APPLICATION OF STRICT LIABILTY AND NEGLIGENCE TO BLASTING CLAIMS

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Abstract

Blasters are usually strictly liable for injury or damage caused by flyrock (trespassory invasion) and blast-induced vibrations (non-trespassory invasion). The application of strict liability to non-trespassory invasions has resulted in significant litigation that has hampered the use of blasting and the blasting industry. Stark (2002) proposes that blasters should not be held strictly liable for non-trespassory invasions but should be liable only if their conduct is proven to be negligent. This change in legal standard was proposed because improvements in blasting technology over the last thirty years allow blasting to be conducted without substantial risk of harm to property and thus the amount of harm imposed by a blast can be related to the level of care exercised by the blaster. It is anticipated that negligence standard will reduce the amount of litigation because a plaintiff will have a greater burden to overcome. To facilitate the acceptance of negligence standard by a court of law, this paper illustrates the application of the negligence and strict tort liability frameworks using actual cases in which a decision was rendered. It is evident from these cases that some of the successful claims under the strict liability framework would not have been successful, and probably not litigated, under a negligence framework, which could result in substantial cost savings to the blasting industry and consumers.

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. Stark (2002) proposes that blasters should not be held strictly liable for non-trespassory invasions but should be liable only if their conduct is proven to be negligent. Stark (2002) presents a number of reasons why blasting should not be characterized as an abnormally dangerous using the six factors used by courts to determine whether or not an activity is abnormally dangerous using the Second Restatement of the Law of Torts (American Law Institute 1976). Section 520 of this Restatement (American Law Institute 1976) presents the six factors that are considered by courts in determining whether an activity is abnormally dangerous:

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(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.

Stark (2002) presents an analysis of these six factors and shows that the only factors that appear to classify blasting as abnormally dangerous are the inappropriateness of location when blasting occurs in an urban area and common usage because typical individuals do not use blasting. The next factor that may result in blasting being classified as abnormally dangerous in Stark (2002) 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. If it is a public project, e.g., a new subway, water or sewer system, the value to the community may outweigh the dangerous attributes. Current blasting technology allows the remaining factors, which relate to harm and risk, to be controlled and thus these factors may not be satisfied to classify blasting as abnormally dangerous if the contractor uses available blasting limits and industry standards.

To facilitate the acceptance of negligence standard by a court of law, this paper illustrates the application of the strict tort liability and negligence frameworks using actual cases in which a decision was rendered. It is evident from these cases that some of the successful claims under the strict liability framework would not have been successful, and probably not litigated, under a negligence framework.

STRICT TORT LIABILITY V. NEGLIGENCE

A strict tort liability standard for blasting makes a plaintiff's claim significantly easier to prove than a negligence standard because there are fewer elements that a plaintiff must prove to a jury before receiving a favorable verdict. The fewer elements, along with the general civil standard whereby the plaintiff's burden of proof needs to reach only the preponderance of the evidence make proving a strict tort liability claim fairly easy. As a result, plaintiff's attorneys are drawn to situations in which the legal standard is strict tort liability and the burden of proof is only the preponderance of the evidence. For comparisons, the burden of proof in a criminal trial is beyond a reasonable doubt but in a civil trial, i.e., a blasting case, the burden of proof is a preponderance of the evidence. Preponderance of the evidence means that the plaintiff only has to prove 51% of the evidence favors their explanation of the injury or damage and thus only 49% favors the defendant. As a result, the preponderance of the evidence standard is a much lower burden and frequently referred to as the "more likely than not" standard. In contrast, the beyond a reasonable doubt standard corresponds to the prosecution having to prove that 95 to 99% of the evidence favors their explanation of the crime.

Under negligence standard, there are four elements that a plaintiff must prove by the preponderance of the evidence standard to prevail (see Table 1). Under a strict liability standard, there are only two elements that a plaintiff must prove to prevail. Table 1 shows that both negligence and strict liability claims require proof of proximate cause and proof of the amount of personal injury and/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.

