

BLASTING: STRICT TORT LIABILITY OR NEGLIGENCE

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ABSTRACT: At present blasters are strictly liable under tort law for personal injury and property damage caused by ground vibrations and/or air overpressures. The application of strict tort liability to vibration and air overpressure damage has resulted in litigation that has hampered and probably will continue to hamper the blasting industry. There are many case histories in which blasters have been sued for the appearance of cosmetic cracking, some of which have involved frivolous claims and marginal expert testimony (Oriard 1999). This litigation has resulted in additional costs to the blasting and construction industries and the American public because there are usually many plaintiffs involved and each case is usually adjudicated separately instead of under a class-action format. It is proposed herein that blasters not be held liable for vibration or air overpressure damages unless their conduct is proven to be negligent. A number of reasons are presented for raising the legal standard from strict liability to negligence including: (1) improvements in blasting technology that allow blasting to be conducted without substantial risk of damage and if damage does occur it is likely to be cosmetic, (2) establishment of conservative ground vibration and air overpressure damage limits for typical structures, and (3) established industry standards for construction blasting.

INTRODUCTION

Modern authorities, including case law and the Second Restatement of the Law of Torts (American Law Institute 1976), apply strict tort liability to trespassory (flyrock) and non-trespassory (ground vibration and air overpressure) blasting damages for construction (Spano v. Perini Corp. 1969), mining (Fantasy Valley Resort, Inc. v. Gaylord Fuel Corp. 1992), and quarry (Poe v. Atlas Powder Co. 1968) related blasting. Strict tort liability has been applied to damages caused by flying debris onto adjacent property as early as 1893 (Spano v. Perini Corp., 1960) and is justifiable based on the theory that a trespass has occurred. This paper focuses on whether or not strict tort liability should be applied to non-trespassory damages by determining whether construction blasting should be classified as an abnormally dangerous activity using the Second Restatement of the Law of Torts (American Law Institute 1967).

Strict tort liability makes plaintiff's claims significantly easier to prove because there are fewer elements that a plaintiff must prove to a jury before receiving a favorable verdict. In particular, there are four elements that a plaintiff must prove to prevail under negligence and only two elements to prevail under strict liability (see Table 1). It can be seen that both negligence and strict liability claims require proof of proximate cause and proof of the amount of personal injury or property damage inflicted by the blasting. The proof of damages is self-evident, e.g., cost to repair cracks, repaint the structure, and diminution in property value, and thus the only element that a plaintiff might have difficulty proving under strict liability is that the blasting is the proximate cause of the damages.

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Table 1: Provable elements of negligence and strict tort liability claims (Epstein 2000)

Negligence	Strict Tort Liability
Duty of care	Assumed proven by plaintiff
Breach of duty of care	Assumed proven by plaintiff
Proximate cause of damage	Proximate cause of damage
Damages	Damages

The plaintiff usually tries to meet the proximate cause burden by testifying that the crack(s) did not exist prior to blasting and then presenting expert testimony that concludes the induced level of vibration and/or air overpressure could have caused the cracking. Defendants usually try to refute the causation evidence presented by a plaintiff by showing that the cracks existed prior to blasting. This can be accomplished by carefully inspecting a crack usually with a magnifying glass or microscope to determine if the cracks are new, e.g., with sharp edges or paint hanging from the crack, or old, e.g., there is paint in the crack. Other techniques for rebutting plaintiff causation evidence is the lack of displacement of nearby loose objects, e.g., dishes, books on tables or in bookshelves, or ornaments, and/or non-disturbance of nearby liquids, both of which would disprove the presence of vibrations (Oriard 1999). In addition, the contractor can conduct a building condition survey prior to blasting to document pre-existing cracks. The performance of crack surveys usually results in significant cost because the surveys may be required for structures within approximately a one-mile (5000 feet) radius of the blasting to discourage fraudulent claims. Dowding (2001) suggests the use of a sensor to monitor the behavior of a crack before, during, and after blasting. This allows a graph of crack movement versus time to be developed, which usually shows that environmental factors have a larger impact on crack displacement than blasting.

