the scene, and share information internally. Remember, however, that non-privileged communications may be discoverable during litigation, so admissions of fault and speculation stated as fact should be avoided.

Speak with one voice. This concept is essential. Designate a corporate point person who makes all statements to the media. This person should be articulate, smart, quick on his or her feet, and most importantly kept in the loop. As far as your business is concerned, this person is on par with the press secretary for the president of the United States. This person should not shoot from the hip and should think before speaking. Ideally, the point person should be several steps removed from any responsibility for any failure by the organization and should have a diminished emotional role in the crisis without appearing detached or aloof. He or she should appear calm and confident. As the face of the organization for the purposes of the crisis, if the point person appears to have things under control so too will the organization. Calm, concise, and empathetic are the key traits.

When making press releases and handling media inquiries, shoot straight. As in the criminal court, what you say can and will be used against you. Nothing makes a reporter's day more than exposing a cover up (real or perceived) or finding the "smoking gun." Whether the news is good or bad, embrace it. Bad news becomes horrible news if it is "discovered" instead of provided up front in a manner that the organization can control.

Importantly, if the message is critical and absolutely must be understood, repeat it. Then, repeat it again and again and again. Provide updates to the media early and often. Delayed disclosures raise eyebrows.

ii. Employees and Social Media

In the court of public opinion, what your employees say about the organization or the crisis is powerful. In the digital age, where an employee can broadcast information essentially worldwide using a pocket device, managing employees and their expectations is essential.

Keeping your employees informed and reassured is a must. Doing so helps to avoid speculation and rumors running rampant both internally and through social media outlets. It also maintains employee morale.

A designated person should monitor social media posts for false information posted by employees. The corporation may request that employees remove false or truly confidential statements or information from social media, but be careful not to run afoul of employees' rights under the National Labor Relations Act to discuss terms and conditions of employment (and the National Labor Relations Board's broad interpretation of the Act), which protects whistleblowing and disclosure of dangerous or harmful conditions. If false information is being disseminated, it must be countered through both social media and the mainstream media. If you appear to be open and honest about the situation, false statements are more easily marginalized and diffused.

iii. Regulators – Interfacing with Government Officials

Failure to notify a government regulator within the prescribed time could lead to fines, and even criminal charges in some circumstances. As with the media, the corporate organization should be open with government officials, and consistent with the information the organization puts out publicly.

Also similar to dealing with the media, a corporate representative must be selected to interface with the fire marshal, the police department, OSHA, the Chemical Safety Board, the EPA, and the NTSB, among other agencies. Unlike the point person for media interfacing, the corporate representative interfacing with government officials need not necessarily have the charm and media savvy of someone who will be in front of the cameras. Instead, the person should be significantly educated within the field at issue. For example, you do not want your CFO dealing with the NTSB. Your chief engineer might be a better choice. But, your chief engineer should avoid representing the company's interests before the IRS.

Government officials inevitably will request documents and information. Typically, under the law, the corporation will be required to comply with the request. Provide all required information, but strictly and narrowly interpret the requests, if necessary and appropriate to fit the objectives set forth in your plan. Counsel should be involved.

iv. Managing the Human Crisis

Within the organization, this arena is one for human resources personnel. That personnel should have the most and best experience dealing with the human factor. Human resources knows the organization's employees best, as well.

Externally, dealing with the ramifications of the human crisis in the realm of public opinion is a job for the organization's media point person. The organization, through the point person, should express remorse and concern for all fatalities and bodily injuries resulting from the crisis. If appropriate, the organization should apologize and take moral responsibility for anyone harmed. Doing so tempers resentment against the organization and could allow the organization to settle claims pre-suit, rather than engaging in expensive and protracted litigation. Often, owning up to fault is invaluable in terms of goodwill. The costs and benefits of doing so must be weighed very carefully, however. In some circumstances where public perception is

critical, consider whether to pay individuals claims up front and then pursue contribution claims against the truly culpable parties.