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

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

The proximate cause element requires a plaintiff to show that the blasting is (1) the primary cause of the injury or damage, (2) the injury is reasonably anticipated or foreseen as a natural consequence of blasting, and (3) without blasting the injury or damage could not have happened. The last two elements of proximate cause are not substantial hurdles in a blasting case. For example, under the second element it is fairly easy to show that cracking of a structure is a foreseeable consequence of blasting based on the numerous references on construction blasting, e.g., Dowding 1996; Oriard 1999, and is usually presented by an expert witness. The third element is provable by showing that the cracks did not exist prior to the blasting and this can be accomplished by testimony of the owner of the structure or a pre-construction survey. The plaintiff usually tries to meet the first element of proximate cause by providing expert testimony that opines that the induced level of vibration and/or air overpressure could have caused the cracking. Therefore, the main hurdle, albeit a small hurdle, for a plaintiff to prove proximate cause is to show that the level of vibration and/or air overpressure could have caused cracking in the structure.

Defendants usually try to refute a plaintiff's proximate cause evidence by (1) showing that the cracks existed prior to blasting and (2) if the cracking did not exist prior to blasting, the level of vibration is not sufficient to cause the observed cracking. Establishing that the cracks existed prior to blasting can be accomplished by careful inspection of the cracks 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.

Establishing that the level of vibration is not sufficient to cause the observed cracking is usually accomplished by a defendant's expert. This testimony may or may not be persuasive to a jury that probably includes many homeowners.

The use of strict liability, which practically only requires 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. 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. In general juries tend to be sympathetic to homeowners because they are homeowners and thus usually give careful consideration to homeowner testimony that the cracks did not exist prior to 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, and the cost of the damages (see Table 1). It is apparent that a blaster will have a duty not to damage adjacent structures while blasting. Thus, the first element that a plaintiff will have to prove is that the blaster breached his/her duty of care. This will 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 industry practices. These differences are illustrated and compared to a strict tort liability framework below.

ROSAS V. AZTEC HOMES

Cahill (2002) presents a case in which the plaintiffs filed claims for damages under negligence and strict tort liability. The claims involve blasting for a housing development near San Diego, California. The new development is located near older residential properties and it was necessary to blast the existing meta-volcanic rock to facilitate construction of the new-housing development. San Diego County ordinances require seismic monitoring for “major blasts” within 300 feet and for “minor blasts” within 600 feet of a structure. The blasting contractor complied with all applicable San Diego County regulations (Cahill 2002). Cahill (2002) reports that the maximum blast-induced peak particle velocity recorded at any of the plaintiffs’ residences is 0.06 inches/sec. Table 1 presents the U.S. Bureau of Mines RI 8507 (Siskind et al. 1980) and the Office of Surface Mining (Office 1983) threshold levels of peak particle velocity. Table 1 shows that the maximum peak particle velocity recorded at any of the plaintiffs’ homes is significantly below the threshold levels for cosmetic damage to plaster-on-lath construction (0.5 ips) and sheetrock/drywall construction (0.75 ips).

Table 1: Range of Common Residential Criteria and Observed Side Effects Based on Peak Particle Velocity (Oriard 1999)

Peak Particle Velocity	Range of Common Residential Criteria and

(inches per second)	Observed Side Effects
0.5	U.S. Bureau of Mines (USBM) Report of Investigation 8507 (Siskind 1980) recommended guidelines (USBM 8507) for plaster-on-lath construction near surface mines, i.e., long-term, large-scale blasting operations inducing low-frequency vibrations
0.75	USBM 8507 recommended guideline for sheetrock/drywall construction near surface mines
1.0	U.S. Office of Surface Mining (1977) (OSM) regulatory limits for residences near surface mine operations at distances of 301 to 5000 feet, i.e., long-term, large-scale blasting
2.0	Widely accepted limit for residences near construction blasting and quarry blasting (USBM 8507). Also allowed by the OSM for frequencies above 30 Hz
5.4	Minor damage to the average house subjected to quarry blasting vibrations
9	About 90% probability of minor damage from construction or quarry blasting. Structural damage to some houses. Depends on vibration source, character of vibrations and the house.
20	For close-in construction blasting, minor damage to nearly all houses, structural damage to some. A few may escape damage entirely. For low-frequency vibrations of long duration, major damage to most houses.