The use of strict liability, and thus only really needing proof of causation, has led to damage awards for plaintiffs even though the cosmetic cracking was not caused by the blasting activities (Oriard 1999) and some dubious plaintiff and expert testimony. For example, in *Capalbo v. Balf Co.* (1994), Mr. Capalbo (the plaintiff) testified in his deposition “blasting caused the cracking in his walls, there was blasting on October 5 and then he noticed a bunch of cracks but he does not remember the year this happened.” An example of dubious expert qualifications and testimony is *Ballard v. Buckley Powder Co.* (1999) where the plaintiff’s expert received a Bachelors Degree in Architectural Engineering in 1983 and his current occupation involved inspecting homes for structural problems and making recommendations for repair. The expert “had no training or education in blasting, has never worked for a blasting company, has never given advice to a blasting company, has never designed a blast, and has never operated any seismic recording devices to record the effect of a blast.” Between his first and second depositions, the plaintiff’s expert “obtained information on blasting from the Internet, spoke briefly with Alcohol, Tobacco and Firearms personnel, and learned from the Kansas state fire marshal that a license is required to conduct blasting in Kansas.” The expert also “is not familiar with blasting logs such as those used by the defendant, nor is he familiar with the formulas or the measurements found on those logs.” However, this expert believed that:

“someone involved in the blasting operations on December 15, 1995, committed some error, but he does not know what the error was. The reason he believes an error was committed is that Mrs. Ballard’s house was damaged.”

Oriard (1999) details 33 cases of questionable plaintiff claims from blasting. These and other claims are facilitated by imposition of a strict tort liability framework on the blaster because the only debatable issue for a jury is whether or not the cracking/damage was caused by the blasting. The use of a negligence framework will require a plaintiff to establish the duty of care for a blaster, show the contractor was negligent, i.e., breached his/her duty of care, and that the blasting is the proximate cause of the damages (see Table 1). Before the legal standard will be raised from strict liability to negligence, courts will have to be convinced that plaintiffs will still be able to recover for legitimate claims without a substantial increase in their burden of proof. Thus the following section describes how a blasting case could be presented by a plaintiff and defended by a blaster under a negligence framework.

IMPLEMENTING A NEGLIGENCE FRAMEWORK

Because the blaster essentially assumes a duty of care by undertaking the activity of blasting, the new obstacle that a plaintiff will have to prove under a negligence framework is that the blaster was negligent or breached his/her duty of care. A plaintiff can prove a breach of duty using direct evidence or inferring negligence from circumstantial evidence. To assist plaintiffs in proving negligence when the defendant has exclusive control over the activity that allegedly produced the harm, e.g., a doctor during medial surgery when the plaintiff is unconscious, courts allow the use of an evidentiary rule termed Res Ipsa Loquitur (RIL). Courts developed this rule of evidence because in many situations a defendant can withhold useful information that a plaintiff cannot obtain, such as manufacturing and design information for a defective product, which can impede a plaintiff's case. A plaintiff can use RIL to infer negligence of a blaster if:

- a. the damage ordinarily does not occur without a blaster being negligent,
- b. the blasting was conducted under the exclusive control of the blaster so no one else could be the cause of the negligence, and
- c. the damage could not be caused by another activity besides the blasting.

The second and third elements could be proven by showing that the blaster was in control of the blasting and relating the date of the blasting or other relevant activity to the occurrence of the damage, respectively. Therefore, the most problematic element for a plaintiff is probably showing that the observed damage does not occur without negligence. A plaintiff could use allowable peak particle velocities or air overpressures in Tables 2 and 3 and comparing the recorded or estimated peak particle velocities and air overpressures to these conservative limits. If the induced vibrations and air overpressures exceed the allowable values, the plaintiff has some evidence, not dispositive evidence, of negligence because these limits have been promulgated for mining blasting and not construction blasting.