First responders (local police and fire departments) and emergency medical services should be contacted and permitted onsite immediately. Cooperation with first responders and EMS is an absolute must, and should be handled by the facility manager. They should be made aware of any hazardous or potentially hazardous conditions onsite and should be allowed to secure the scene. It is important to remember that, during a crisis, certain factors will be entirely out of your control. The work of first responders and emergency medical services is one of those factors.

d. Competing Interests at Stake: Investigation and Preservation versus Restoration and Repairs

At most scenes of a catastrophic event, there will be those interested in investigating and preserving the scene and those interested in restoring and repairing it. These competing interests will need to be managed.

Those interested in investigating the incident and preserving the scene typically are the insurers and the insured. They are focused on determining who is culpable for the incident and to what extent damages can be recovered from those culpable entities. In some circumstances, this takes time. Often, an initial investigation and inspection must be performed to determine who should be put on notice of potential liability. During that inspection, the scene should avoid being disturbed (or should be disturbed only to the least degree possible). Disturbing the scene can lead to claims of spoliation.

A second round of investigation and inspection usually occurs within a short period of time thereafter and involves other entities that have been placed on notice. That investigation might lead to the identification of other potentially liable third-parties, who would also want to inspect the scene. Therefore, to the extent that the scene must be disturbed, it must be documented and done for a significant reason, such as safety and mitigation purposes.

Mitigating damages is the focus of those who are interested in expediting restoration and repairs. They want to resume normal operations as soon as possible and often have little concern or appreciation for the legal effects of their actions. They often are company employees facing pressure from people much higher up in the organization, whose interests solely focus on the bottom line. From a legal perspective, however, mitigation of damages should be done as quickly as possible or recovery for certain unmitigated damages could be barred.

Balancing the needs of these two competing interests usually falls on the shoulders of external counsel, corporate counsel, and the corporate representative handling the recovery efforts. Communication and expediency are keys to properly managing expectations. Moving at rapid speed to secure the scene and to make sure it remains secure until the necessary inspections are complete is the first important step. Identifying the potentially liable parties and expeditiously notifying them of an immediate inspection are others. Most importantly, there must be communication with those interested in restoration and resumption of operations that they are

not to disturb or dispose of any potential evidence. One man's junk is another's key piece of evidence.

III. The Early Days of the Investigation.

It is critical that the recovery team—the attorneys, the experts, and the insurer and their adjusters—develop the initial objectives for the investigation at the beginning of the engagement. The initial objectives will guide the development of the investigation scope of work, schedule, and budget. At the start of an investigation into a catastrophic fire or explosion there will be far more questions than answers and everyone on the team will need to be comfortable with the high degree of uncertainty and fluidity in the process.

Undoubtedly the first objective of the investigation is to determine what happened. The determination of cause is sometimes a long and difficult process. A first step in that determination is to establish a timeline or sequence of events. The timeline basically answers two questions: “what happened?” and “in what order did these events occur?” In a general sense, the timeline is the “story” behind the accident. Initially the timeline may be sparsely developed, but over time as new evidence is obtained the narrative should grow more detailed and substantive. The timeline often gives the investigators clues of what evidence is needed to drive towards the determination of the cause.

It is important to be mindful of investigation good practices. One source of good information on explosion investigations is *NFPA 921 Guide for Fire and Explosion Investigations*. NFPA 921 contains a wealth of information on evidence collection and preservation, documentation of the scene, and methods for the determination of origin and cause. An important element of good investigation practices is the use of the scientific method to guide the determination of the cause. The hallmark of the scientific method is the formulation and testing of different hypotheses to explain the cause. By testing hypotheses with the evidence developed during the investigation, you can have confidence that you are honing in on the actual event. By developing a scientifically defensible cause for the fire or explosion, you can be more confident that your experts will be better able to withstand any legal challenges to their investigation (*e.g.*, Daubert challenges).

i. Early Phase: Finding the Critical Information

During the initial phase of the investigation, it is important to gather accurate information that will assist the forensic experts in their investigation. There are several pieces of information that will be critical to the investigation into the origin and cause, as well as the eventual legal strategy regarding potential recovery. During the initial phase of the investigation, it is important to gather as much accurate information regarding the incident as possible. This information includes, but is not necessarily limited to:

- Witness statements from people who may have observed the event
- Security camera footage
- Plant operations (particularly if something was recently changed or modified)
- A large number of high-quality digital photographs of the incident scene

- Identification of the person(s) most knowledgeable regarding the facility design/operation
- Identification of any individuals who might have potentially caused or contributed to the fire or explosion
- Identification of installed relief/suppression systems on the involved equipment/system
- Electronic data (alarm or process data) that is relevant to the involved system during the period of interest
- Contracts, agreements, and documentation for installation, maintenance, and/or modifications of the involved systems

Some of the information listed above will take time to gather, and will not be available immediately. However, it is important to establish whether any critical information will be altered/lost due to post incident activities (*e.g.*, accidentally overwriting equipment's alarm history by applying power to the equipment).

ii. Gathering Additional Facts: Onsite Investigation

After collecting the initial information, an onsite investigation is usually necessary. Onsite investigations can provide experts with information that is critical to the investigation. An appropriate budget should be established for the onsite investigation. The budget should be proportional to the severity and cost of the damages, and must be fluid and dynamic. Onsite investigation budgets need flexibility to account for changes that may occur in terms of equipment, people (experts and support staff), and/or time that needs to be added or shifted to increase the overall efficiency of the onsite investigation.

Several items may need to be addressed prior to an onsite investigation, including personal safety/environmental compliance for a hazardous scene or operation, site accessibility and scaffolding, lighting or power availability, transportation to and around the site, and necessary equipment for conducting the investigation. Having flexibility built into the budget can help experts limit the amount of time required to complete the onsite investigation.

iii. Preserving the Scene and Information

Before and after the scene investigation, it is important to establish scene preservation and control. There may be areas of a facility where remediation and cleanup activities can begin, while other portions should be preserved for the ongoing investigation. The site may need to be fenced off with access only through a gate supervised by a security guard who controls and records who enters.

In addition to scene preservation and management, proprietary information related to the investigation and process must also be controlled. Legal counsel should determine what type of any non-disclosure agreement needs to be in place prior to the distribution of business confidential information. Establishing a chain of communication helps preserve any privileged and confidential work, and helps a site limit potential rumors or misinformation.

iv. Evidence Collection

Evidence collection is often necessary to facilitate further investigation into critical items. Evidence collection should be conducted and preserved as early as possible and is critical to legal recovery efforts. Removal of physical evidence should include appropriate tagging/labeling, documentation with photos and video, and plans for storage. All collected evidence should include a chain of custody process that identifies what is being collected, who is collecting it, where it is being shipped and who is receiving it. Many types of physical evidence are perishable, that is, their exposure to the environment or simply passing time may alter the physical appearance or chemical composition of the evidence. Ask the investigators to determine if any special preservation methods need to be used to prevent deterioration of the evidence.

Electronic data should be collected digitally. Relevant documents should also be collected either digitally or in hard copy form.

After collecting necessary evidence, additional debris may need to be removed with chain of custody procedures as necessary. A qualified demolition contractor may need to be hired to assist in debris removal.

v. Witness Identification

At the outset of a scene investigation, documenting the names and contact information of all potential witnesses is a necessary part of evidence collecting and important for future subrogation efforts. Consider including a broad swath of witnesses. Interviews should be conducted of eyewitnesses, first responders, injured individuals, and employees. Knowledgeable individuals at the facility should also be identified. All remotely relevant employees who could provide insight into the loss might be valuable down the road. As always, document who is interviewed, when they are interviewed, and by whom. Determine whether legal counsel should interview certain witnesses. Certain information may need to be gathered under the protection of the attorney-client privilege.

