

PRODUCTS LIABILITY

An Interactive Qualifying Project Report

submitted to the Faculty

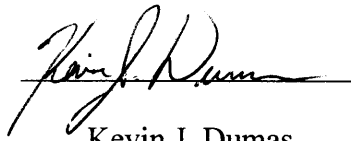
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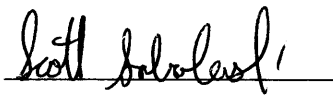
in partial fulfillment of the requirements for the

Degree of Bachelor of Science

by

A handwritten signature in cursive script, appearing to read "Kevin J. Dumas", is written over a horizontal line.

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Date: April 22, 2002

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Abstract

The goal of this Products Liability IQP is to learn the basic concepts of products liability law. First, to gain this fundamental understanding, we watched nine videos and read two books pertaining to products liability. Using this solid foundation, we analyzed two liability cases and performed one accident reconstruction. This experience expanded our knowledge of safety, ethics, and good engineering practice.

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Chapter 1: Art of Advocacy Skills in Action Series

Art of Advocacy Skills in Action Series is a series of videos that were very helpful in visually explaining the inner workings of the courtroom. These videos were very effective in increasing our knowledge of court proceedings. They also show various successful techniques in the courtroom. Success in the courtroom is affected by every little detail, from the tone of your voice to the way a question is phrased. The first eight videos we watched displayed the different parts to a court proceeding and how the lawyer handled the situation. The ninth video was an example of a products liability case that is similar to the ones we will be studying in this IQP.

1.1 - Video 1: Opening Statement

The opening statement is perhaps the most important part of a case for a lawyer. In the opening statement a lawyer has to do a few things to pave the way to success. The opening statement is significant because the lawyer has to form a relationship with the jury. A lawyer must establish his integrity, credibility, and the trust of the jury. Finally, a lawyer wants to connect the jury to the victim. A well told story through the use of imaginative words and narrative storytelling could get a jury to relate with the victim. Once a lawyer has swayed the jury to his side, the rest of the case will be much easier for the lawyer to obtain the jury's complete trust and loyalty.

Before lawyers realized that the opening statement was crucial to a case it was very drab and straightforward. Lawyers would approach the jury and basically fill in the blanks about the case. Usually the lawyers were trite, apologetic, tentative, and unimaginative. A lawyer must capture the jury's attention and hold it, a very difficult task but an important one. This also includes explaining things to the jury in words they can understand; "Lawyer Talk" does not impress juries.

In the opening statement it is important that the lawyer gives the jury orientation, such as where and when this incident took place. Then a protagonist must be introduced to

the jury. Lastly, an overall theme should be given to the case by the lawyer to get the jury to side with his version of the truth.

During an opening statement it is important to hit on the strong parts of your case. However, the strong points of the opposition should also be addressed. These key elements to the opposition's case should be put to rest with a valid explanation. By doing this a lawyer can rebuttal to an argument by the opposition before the jury has even heard it. If a lawyer is honest and exposes the "so called" weak part of his case, the jury will appreciate the lawyer and a trust will be formed. Also outline certain steps that could have been taken to prevent the incident in the future. Sometimes that puts things in perspective for the jury.

After the jury has heard about a case a lawyer should inform them why their client is not liable. The damages and injuries that the lawyer's client suffered should also be addressed. The jury should understand the full capacity of these injuries and damages. To complete the opening statement the theme of the case should be brought 360 degrees, back to where the lawyer started.

1.2 - Video 2: Direct Examination

During this part of the trial both lawyers get the chance to question witnesses to help support their version of the truth. A witness is usually prepped for the stand before trial so the lawyer can get the full effectiveness that a witness can provide to a case. It is very important for a lawyer to once again grab the jury's attention and hold it. This can be done through questioning, visual aids, pace and flow of the case, etc. The lawyer then extracts all the information that is pertinent from the witness. When the witness has revealed all the information relevant to the case, the lawyer should conclude and move on. This also includes introducing and displaying evidence. If a lawyer is not prepared with an organized and quick approach to showing the evidence, the jury will lose interest. The jury may also think the lawyer does not care about the case.