Table 2: Allowable Peak Particle Velocities as a Function of Distance from the Office of Surface Mining (OSM) Regulations (Office 1983)

Distance from Blast (feet)	Permitted Peak Particle Velocity (inches per second)	Scaled-Distance Factor to be applied without seismic monitoring (ft/lbs ^{1/2})
0 - 300	1.25	50
301 - 5000	1.00	55

Greater than 5000	0.75	65
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Table 3: Typical Air Overpressures, Office of Surface Mining (OSM) value, and Potential Damage (Oriard 1999)

Air Overpressure	Potential Damage
0.0145 psi (134 dB)	OSM overpressure limit for no damage
0.029 psi (140 dB)	Safe limit and project specification value
0.1 psi (151 dB)	Occasional window breakage
1.0 psi (171 dB)	General window breakage
3.0 psi (180 dB)	Possible structural damage

If the plaintiff can satisfy these three elements, the court will assume that the plaintiff has met their burden of proof concerning the blaster's negligence and thus only needs to prove causation and damages, both of which are required under strict liability. Therefore, the proposed negligence framework will allow meaningful claims to be proven with only slightly more evidence than under the strict liability framework. However, it is anticipated that this increase in proof will be sufficient to reduce the number of unwarranted claims.

Before the court awards a verdict to the plaintiff under negligence, the use of RIL allows the defendant to rebut the plaintiff's circumstantial proof that he/she was negligent during the blasting. This is justified because the plaintiff proved the defendant was negligent only by showing the three circumstantial elements shown above. The defendant can now introduce evidence to rebut the presumption that he/she was negligent during the subject blasting. This evidence can consist of the following:

- a. using industry standards or customs that have developed under the strict liability regime and thus are conservative for use under a negligence framework. These customs include typical explosive weights, spacings, depths, and delays, use of blasting mats, time of blasting, types of explosive, types of monitoring equipment, typical experience of a blaster, the particular site and blasting application, etc.
- b. using compliance with vibration and airblast limits developed for residences near mining related blasting (see Tables 2 and 3) as some evidence of non-negligence in construction blasting. In mining related blasting, non-compliance with these limits can be proof of negligence, not just evidence of negligence, because the limits pertain directly to mining blasting. However, there are no legal standards for construction blasting so these limits are only considered to be mere evidence of negligence or non-negligence depending on whether there is non-compliance or compliance, respectively. These mining related limits may be problematic for close-in construction blasting where vibrations and air overpressures can safely exceed these limits (Oriard 2001). This should not present an insurmountable problem for the blaster because (1) the limits were developed for mining related blasting, which is usually not close to structures and thus should be considered as only some evidence of possible negligence and (2) they have not been adopted into any law or ordinance pertaining to close-in construction blasting. The blasting industry should consider developing vibration

and air overpressure limits for close-in construction blasting to overcome this information void.

- c. accepted vibration and air overpressure limits for construction blasting developed by experts and endorsed by an industry group such as the ISEE.

After the defendant presents their evidence that demonstrates that he/she was not negligent, a jury, not the judge, decides whether or not the blaster was negligent, and thus breached his/her duty of care. If the blaster is found to have breached his/her duty of care, the jury then will decide whether or not the blasting was the cause of the damage. If the jury concludes that the plaintiff did not prove that the blaster was negligent, the jury will not have to consider proximate cause of the cracking/damage. Thus if a blaster is not negligent, a claim could be dismissed prior to a jury weighing any evidence of proximate cause. In summary, under a negligence framework a plaintiff will have to convince a jury, not the judge, that the blaster was negligent and caused the damage. This still may be favorable to plaintiffs because juries may be sympathetic to property owners but at least the blaster gets an opportunity to show that he/she conformed to industry standards and is not presumed to have breached a duty of care. The use of the negligent standard will also allow the blaster to more thoroughly question the credentials of expert witnesses because the expert will have to be knowledgeable about industry standards, blasting analyses that allow prediction of induced blast vibrations and air overpressure limits, safe vibration and air overpressure values for a particular site and structure, and typical blasting techniques such as the use of blasting mats, charge delays and spacing, and explosives weight. Under a strict liability framework the plaintiff expert only has to opine that the blasting probably caused the cracking and thus does not have to be well versed in blasting technology and practices as noted previously in *Ballard v. Buckley Powder Co.* (1999). However, the effectiveness of the plaintiff's expert will still be somewhat dependent upon the inquisitiveness of the defendant's attorney.