Every interview will be contextually based on the witness's role in the loss. However, several questions can be universal when investigating an industrial accident:

- Background information of the witnesses and their relationship, if any, to the incident.
- What did you see or hear? When?
- Where were you when the incident occurred?
- Describe the moments leading up to the incident.
- What is your understanding of what happened?
- Explore the witness's knowledge of third-party involvement.

vi. Chain of Custody

A "Chain of Custody" refers to the progression of people who have physical possession of various evidence items. Documenting who has what and when must be maintained throughout

the collection, transport, examination and storage processes. Maintaining the chain of custody ensures that the evidence is handled only by authorized individuals who document their actions. Excellent record keeping is critical to avoid later spoliation challenges by potential targets. Retained personnel should always consider documentation strategies prior to handling potential scene evidence.

vii. Spoliation

Spoliation is intentionally, recklessly, or negligently making evidence that may be potentially relevant to a legal proceeding unavailable to others, most commonly including the destruction of evidence. Spoliation typically results in an adverse inference that the party guilty of spoliation had a motivation to avoid the outcome of the evidence. The trier of fact may then conclude that the evidence would have been unfavorable to the spoliator.

The primary factors to consider in spoliation disputes are duty, relevance, and prejudice. To be guilty of spoliation, a party must have an affirmative duty to preserve the evidence. The duty is generally defined as the obligation to locate, maintain, and catalogue information that is relevant to foreseeable litigation. In some jurisdictions, this duty extends to evidence held by interested third-parties, including insurance companies. The duty can be taken on voluntarily.

Not all destruction of evidence leads to sanctions. The evidence must be relevant and the opposing party must be prejudiced by the inability to examine that relevant evidence. If there is alternative information, photographs, or witnesses to mitigate the loss of evidence, the party seeking to take advantage of the evidence might not be prejudiced. A party is harmed when it is precluded from presenting essential evidence to its claim or defense because of the spoliation.

viii. Notifying Other Parties

Notice to any potentially interested parties and their liability insurers is critical. During the early days of the investigation, it may be unclear which parties might have a legal or economic interest in the loss. As the investigation unfolds, it may be necessary to notify potentially interested parties at various stages of the investigation. It is important to identify the correct parties and entities involved. When in doubt, error on the side of inclusion.

Claims of spoliation of evidence can also be minimized when notice is given to all known interested parties that an investigation at the site of the incident is going to occur so as to allow all known interested parties the opportunity to retain experts and attend the investigation. The following should be considered when providing notice:

- Such notice may be made by telephone, letter, fax, or e-mail. Proceed with as many delivery methods as are available.
- Oral notification should be confirmed in writing.
- Notification should include:
 - The date, type, and location of the incident;
 - The type and extent of loss, including damages, injuries, or death to the extent known;

- The interested party’s potential connection to the incident;
- Next action date;
- Circumstances affecting the scene (such as pending demolition orders or environmental conditions);
- A request to reply by a certain date;
- Contact information as to whom the notified person is to reply;
- The identity of the individual or entity controlling the scene;
- An inspection protocol, as necessary;
- Relevant, identifying photographs; and
- Limiting time constraints based on the insured’s commercial needs should be made expressly clear to potentially adverse parties.

ix. Assembling Damages Documentation

Damages are often overlooked as the explosion investigation unfolds. As part of the ongoing investigation, damages documentation should be assembled and preserved concurrently. The risk management team needs to identify and discuss with those persons most knowledgeable on the losses suffered and the mitigation efforts. Keeping a running index of damages and impacted revenue streams will preserve the “value picture” at the end of the investigation and for eventual litigation and recovery.

IV. Recovery Theories

a. Determining Type of Explosion, Origin, and Cause

During the ongoing investigation, the experts will develop and test hypotheses for the explosion based on the available information. These hypotheses will aim to explain how an explosion’s fuel and ignition source came together and how the initial explosion propagated to create the damages. During this process, the expert will use several tools and approaches to develop and test hypotheses, combining the physical evidence with fire and explosion science (*i.e.*, blast overpressure/wave properties, combustion chemistry, and/or pressure/flow dynamics). The expert will also consider several different types of explosions as part of the investigation, such as mechanical explosions, boiling liquid expanding vapor explosions (BLEVEs), chemical explosions, combustion explosions, electrical explosions, and nuclear explosions, as well as flash fires. The effects of these types of incidents will be combined with the damage and the available information regarding the system prior to the explosion (fuels, ignition sources, confinement/geometry, venting/protection systems, and blast dynamics) to rule in or to rule out various hypotheses and to determine an origin and ignition scenario for the incident.