Very often in liability cases expert witnesses are brought in to give their expert opinion on the case. Such experts can be used for reenacting an accident, calculating monetary damages, etc. The background and expertise of the expert should be established right away to the jury. When large sums of money are involved in a case, it is crucial that

the jury knows there is solid reasoning behind the large claim. Thus many times a financial expert witness is brought in to explain to the jury how and why the client deserves the large sum.

When questioning the defendant, it is best to use “yes” and “no” questions. Thus the witness will not have a chance to provide an explanation to the jury. The lawyer wants to use the witness as a medium to portray his particular version of the truth. This is a very effective method because the witness must answer only the questions they have been asked.

A totally different method of questioning should be conducted when the victim is on the stand. The victim should set the mood of the courtroom. The effects of the injuries and damages on the victim are important to display to the jury. It is probably a good idea to save any sights of injuries till the end of direct examination. This visual of what the victim is actually going through will leave a lasting impression on the jury.

1.3 - Video 3: Opening Statement Part 2

This video revisits the opening statement and its importance. This video stressed the importance of the opening statement through discussing additional opening statements. These examples show the different ways to approach giving an opening statement. It is crucial for a lawyer to gain identity and create a relationship with the jury. There are many different ways this can be done. A lawyer can do this through changing his voice patterns, stressing certain facts or ideas, hand movements, physical presence and location in the courtroom.

In the first opening statement we heard the lawyer discuss his client’s case and injuries very vaguely. The lawyer did not go into much depth about the injuries, leaving that to a later time. The lawyer briefly explained the character of the victim to the jury to try to get the jury to relate to the victim. Then the lawyer briefly but efficiently explains the events that took place before, during and after the accident. The opening statement should bring the jury up to speed with the case while keeping their focus and attention. Finally the lawyer quickly discusses the financial situation that the victim is suing for. It is important for the lawyer to assure the jury that his client has every right to the money, through the use of an expert witness.

The second opening statement was showing a different approach to tell the story of the case. The lawyer followed the basic steps of the opening statement. However, the lawyer used very descriptive words to get the jury to see through the eyes of the victim, a young boy. The lawyer speaks softly to the jury, as if trying to create a mood of somberness. The lawyer then explains the quick details of the events that took place before, during, and after the accident.

After the lawyer completed explaining what happened, he discussed the injuries and damages received by the boy. The lawyer discussed briefly how the head injury presently affected the boy and will affect the boy for the rest of his life. This is a good technique to make the jury realize the seriousness of the accident. Once the injuries are understood the lawyer explains the damages his client deserves. He does this by explaining compensatory damages and punitive damages.

1.4 - Video 4: Cross Examination

Cross examination is the point in the trial where a lawyer gets to question the opposition's witnesses. The first thing a lawyer will do is introduce the witness to the jury. If the witness is an expert witness the lawyer should try to show that this expert is working for the opposition. The lawyer can also make the jury aware that the expert has a lot of experience as acting as a witness.

After the witness has been introduced the line of questioning should change. A lawyer should use the expert as a "sounding board". This means that the lawyer asks "yes" or "no" questions to get to the point he is trying to make. If open-ended questions are asked the lawyer is giving the expert a chance to explain his view (usually in favor of his employer). Any faults in the expert's professionalism in handling the case should be questioned. Such as determining what, if any, facts the witness is unaware of, where, if any, is a report from the expert on the case, and what, if any, research was conducted. A very effective technique is finding holes in the witness's testimony to discredit his expertise. For a successful cross examination the lawyer should control pace, control the witness, and control the content the jury hears.

1.5 - Video 5: Cross Examination of Non-Medical Experts

Often in a products liability case an expert witness will be called. These witnesses could be doctors, economists, inspectors, engineers etc. Most of these witnesses have taken the stand before and are very good at swaying a jury. Cross examination of these witnesses is very important to the opposing side. During cross examination, the lawyer cannot be tentative or hesitant and must exercise psychological control. He should dominate the witness by exercising good eye contact, keeping a good pace, and creating a presence in the court room.

There are several ways a lawyer can have a successful cross examination. A lawyer will want to compare a witness's answer to his deposition. Establishing contradictions of the expert can provide a very destructive cross examination for the opposing side. To discredit an expert witness, lawyers could attack the professional nature of the witness. For example, you would want to mention if the witness did not prepare a report or take notes on the case. Attacking the witness on a personal level is not a good idea. Juries are usually made up of fair people that would not appreciate it.