The use of a negligence framework can be illustrated using a seminal case for imposing strict liability on construction blasting in New York in 1969 (*Spano v. Perini Corp.* 1969). Prior to this case blasting was considered under a negligence framework. Spano was the owner of a garage in Brooklyn that was damaged by construction blasting on November 27, 1962. The undisputed blast involved a total of 194 sticks of dynamite at a construction site that was only 125 feet away. The blasting was conducted to facilitate construction of a water supply tunnel. Each stick of dynamite contained one-half pound of dynamite and thus the blast had a charge of 97 pounds of dynamite. A lessee of a portion of the premises testified that there was "no damage on or to the premises prior to November 27." This witness also testified that he heard the explosion on November 27 around noon while he was working "some three blocks away" and when he returned to the property a few hours later, "the building was cracked in the wall, the window broke, and the cement floor all pop up" (*Spano v. Perini Corp.* 1969). This evidence would be sufficient to satisfy the three element of RIL namely

- a. the damage ordinarily does not occur without a blaster being negligent, which is evident because damage to a wall, window, and concrete floor usually does not occur without negligence based on many years of successful blasting,
- b. the blasting was under the exclusive control of the blaster so no one else could be the cause of the negligence, which should be easily proven by identifying the contractor for water tunnel, and

- c. the damage could not be caused by another activity besides the blasting, which should be proven because the damage was not present before the November 27 blast.

Therefore, the court would presume that the blaster was negligent and assuming that the plaintiff can prove causation and damages, which appears extremely likely in this case, the case would not be dismissed. The blaster then would have an opportunity to rebut the presumption of negligence. In this case it appears that the blaster was probably negligent given the substantial damage to the garage and thus the plaintiff would still be able to recover under a negligence framework. In the actual case, the trial judge awarded damages based on a strict liability framework without proof of negligence. In summary, a plaintiff should be able to prove negligence in meritorious blasting cases and still gain recovery with little additional proof if the legal standard is raised from strict liability to negligence. However, the use of a negligence framework may make marginal and frivolous cases more difficult because the burden of proof and level of expertise required is greater. This may stem the numerous unwarranted claims that the blasting industry must defend, reduce the number of experts that choose to participate in litigation, and increase the use of blasting as a cost-effective excavation technique while protecting the interests of the public. However, a blaster will still have to mobilize an expensive defense to combat a blasting claim but the increased legal standard may provide some justification for a blaster to pursue a court appearance instead of simply settling and paying some damages.

IMPOSITION OF STRICT TORT LIABILITY ON BLASTING

Judges, not juries, use the Restatement of the Law of Torts, Second, (American Law Institute 1976) to impose strict tort liability on blasting, e.g., *Whitman Hotel Corp. v. Elliot & Watrous Engineering Co.* (1951). In particular, the Restatement is used by judges to classify blasting as an abnormally dangerous activity and thus making it eligible for strict tort liability instead of negligence. Therefore to implement a negligence standard, the blaster will have to convince the judge, not jury, that blasting is not an abnormally dangerous activity. The following paragraphs suggest arguments that can be used to persuade a judge that construction blasting is not abnormally dangerous. At present, thirty-five states (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Hawaii, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Missouri, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia, and Wisconsin) apply strict tort liability to non-trespassory damages caused by construction blasting while only six states (Kentucky, Maine, Massachusetts, New Jersey, Texas, and Vermont) apply a negligence standard. Definitive case law was not found in nine states (Alaska, Georgia, Idaho, Maryland, Minnesota, Mississippi, Nevada, North Dakota, and Wyoming) but this is a topic of continuing research. This section describes the test presented in the Second Restatement of the Law of Torts and used by courts to classify an activity as abnormally dangerous and then applies the test to blasting to assess whether or not blasting should be classified as an abnormally dangerous activity.

Section 519 of the Second Restatement of Torts (American Law Institute 1976) states one who carries on an abnormally dangerous activity is subject to strict liability for personal injury and property damage resulting from the activity, although the actor has exercised the utmost care to prevent the harm. Therefore, if blasting is classified as an abnormally dangerous activity, the blaster will be held strictly liable for personal injury and property damage if the plaintiff can prove blasting is the proximate cause

of the damage. Section 520 of this Restatement (American Law Institute 1976) presents the following six factors that are considered by courts in determining whether an activity is abnormally dangerous:

- (a) existence of a high degree of risk of some harm to the person, land or chattels (personal items) of others;
- (b) likelihood that the harm that results from it will be great;
- (c) inability to eliminate the risk by the exercise of reasonable care;
- (d) extent to which the activity is not a matter of common usage;
- (e) inappropriateness of the activity to the place where it is carried on; and
- (f) extent to which its value to the community is outweighed by its dangerous attributes.