This case was successfully defended because the sixteen plaintiffs could not prove that the blasting caused the damage to their homes. This means that the plaintiffs were not successful under strict liability. A plaintiff can be successful under strict liability but not successful under negligence because there are more elements to prove for a negligence claim. Because the plaintiffs were not successful proving causation, they probably could not have proven breach of the standard of care in a pure negligence action. Review of this case suggests that a plaintiff attorney working on a contingency fee might not have taken the case to trial if he/she had to prevail on all e elements of a negligence claim.

1. UNDER STRICT TORT LIABILITY FRAMEWORK

The plaintiffs claimed over $700,000 in damages and thus probably had some evidence of the damages that had occurred to the residences by expansive soils, slope creep, blasting, or other means. Thus, under strict liability the only other element that the plaintiffs needed to prove is that the blasting caused the claimed damage. The plaintiff's expert for proving causation is a geotechnical engineer and not a licensed blasting expert. Geotechnical engineering covers a number of areas of practice, including landslides, building foundations, waste containment, environmental site remediation, and underground technology. Thus, a portion of a geotechnical engineers' practice can deal with construction blasting. The defendant's expert is a geophysicist and a licensed blasting expert. Because the plaintiff's expert did not have any seismic recordings that exceeded the threshold peak particle velocity levels in Table 1, the plaintiff's expert "tried to be creative with his analysis, opining that perhaps some unmonitored blasts created seismic activity sufficient to have created damage to plaintiffs' homes" (Cahill 2002).

The defense countered this sparse causation evidence in two ways by: (1) attacking the expert's credentials and analyses and (2) demonstrating prior damage to the homes. The defense attacked the geotechnical engineer by proving that he/she had not performed any type of diminishing amplitude calculations for the closer blasts, was speculating that seismic activity exceeded the measured values, and that the monitored blasts did not exceed the vibrations induced by a door closing or a person jumping. The defense also was able to show that the plaintiff's homes had already been experiencing expansive soil and slope creep damage and some had been involved in prior soils related litigation. These two factors were sufficient to convince the jury that the plaintiffs' had not proven by the preponderance of the evidence that blasting caused their claimed damages.

Even though this case was successfully defended, the defendant probably incurred some expenses and lost time in defending this unmeritorious claim. In fact, it might be surmised that the attorney was on an all too common "fishing expedition" for the plaintiff's in an effort to find a new "pocket" to offset some of the plaintiff's damages. This is possible in a strict liability framework because the only element that needs to be proved is causation. .

2. UNDER NEGLIGENCE FRAMEWORK

Under a negligence framework, a plaintiff will have to prove that the blaster was negligent or breached his/her duty of care in addition to causation and damages. Given that the geotechnical engineer could not convince the jury of causation, it is doubtful that he/she could have convinced the jury of breach of the standard of care. More importantly, the plaintiff's expert would have had to demonstrate that he/she was knowledgeable about the standard of care in the blasting industry and demonstrate how the blasting contractor breached that standard of care. Because of the greater expertise and evidence required for a negligence case, the plaintiff attorney(s), who probably took the case on a contingency basis, may not have taken this case to trial in which the expert could not show calculations of diminishing amplitude calculations for the closer blasts, was speculating that seismic activity exceeded the measured values, and that the monitored blasts did not exceed the vibrations induced by a door closing or a person jumping during deposition and knowing that this individual also had to knowledgeable about the standard of care and prove that the blaster breached the standard of care.

In summary, it appears unlikely that a plaintiff attorney would have pursued this case through trial under a purely negligence framework. One might even argue that it would be unlikely that a knowledgeable plaintiff attorney would have pursued a similar case even under a purely strict liability framework.

FRYE V. KANAWHA STONE COMPANY, INC.

This case differs from Rosas v. Aztec Homes case because a strict liability claim was successful and thus it is interesting to determine whether or not it would have been successful under a purely negligence framework. A negligence claim was not included in this complaint.