If a lawyer can utilize the opposing sides expert to draw support for their theory, the cross examination will be successful. In the example case in this video, the lawyer accomplishes this feat. He is not hostile toward the expert. In fact, he is rather passive and non confrontational toward the witness. He uses mostly statements that the witness affirms. Getting the expert to point out code violations and violations of normal operations allow the lawyer to draw support for his theory.

1.6 - Video 6: The Deposition

A deposition is a testimony under oath by a witness that is written down or recorded by a court stenographer. Depositions usually take place in a conference room or somewhere outside of the court room. The deposition is considered valid evidence in trial.

Depositions are taken to establish facts and determine the origins of and the bases for those facts. The phrasing of a question and its answer are often cause for argument in a trial. A deposition is often used to pin down a testimony. If the information and opinions

the witness offers are damaging to the questioning lawyer, he will try to use the deposition to seek information and bases to impeach the witness.

Most importantly, you must always be honest during a deposition. It is important to listen carefully to the questions asked by the lawyer because you want to have a complete understanding of what is being asked. Take some time before answering any question to gather thoughts about the answer. If the true answer to a question you are asked is “I don’t know”, then don’t be afraid to answer with that. It is important not to volunteer any information to the opposing party. Your answers should be kept clear and concise.

1.7 - Video 7: Summation II

This video discusses the shift of focus in a closing argument toward a conclusion. Closing arguments are the final opportunity attorneys have to persuade jurors. Unlike opening statements, attorneys know what evidence is before the jury, and they are able to use their persuasive skills and techniques in a relatively unrestricted manner. Through closing arguments and any rebuttal arguments available, attorneys show jurors how the evidence supports a verdict in favor of the client and they motivate jurors to return such a verdict.

A good closing statement uses several devices. Persuasive closing arguments provide a detailed description of the party's evidence. This detailed description should be presented as a story. The successful lawyer in a closing argument will have to be a good story teller. Telling a good story involves creating colorful images in the minds of the jury. When describing something intimate to the jury, the lawyer may want to step away from the podium and move closer to the jury. Another important device that helps in a successful conclusion is alienation. Alienation is the capacity of taking a familiar situation, removing it from the context we usually think of it in, and giving it a new perspective.

A products liability lawyer is often required to convey to the jury the extent of the pain and disfigurement of his client. In the example case, a young woman was severely burned in an explosion. How to describe to the jury the extent someone’s suffering will be the product of a lot of thought. In this case, the lawyer chose to convey the woman as living in a world of beauty. He described in detail how her injuries will affect her role in

that world. Basically, he is asking the jury to consider basic principles of American culture. The lawyer also emphasizes the importance of their role in this case and the finality of the result.

As a lawyer, you will know when you get a good result from a closing argument. Trying to use that same method on another case, however, could be a big mistake. The underlying principles to why the argument got you such a good result are the things you need to take with you to the next case.

1.8 - Video 8: Summation

The summation is the concluding part of a case in which a summary of the principal points is given. The lawyer needs to “say interesting things and say them interestingly”. At this point in the trial, the lawyers and the jury have seen a lot of each other. They should feel very comfortable with each other. There is generally much excitement and suspense that comes with closing arguments.

In the case depicted in this video, the lawyer reminds the jury of something he asked them during jury selection; “If the evidence that I present to you shows that the defendant is responsible would you be willing to award my client the money he deserves?”

The lawyer presenting the summation uses some very good principles of argumentation. He uses no factual information to summarize the case. The facts of the case have already been picked through with a fine tooth comb during the trial so he doesn't want to bore the jury by repeating it. Another good principle he uses is trying to get the jury to accept the idea of product liability. This will make their decision easier. He also paints a vivid picture in the minds of the jurors of the incident at hand.

In presenting the summation, the lawyer uses no visual aids. He expresses all elements and precise sums of money off the top of his head. To establish that he was a fair person and to make the other elements seem fair, he told the jury of one element which they are not asking money for. The lawyer is a very good story teller. He is faced with the problem of expressing to the jury how much the injuries will affect his client's life and living. To accomplish this, he employs the rhetorical device of slipping from the past tense to the present tense.