Judges consider all of these factors and none is dispositive so ordinarily a plaintiff will have to prove at least several of the factors to classify an activity as abnormally dangerous. On the other hand, it is not necessary that each of the factors be present especially if a court weighs one factor more heavily than another (American Law Institute 1976). The first three factors are interrelated whereas the last three, which evaluate common usage, location, and value of the activity to the community, are not. The first three factors relate to the level of risk, magnitude of the harm if harm occurs, and the ability to eliminate the risk of the activity by reasonable care. The following paragraphs utilize current blasting technology to evaluate the first three factors and show a low degree of risk with construction blasting, a small likelihood of harm and if harm does occur it will consist of cosmetic cracking, and the risk of harm can be reduced significantly, if not eliminated, with reasonable care, which suggest blasting is not an abnormally dangerous activity.

a. High Degree of Risk of Some Harm

The first abnormally dangerous factor considers whether there is a high degree of risk of some harm by the activity. The Restatement clarifies the degree of risk in Comment (g) of Section 520 by stating the harm threatened must be “major in degree” and sufficiently serious in its possible consequences to justify strict tort liability. Comment (g) continues “It is not enough that there is a recognizable risk of some relatively slight harm, even though that risk might be sufficient to make the actor’s conduct negligent if the utility of his conduct did not outweigh it, or if he did not exercise reasonable care in conducting it.” Therefore, if the blasting industry can show that the harm, if any, that will occur from blasting is cosmetic cracking, this factor does not appear to be satisfied and suggests blasting is not abnormally dangerous.

Three harms that could be viewed as “major in degree” from blasting are flyrock, structural damage or collapse caused by ground vibrations, and flying glass from air overpressures. The magnitude of explosives and levels of vibration and air overpressure required to cause these harms are not encountered in current blasting projects (Siskind 2000). The harm, if any, will consist of hairline cosmetic cracking with no impact on the structural integrity of the structure (Dowding 2001). Currently, blasting damage is classified using the classification scheme presented by the U.S. Bureau of Mines (USBM) in RI 8507 (Siskind et al. 1980) and shown in Table 4. It can be seen that threshold damage corresponds to the first indication of cosmetic damage, e.g., loosening of paint, lengthening of old cracks, or initiation of small plaster cracks. As a result, plaintiff attorneys perceive loosening paint, small plaster cracks, or lengthening old cracks as physical damage (Oriard 1999) and file a claim under strict tort liability even though the harm is not major in degree. It is proposed that cosmetic cracking is not a harm

of major degree, has no serious implication to the stability of a structure, and does not satisfy the first factor of Section 520. For example, Scholl (1976) studied 52 cases of alleged nuclear-blast induced damages in Nevada and the average damage award to remediate the cosmetic cracking is approximately \$400. It will be recommended subsequently that if the cosmetic cracking cannot be remediated with routine patching and painting, the homeowner can request reimbursement up to a specified amount from a remediation fund established by the blaster to repair the premises.

Finally, most, if not all, houses have some cracking regardless of the age of the structure (Oriard 1999). Normal cracking in structures can occur for a variety of reasons, such as environmental forces, type of construction material, e.g., wood versus masonry, and design and construction practices. For example, shrinkage and heave of foundation soils is a common cause of cracking in a structure or appurtenant structures, such as driveways, walkways, and patios, in a number of areas of the country because of the presence of expansive soils. Expansive soils cause about \$9 billion dollars of physical damage each year in the United States, which is more than that incurred in all earthquakes, floods, tornados, and hurricanes combined in an average year (Coduto 2001). In summary, the type of harm that is likely to occur with blasting, i.e., cosmetic cracking, is usually present in a structure or is likely to develop during the life of the structure. The large number of actors that usually cause cosmetic cracking facilitates unwarranted claims against blasting contractors because all houses have some cracking and plaintiff experts can attribute this cracking to nearby blasting as illustrated in *Capalbo v. Balf Co.* (1994).