b. Various Types of Explosion, Causation & Recovery Theories

i. Flash Fires

Flash fires are generally sudden, intense fires caused by a combination of air and a dispersed flammable substance such as a solid (including dust), a flammable or combustible liquid (like an aerosol or fine mist), or a flammable gas. Flash fires can be characterized by high

temperature, short duration, and a rapidly moving flame ignition. In a flash fire, the flame spreads quickly and the bulk of the damage comes from the thermal radiation and secondary fires.

ii. Chemical Hazards

Chemical hazards are a broad category for any substance that can cause harm, primarily to people. Chemicals are required, by OSHA, to have symbols showing their possible hazards. Chemicals are grouped according to the types of effects they could have on their surroundings and can be classified as: corrosive; highly flammable; toxic; harmful to the environment; irritants; radiation risks; and carcinogens. Some chemicals are incompatible with other chemicals and should be stored separately from each other. For example, flammable chemicals should never be mixed with oxidizing chemicals as the result could be a large, uncontrollable fire.

iii. Combustible Dust

Combustible dust is defined as solid material composed of distinct particles, regardless of size, shape, or chemical composition, which presents a fire hazard when suspended in air or some other oxidizing medium over a wide range of concentrations. Combustible dust explosions occur when dust particles are suspended in the air and confined in an enclosed space. These restrictions allow pressure to build up, increasing the likelihood of an explosion after an ignition source is introduced. The particle size of the dust, the method of dispersion, ventilation, ignition source potential, and dust confinement are variables that must be considered when assessing the risk of a combustible dust hazards. Ultimately, the best practice is to avoid fugitive dust accumulation as much as possible, while eliminating or carefully managing ignition sources in proximity to the dust.

iv. Boiling Liquid Expanding Vapor Explosion

A boiling liquid expanding vapor explosion (“BLEVE”) is an explosion caused by the rupture of a vessel containing a pressurized liquid above its boiling point. If the pressurized vessel containing liquid at high temperature (which may be room temperature, depending on the substance) ruptures, the pressure preventing the liquid from boiling is lost. This circumstance causes the entire volume of liquid to instantaneously boil, generating hot vapor, which in turn causes extremely rapid expansion. Depending on temperatures, pressures, and the substance involved, that rapid expansion may be classified as an explosion, capable of severely damaging its surroundings.

v. Electrical Fires

Electricity often plays a large role as an ignition source and must be considered in any fire or explosion event, as well as other equipment-based losses. Ignition by electrical energy involves transferring sufficient heat to a fuel by passage of electrical current to ignite nearby material. Sufficient heat may be generated by a wide variety of means (short-circuits, ground-fault arcs, excessive currents, resistance heating, or failures of ordinary sources like light bulbs, heaters, and cooking equipment). Under NFPA 921, electrical fires require the following for

ignition to occur: (1) the electrical wiring, equipment, or component must have been energized and (2) sufficient heat and temperature to ignite a nearby combustible material must have been produced by electrical energy at the point of origin by the electrical source.

c. Causation Considerations

i. Operator Error or Misuse

A wide variety of incidents occur as a result of operator error or equipment misuse. If human error is a possible cause and contributing factor, investigative efforts must be aimed at identifying the culpable individual. Factors such as inadequate training, inadequate procedures, ineffective equipment manuals, improper equipment designation, or lack of oversight, may have contributed to the mistakes.

ii. Spills or Leaks

If there is evidence of a spill or a leak that caused the explosion, there are several broad investigation objectives to consider. First, the type of spill and type of release, whether sudden or long-term, must be determined. The spill location and identification type of product spilled are important for subsequent action steps (cleanup/containment). Then, the investigator must determine if another hazard exists relating to the spill that could threaten the soil, ground water, or other materials that necessitate immediate cleanup.

iii. Design Defects

Design defects must always be considered when an equipment failure is involved in the explosion. Generally, there are two types of design defects—ones that directly cause harm and ones that make harm from other sources more likely.