1.9 - Video 9: 60 Minutes II: A Classic Cover-Up?

On July 15, Harold Gielow was driving his beloved 1966 Mustang in the rain. The car hydroplaned and spun across the center line into the other lane, where an oncoming vehicle hit the Mustang in the rear. Gielow's car exploded into flames. Craig Jackson, a professional firefighter, was driving behind Gielow and served around the skidding Mustang. Mr. Jackson has seen many car fires and was startled by the size of the exploding fireball in the Mustang.

Harold Gielow was burned to death in the Mustang fire. The police say Harold was going faster he should have in those conditions. Ford says Harold panicked and was killed on impact. Harold's parents were troubled by the coroner's report saying their son was burned to death in the Mustang fire.

The Gielows looked into the accident and learned a secret about 1964 to 1970 classic Mustangs. Fires that erupted after crashes in the trunks of some classic Mustangs have spread into the passenger compartment. All across America there are up to 1.5 million Mustangs still on the road. "Every one of them carries in the trunk a potentially deadly defect", says San Francisco attorney David Rand. He's representing the parents of Harold Gielow. The top of the Mustang's tank is also the floor of the trunk and terrible car fires can erupt after even small rear-end crashes.

Ford has been sued more than 70 times by people burned in rear-end collisions in classic Mustangs. Most of the suits have been settled out of court. Ford refuses requests to appear on 60 Minutes to discuss the fires in classic Mustangs. Ford says these were all high-speed crashes and insists that "the fact that there are so many registered Mustangs is evidence of the design integrity of this car." Lee Iacocca, a former president of Ford and the father of the Mustang, did agree to appear on camera. He says that safety was not a major concern in the 60's and that fuel tank safety was never discussed. He claims that "to say that the Mustang had more problems or severity of problems than any other car in its class to me is poppycock."

However, some of Ford's own safety engineers concluded early on that there was a problem with the Mustang's fuel tank design. One of those engineers is Peter Bertelson.

Ford was the only American manufacturer to use a drop-in fuel tank before abandoning the design in 1971. "It's not a safe way to put fuel into an automobile," Bertelson says. He also says that he is absolutely sure that all of Ford's executives knew of the problem in 1966.

Rand, the lawyer, discovered film of an old Mustang crash test, Ford Crash Test 301, which he says shows gas spewing onto the dummy's head. If the gas was ignited, everyone in the vehicle would have died. The family has not sued Ford yet, but is on a safety campaign to get people out of classic Mustangs.

Chapter 2: An Engineer in the Courtroom

2.1 – Introduction

The purpose of this book is to introduce an engineer to the legal system, especially litigation. In this book the engineer will learn what to expect, how to avoid problems inside and outside the courtroom, and above all make the engineer more valuable to his clients because of his knowledge of litigation.

2.2 - Chapter 2: The Nature of Accidents

An accident is an occurrence that is unexpected and causes loss or injury, which can be expressed in some form of economic terms.

Accident Examples:

Collision – Two bodies trying to occupy the same space

- Two moving machines or vehicles.
- A vehicle or machine hitting a fixed object.
- A vehicle hitting a person.
- A person running into another person.

Slip and Fall Accidents – Victim involved only with a surface on which they were moving.

- Loss of traction between the foot and the surface.
- Tripping.
- Physical malfunction of the person.

- Unexpected change in surface level.
- Loss of step support.
- Loss of balance and/or support of the body.
- Fall from ladder or step

Loss of Control – The loss of control of a machine by an operator.

- Inadvertent motion

Hit By Falling Object – Operator or machine are hit by falling object.

- Hit by rolling object

Suffocation – When a person is deprived of oxygen.

- Drowning

Electrocution – Contact with electric power.

Poisoning – Contact or ingestion of substances that can cause bodily harm or sickness.

Shock and Vibration – The effect of sudden changes of force acting on or against the human body for any period of time.

Entanglement – When operator gets something caught in a machine, such as body parts, clothes, or equipment.

Cuts and Abrasions – Result from partial involvement with machines, touching a surface or an edge just briefly.

Fire – Combustion of any kind.

- Chemical burns
- Explosion
- Radiation
- Burns from contact with hot surfaces

Mechanical Failure – A machine failing which results in injury to someone.