b. Likelihood that Resulting Harm will be Great

The second abnormally dangerous factor considers the likelihood that the harm that results from the activity will be great. If the conservative blasting limits in Tables 2 and 3 are followed, field measurements and observations of blasting activities show that the harm, if any, to adjacent structures will be cosmetic (Oriard 1999; Siskind 2000). In addition, there is no field evidence of personal injury being caused by ground vibration when the peak particle velocity is less than two inches/second and the air overpressure is less than 0.0145 psi (134 dB). Flying debris causes the largest potential for personal injury. If common remedial measures are used, e.g., covering the blast area with blasting mats and limiting the explosives per delay to comply with the conservative limits in Tables 2 and 3, there is little, if any, probability that personal injury will occur because of flying debris. Therefore, there is no evidence of great harm when these conservative limits are followed (Oriard 1999). In fact there is no evidence of cosmetic cracking occurring from construction vibrations at peak particle velocities below 0.8 inches/second (Dowding 2001) and the USBM guidelines in RI8507 (Siskind et al. 1980) limit the peak particle velocity to 0.75 to 0.5 inches/second for drywall and plaster construction, respectively. Therefore, if these conservative limits are followed, even cosmetic cracking should not be an issue and the second factor also does not suggest blasting is abnormally dangerous.

c. Inability to Eliminate Risk by Exercise of Due Care

The third abnormally dangerous factor is the inability to eliminate the risk. Comment (h) of Section 520 describes the essence of this factor is to evaluate the “unavoidable risk” remaining in the activity after the actor has taken all reasonable precautions (American Law Institute 1976). Substantial research (Dowding 1996; Oriard 1999) shows that blasting programs can be designed to significantly reduce or eliminate the risk primarily by reducing the weight of explosives detonated in each delay. A number of explosive delays can be used to achieve the desired excavation results without inducing detrimental vibrations. A blasting program can be adequately designed using the conservative vibrations and air overpressures in Tables 2 and 3 to eliminate the risk of vibration and air overpressure induced damages.

This design can be implemented in practice via a performance-based specification that details the peak particle velocity and air overpressure that a contractor can induce to accomplish the desired excavation. This allows the contractor to design the appropriate explosives weight per delay, depth and location of explosives, and remedial measures for the blasting based on his/her local experience. In summary, there are many parameters that can be controlled in blasting to significantly reduce the risk of damage and thus it is proposed that blasting also does not satisfy the third abnormally dangerous factor of Section 520.

Table 4: Damage Classification from U.S. Bureau of Mines RI 8507 (from Siskind et al. 1980)

Uniform Classification	Description of Damage
Threshold	Loosening of paint; small plaster cracks at joints between construction elements; lengthening of old cracks
Minor	Loosening and falling of plaster; cracks in masonry around openings near partitions; hairline to 3-mm cracks (0 to 1/8 in.); fall of loose mortar
Major	Cracks of several mm in walls; rupture of opening vaults; structural weakening; fall of masonry, e.g., chimneys; load support ability affected

d. Common Usage of Activity

The fourth abnormally dangerous factor is whether the activity is a matter of common usage. Comment (i) of Section 520 states common usage is “an activity carried on by the great mass of mankind or by many people in the community.” Comment (i) uses blasting as an example of a proper means of excavation for building purposes that is not carried out by “any large percentage of the population” and thus is not a matter of common usage. Following this logic most, if not all, construction activities are not common usage, and thus abnormally dangerous, because only a small percentage of the population participates in construction activities. The societal benefits of construction in the development of towns and cities and the resulting improvement of property (*Booth v. Rome, Watertown & Ogden Terminal Railroad Company*, 1893) suggests that each construction activity should be evaluated to assess whether or not it is abnormally dangerous. For example, should excavation by a backhoe be an abnormally dangerous activity because it is not in common usage by a large percentage of the population? It is arguable that the use of a backhoe is similar to the use of a car, which is an example in Comment (i). An automobile was initially used on a limited basis and came into general use such that cars are now a matter of common usage. Backhoes are now present on most construction sites and frequently travel on public roads and may be considered to be common usage. At present blasting is not a common usage in urban areas because of unwarranted claims of damage that have been awarded (Oriard 1999) under strict tort liability. However, blasting has been used in urban areas to facilitate construction and development activities, e.g., implosion of structures, albeit at a reduced level because of litigation concerns. Comment (i) of Section 520 does leave open the possibility of blasting being a common usage by stating “Certain activities, notwithstanding their recognizable danger, are so generally carried on as to be regarded as customary.” It is possible that imposition of a negligence framework for blasting would increase the use of this cost-effective excavation technique and thus it could become another example of a risky activity

becoming common usage like many other construction activities, such as excavation by backhoe, steel erection for high-rise structures, and use of large construction equipment.