The two most common tests used to determine whether a design defect was present are the consumer expectation test and the risk-utility test. Under the consumer expectation test, courts determine whether the product was dangerous to a degree not ordinarily contemplated by the reasonable consumer. Under the risk-utility test, courts determine whether the harm posed by the product outweighs the benefits associated with its use.

Product designers need to account for all foreseeable users and uses/misuses to which the users might put the product. No absolute legal standard for foreseeability exists, though it is generally limited to reasonably anticipated contingencies.

iv. Manufacturing Defect

Manufacturing defects occur when the product is manufactured in a way that departs from its intended design and is more dangerous than consumers expect the product to be. This generally means that, no matter how careful the manufacturer was when designing the product, choosing materials, creating the assembly line, and issuing quality assurance, the manufacturer is still liable for deviations that injure consumers. However, manufacturing defects can be difficult

to establish. A plaintiff must show that the claimed defect was outside the product's design specifications. Furthermore, extracting the failed component(s) in a state that allows for further forensic analysis is challenging, especially when the malfunction caused internal damage to the product itself.

v. Improper Packaging/Inspection

Improper packaging is a subset of design and manufacturing defects. If a volatile chemical or combustible item is packaged in a leaking or poorly sealed container, it is reasonably foreseeable that the item will spill, potentially causing a fire. Manufacturers have a duty to inspect their packaging for defects or consumer hazards. Even with proper warning labels, courts have held manufacturers liable for improper packaging and inspections thereof.

vi. Failures to Warn

Sellers and manufacturers have a duty to warn consumers when their products or equipment pose reasonably foreseeable risks of harm. Failures to warn are considered marketing defects, and a product can be defective because of inadequate instruction or lack of appropriate warnings. Factors to consider when evaluating whether there was an issue with warnings are: the severity of the likely harm; the ease of providing an appropriate warning; and the likelihood that the warning is effective. Even with proper warning labels, courts may hold manufacturers liable for industry knowledge or practices that indicate consumers disregard the warning.

vii. Implied Warranties

Warranty claims are contract based, meaning that they can generally be brought when the plaintiff dealt directly with the defendant. However, some courts extended warranties to reach members of a buyer's household, to guests, and to people who borrow a product. There are two types of implied warranties: warranties of fitness and warranties of merchantability. However, both can be disclaimed explicitly within a contract.

a. Implied Warranty of Fitness

This implied warranty relies on the intentional representations that the buyer relies on. To establish this claim, the buyer has expressly or impliedly informed the seller of a particular purpose for which the product is required and relied on the seller's skill or judgment in selecting or furnishing a product to satisfy that purpose.

b. Implied Warranty of Merchantability

This implied warranty certifies to a buyer that the goods are fit to sell. "Fit to sell" just means that the product is reasonably fit for its foreseeable, ordinary purpose within the customer's reasonable expectations.

viii. Express Warranties

An express warranty is any affirmation of fact or promise the seller makes to the buyer, relating to the goods, that becomes part of the basis for the bargain. A particularly sensitive area is created in statements made in advertisements, brochures, sales pitches, and instruction manuals. Vague statements may even be construed as express warranties, if a reasonable buyer would consider them in purchasing the product. Unlike implied warranties, express warranties cannot be disclaimed.

ix. Protection/Suppression System Failures

Automatic fire suppression systems (wet or dry) are the most effective means of preventing fire damage. A fire suppression system can be design-specific and engineered for a particular application, like an industrial plant or computer clean room. Otherwise, the system is likely pre-engineered and has general application. Failure of the system should be considered at the outset of every fire and explosion investigation. Design documentation regarding the particular system or component of interest should be obtained. Installation documentation, invoices, contracts, service providers, alarm activation history, product literature, and maintenance records should all be examined.

V. Conclusion

The key to a successful recovery pursuit is having the right team of professionals in place. The investigation and any recovery litigation must be based on credible evidence and good science. The recovery team should be effective, efficient and strategic in their efforts. While an industrial accident crisis is severe and chaotic, a strong thorough forensic investigation, with skilled leadership, affords the potential for maximizing your recovery opportunities.