In Frye v. Kanawha Stone Company, Inc. (1998) a blast was conducted 962 feet from the Frye home on May 25, 1993. The blast rattled windows and cabinets in the Frye home and in other homes in Frye's' neighborhood. Mr. Frye inspected his home for damages after each large blast. After the May 25 blast, Mr. Frye testified, "Numerous cracks suddenly appeared in the mortar joints and blocks of his home's cinder block walls". At trial, the Frye's introduced corroborating neighbors who had observed the cracks and one that helped Frye paint his house in 1992 and didn't notice these cracks at the time of painting.

The defendant provided expert testimony by a blasting specialist who testified that the vibration level recorded by the defendant's seismograph on May 25, 1993 is insufficient to cause any damage to the Frye house. The expert also produced photographs taken in 1995 that showed the cracks contained paint and thus the cracks were present when the house was painted in 1992. However, the Frye's disputed this evidence and introduced photographs that they claimed accurately depicted the cracks in the home after blasting and there was no paint in the cracks. A jury returned a verdict in favor of the Frye's for $20,000.

1. UNDER STRICT TORT LIABILITY FRAMEWORK

The award of $20,000, $10,000 of damages and $10,000 for annoyance and inconvenience, indicates that the plaintiffs produced sufficient evidence of damages. In addition, the jury award indicates that the plaintiffs produced sufficient evidence that the blasting caused the damage, namely Mr. Frye's testimony. Thus, in some states, e.g., West Virginia where the Frye case occurred, causation can be proven by circumstantial evidence and thus the plaintiff is not required to show that the damages were caused by a particular blast.

2. UNDER NEGLIGENCE FRAMEWORK

Under a pure negligence framework, the Frye's would have to prove breach of the standard of care assuming that the proof of damages and causation presented above are sufficient under the negligence framework. To prove breach of the standard of care, Mr. Frye probably would need to hire a blasting expert because there is no evidence in the case that Mr. Frye is a blasting expert and knowledgeable about the standard of care. If a qualified expert was hired, the facts in the case do not appear sufficient to determine conclusively whether or not the defendant breached the standard of care. However, the fact that the May 25, 1993 blast rattled windows and cabinets suggests that the vibrations and may be the air overpressure exceeded the threshold values. The plaintiff's expert would have to prove this to show breach of the standard of care and thus his/her analysis could be compared to the defendant's analysis instead of simply relying on circumstantial evidence to prove causation. The plaintiff's expert also may have been able to show that the defendant did not use typical blasting techniques, such as typical explosive weights, spacing, depths, and delays, blasting mats, time of blasting, types of explosive, types of monitoring equipment, typical experience of a blaster, the particular site and blasting application, etc., that are described in the surface mining rules and regulations (Office 1983), Dowding (1996), and/or the ISEE Blaster's Handbook (2001) but this would probably require more knowledge about blasting than Mr. Frye possessed. However, given that the vibration level recorded by the defendant's seismograph on May 25, 1993 is insufficient to cause any damage to the Frye house, it seems doubtful that the May 25, 1993 blast rattled windows and cabinets.

The benefit of a negligence framework would be that the technical aspects of the blasting would have to be discussed and thus a defendant could not be found liable on circumstantial evidence. This is an undesirable situation because jurors that are homeowners may be sympathetic.

EXPERT NOT QUALIFIED TO TESTIFY TO STANDARD OF CARE

An example of dubious expert qualifications and testimony that can occur in regards to the standard of care required for a negligence claim is Ballard v. Buckley Powder Co. (1999). In *Ballard*, 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."

This level of expertise may be sufficient to prove causation in some states but substantially more familiarity with the blasting profession, typical blasting techniques, threshold levels of peak particle velocity, and probably a blasting license will be required to opine about whether or not a blaster breached the standard of care. In *Ballard*, the Kansas judge held that this expert's testimony regarding the standard of care was inadmissible because the expert was not familiar with the U.S. Bureau of Mines blasting limits, the blasting logs used by the defendant, and the formulas and measurements contained in the logs.