e. Inappropriateness of Location of Activity

The fifth abnormally dangerous factor considers the appropriateness of the activity to the place where it is carried on. Comment (j) of Section 520 (American Law Institute 1976) illustrates this factor using explosives and states explosives “capable of destroying everything within a distance of half a mile, does not necessarily create an abnormal danger if it is located in the midst of a desert area, far from human habitation and all property of any considerable value.” However, the same blasting operations “become abnormally dangerous if they are carried on in the midst of a city.” This factor is sometimes used by courts to apply strict tort liability in the absence of the first three abnormally dangerous factors, which is not in agreement with the purpose of imposing strict tort liability. The main purpose of strict tort liability is preventing harm that will be great and cannot be eliminated by reasonable care (American Law Institute 1976). Applying strict tort liability only based on location of the activity, or even common usage, does not comport with the purpose of strict tort liability and defense attorneys should strenuously object to imposition of strict tort liability under these circumstances. If the activity can be conducted safely without great harm and reasonable care can alleviate the slight harm, the activity should not be treated as strict tort liability as suggested by Comment (i) of Section 520 in regards to the use of the automobile. This is reinforced by Comment (j) of Section 520 by allowing blasting operations to occur in a desert area even though such blasting is not a common usage because the risk of great harm is low and thus the exercise of reasonable care is irrelevant. This leads to the premise that blasting can be conducted in urban areas under a negligence framework if the activity can be performed without creating an abnormal danger or high risk of great harm. As discussed earlier, the harm, if any, to adjacent structures will be cosmetic if the conservative blasting limits in Tables 2 and 3 and typical industry procedures, e.g., use of blasting mats, are followed.

f. Extent that Value to Community is Outweighed by Dangerous Attributes

The final abnormally dangerous factor is the extent to which the value of blasting to the community is outweighed by its dangerous attributes. Comment (k) of Section 520 illustrates this factor by stating:

“Even though the activity involves a serious risk of harm that cannot be eliminated with reasonable care and it is not a matter of common usage, its value to the community may be such that the danger will not be regarded as an abnormal one.”

Given that the dangerous attributes of blasting can be mitigated, the community value of blasting to facilitate construction and property development should be compared with the potential harm of cosmetic cracking. Therefore, the community value of using this cost-effective excavation technique should be compared with the non-threatening/cosmetic nature of the possible damage. If the blasting contractor uses reasonable care, e.g., follows the conservative blasting limits shown in Tables 2 and 3, blasting can provide value to a community by allowing excavation to occur in a cost-effective manner. Blasting provides social utility by reducing excavation costs, accelerating construction, and allowing underground excavation without typical cut and cover operations that disrupt ground surface activities.

If blasting is being conducted for a public works project, e.g., a new water tunnel, subway, or sports stadium, the value to the community may exceed the reduction in property resale value caused by cosmetic cracking. However, the property owner will probably argue that the contractor is liable

regardless of the project because the damage is real and must be remediated. This reasoning could be rebutted by considering the value of the project to the community and the subject property. The ultimate measure of property damages caused by blasting is the diminution in the value of the plaintiff's property. It is possible that the property damages could be offset by an increase in property value because of the completion of a new public works project, such as a sports arena, tunnel, or government building. If the blasting is being performed for a private construction project, the benefit to adjacent property may be less, depending on the nature of the private project and the creation of jobs, than the diminution in resale value.

FACILITATING A NEGLIGENCE FRAMEWORK

In one respect law is similar to civil engineering in that a new idea must be tested or tried to determine its feasibility. For the problem at hand, blasting must be tried to determine whether or not a judge will interpret the six abnormally dangerous factors in the same manner as described above, i.e., that blasting is not an abnormally dangerous activity when the conservative limits in Tables 2 and 3 are followed. To change the current strict tort liability standard to a negligence standard, it is anticipated that the blasting industry will have to reverse the imposition of strict tort liability in at least one of the thirty-five states that currently imposes strict tort liability. It is recommended that New York be considered for overturning the use of strict tort liability because in 1969, New York abandoned a negligence framework for strict tort liability in the landmark case of *Spano v. Perini Corporation* (1969). Prior to 1969, New York did not award a plaintiff damages unless the plaintiff showed that the blaster was negligent, i.e., proved the four elements presented in Table 1. Therefore, a new defendant could argue that blasting technology has greatly improved since 1969, e.g., USBM research (Siskind 2000) and new blasting techniques, and allows reversion to a negligence framework especially in public works projects where adjacent property owners may be benefiting from the project and blasting may facilitate construction or provide a cost-effective and possibly less disruptive excavation technique.

To facilitate implementation of a negligence framework by a judge instead of strict liability, contractors could agree to create a remediation fund for adjacent property owners that would provide a nominal amount of money for repair of cosmetic damage if the damage exceeds a threshold value but is less than a maximum amount. If the damage does not exceed the threshold value, it can be alleviated during routine maintenance of the structure and thus the contractor would not provide remediation funding. However, if the damages exceed the threshold value and the blasting causes the damage, the property owner could request assistance from the contractor's remediation fund. This would provide some certainty to the contractor in regards to their foreseeable loss and also provide the property owner with a mechanism for recovery without litigation. (Presently, a contractor cannot predict the number of claims or the dollar value of the claims against his/her operation even if the conservative blasting limits in Tables 2 and 3 are followed.) If the damages exceed the maximum amount allotted by the remediation fund, the plaintiff can file a negligence claim using *Res Ipsa Loquitur*, described previously, and the fact that significant damage does not occur from blasting activities which utilize the conservative blasting limits in Tables 2 and 3 (Dowding 2001). In addition, a negligence judgment frequently yields a larger recovery than a strict tort liability judgment (Henderson and Twerski 2000), which can reduce a plaintiff's concern about recovery and imposition of a negligence framework.

SUMMARY

The main issue concerning construction blasting in urban areas is whether the risk created is so unusual as to justify the imposition of strict tort liability by a judge for the resulting harm regardless of the level of care exercised by the blaster (American Law Institute 1976). Based on current blasting techniques, the risk of building damage caused by ground vibrations and air overpressures is small and the risk can be reduced or eliminated with reasonable care. In addition, the type of damage is also not unusual because similar cracking can occur in structures during the normal service life of the structure from a variety of environmental, construction, and maintenance factors. For these reasons, it is proposed that the blasting contractor pay for damages only if the contractor is found to be negligent. If the remediation costs exceed a threshold value, the property owner could access a remediation fund up to a maximum value. If the damage exceeds the maximum value it is likely a negligence claim will be readily provable and the property owner will be able to recover under a negligence framework. Techniques for a plaintiff to prove negligence and a blaster to rebut this proof of negligence are presented herein.

The main obstacle to implementing a negligence framework is overcoming the nearly automatic imposition of strict tort liability for blasting based on existing case law. The six factors used in Section 520 of the Restatement of Torts, Second (American Law Institute 1976) to determine whether an activity is abnormally dangerous are all important and none is sufficient of itself to classify an activity as abnormally dangerous (American Law Institute 1976). The analysis of these six factors presented herein shows that the only factors that appear to classify blasting as abnormally dangerous are the inappropriateness of location and common usage when blasting is conducted in an urban area. The next factor that may result in blasting being classified as abnormally dangerous is the value of blasting to the community. The analysis of this factor probably depends on the nature of the construction project, public v. private. Current blasting technology allows the remaining factors to be controlled and thus these factors may not be satisfied if the contractor uses the conservative blasting limits in Tables 2 and 3. To implement a negligence standard, it is anticipated that the blasting industry will have to reverse the imposition of strict tort liability in at least one of the thirty-five states that currently imposes strict tort liability. It is recommended that New York be considered for overturning the use of strict tort liability because prior to 1969, New York used a negligence framework until it was rejected for strict tort liability in the landmark case of *Spano v. Perini Corporation* (1969).

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