The extra expertise required to prove breach of the standard of care at the time of blasting may reduce the number of qualified experts and thus hopefully reduce the amount of litigation related to construction blasting. A reduction in litigation costs may result in lower insurance costs and an overall lower cost for blasting making it a more cost-effective excavation procedure.

SUMMARY

Blasters are usually strictly liable for injury or damage caused by flyrock (trespassory invasion) and blast-induced vibrations (non-trespassory invasion). However, the application of strict tort liability to non-trespassory invasions has resulted in significant litigation that has hampered the use of blasting and the blasting industry. Stark (2002) proposes that blasters should not be held strictly liable in tort for non-trespassory invasions but should be liable only if their conduct is proven to be negligent. This change in

legal standard was proposed because improvements in blasting technology over the last thirty years allow blasting to be conducted without substantial risk of harm to property and thus the amount of harm imposed by a blast can be related to the level of care exercised by the blaster. It is anticipated that negligence standard will reduce the amount of litigation because a plaintiff will have a greater burden to overcome and the number of qualified experts may be reduced.

To facilitate the acceptance of negligence standard by a court of law, this paper illustrates the application of the negligence and strict tort liability frameworks using two cases in which a decision was rendered. These two cases suggest that many of the successful but unwarranted claims under the strict liability framework may not have been successful, and probably not even litigated, under a purely negligence framework. This reduction in litigation could result in substantial cost savings to the blasting industry.

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REFERENCES

American Law Institute, 1976, Restatement of the Law, Torts 2d, Sections 519 and 520, Philadelphia, Pennsylvania, pp. 35 – 40.

Ballard v. Buckley Powder Co., 1999, Federal Supplement 2d, vol. 60, p. 1180.

Cahill, S., 2002, "Defending a Blasting Case at Trial Rosas v. Aztec Homes", The Journal of Explosives Engineering, International Society of Explosives Engineers (ISEE), September/October, pp. 10-14.

Dowding, C.H., 1996, *Construction Vibrations*, Prentice Hall, Upper Saddle River, NY, 604 p.

Dowding, C.H., 2001, "Measure the Crack Instead of Construction Vibrations", *Geo-Strata*, American Society of Civil Engineers, Reston, VA, p. 20.

Fantasy Valley Resort, Inc. v. Gaylord Fuel Corp., 1992, 607 A.2d 584 (Md. 1992)

Frye v. Kanawha Stone Company, 1998, 505 S.E.2d 206 (Supreme Court of Appeals, WV 1998).

International Society of Explosives Engineers (ISEE), *Blaster's Handbook*, Cleveland, Ohio, (2001).

Office of Surface Mining, 1977, Surface Mining Reclamation and Enforcement Provisions, Public Law 95-87, Federal Register, Vol. 42, No. 289.

Office of Surface Mining, 1983, Surface Mining Reclamation and Enforcement Provisions, Federal Register, Vol. 48, No. 6, pp. 9788-9811.

Oriard, L.L., 1999, "The Effects of Vibrations and Environmental Forces: A Guide for the Investigation of Structures", Monograph published by International Society of Explosives Engineers, Cleveland, Ohio, p. 227 – 265.

Poe v. Atlas Powder Co., 1968, 444 Southwestern Reporter, 2d, vol. 444, p. 170.

Siskind, D.E., Stagg, M.E., Kopp, J.W., and Dowding, C.H., 1980, "Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting," United States Bureau of Mines Report of Investigations RI8507, p. 49.

Stark, T.D., 2002, "Blasting: Strict Tort Liability or Negligence", Proceedings of the Twenty-Eighth Conference of Explosives and Blasting Technique, Las Vegas, NV, February 10-13, 2002, International Society of Explosives Engineers, Cleveland, Ohio, pp. pp. 245 - 258.

Spano v. Perini Corp., 1969, Northeastern Reporter, 2d, vol. 250, page 31.

Whitman Hotel Corp. v. Elliot & Watrous Engineering Co., 1951, A.2d, vol. 79, p. 591.