Struck by Moving Projectile – Being hit by anything that has become airborne.

- Firearms and other such devices
- War

Natural or Environmental Factors – Broad classification for accidents caused by natural and environmental events.

- Heat
- Cold
- Lack of water
- Animal attacks

Homicide – The killing of a person.

- Suicide
- Legal intervention

Other Accidents – Accidents that do not fit in any of the above categories.

2.3 - Chapter 3: Why Go To Court?

In everyday life there are many problems that arise in our society that cannot be settled outside a courtroom. For litigation to take place a person must first file a suit against someone or somebody. A person would do this if he/she feels they have been wronged or an accident has occurred because of someone else's neglect. The two parties involved will make claims and try to come to a compromise, however, if the two parties cannot reach a compromise the matter is brought in front of a judge. Going to court keeps everyone

honest. It will prevent manufacturers from producing unsafe equipment and it protects manufacturers from being taken advantage of by an unsafe machine operators looking for someone to blame.

2.4 - Chapter 4: Avoiding Litigation

The easiest way for an engineer to avoid a litigation process is to design a product to be as safe as he can possibly make it, thus preventing any possible accidents that could occur. During the process of designing, producing, and testing the product, any plausible forms of failure that could take place should be addressed. Again, trying to prevent litigation causing accidents. When producing a product the six lines of defense should be followed. These are guidelines to help prevent accidents in machines.

1. Avoid the Accident

If the accident does not take place, then it is very difficult to bring claims of loss against the product. Therefore the engineer can eliminate hazard and increase safety while the operator follows instruction in order to avoid possible accident situations.

2. Protect from the Accident

Shields and guards are good ways to protect the operator from an accident. Thus, an accident can be avoided without an entire design change.

3. Make the Accident Safe

Though design, create an operating environment safe enough, where even if the accident was to occur there would be no injury. For instance the roll bar on farm

machinery is not there as a safety device. It is there to forgive the operator should he roll his machine over.

4. Warn of an Impending Accident

A built-in warning device that makes the operator aware that the machine is close to failure. This warning can be a voice, a flashing sign or light, or any type of method that warns the operator there is danger.

5. Warn of the Possibility of an Accident

To warn the operator of the actuality of an accident taking place, instructions and warnings can be placed on the machine as decals or given in the operator's manual. Thus the operator is informed of the possibility of an accident occurring under certain circumstances.

6. Protect the Operator from the Accidents if it Should Happen

Basically, the operator is protected from accidents if they do occur. Protection such as this is displayed in the use of hard hats and roll bars.

- A Balanced Product – Dr. O'Toole's concepts of the general objectives for designing a product.
 - Specifications – Measurements that can be taken on a product such as power, size, weight, etc.
 - Performance – The amount of work and the speed at which the machine completes it.
 - Reliability – The dependability of the product and how often the machine fails.

- Serviceability – How much routine schedule service and unexpected service will affect the operator.
- Costs – The amount of money needed to build the machine. This is very important to the user and the designer. The cost has to be affordable, yet enough so the designer can make a quality product.
- Safety – How safe is the product and what, if any, hazards does it present.

2.5 - Chapter 5: The Litigation Process

The litigation process is called upon when a person sues somebody else. A person can sue when the individual feels that a loss or injury incurred to them is due to someone else's neglect. Litigation, therefore, has several different segments that comprise the entire process.

Segments

1. The Claim

The start of a lawsuit begins with the filing of a claim in a "Complaint" and the request of the plaintiff to the court for trial. This claim must also include reasons for the defendant's responsibility. A claim can start out with vague reasons for the defendant's responsibility and the plaintiff hopes that a further investigation will bring out more specific reasons for the lawsuit. Because a judge can dismiss a case once he feels that the claim is too "fuzzy" the claim must be very clear and precise to both sides before trial can begin.

2. The Response and Defenses

Once the defendant receives the claim they must return an answer, the defendant is given a sufficient amount of time to answer to the claims. If the defendant agrees with the claims and answers yes, that means an agreement can be reached without dispute. However the answer is more commonly no, which is a denial of the claim. The defendant can respond with a list of reasons as to why they are not responsible. If there is a claim relating a defect in a product, it is possible that an engineer's expertise may be needed.

3. *The Discovery Process*

In the Discovery process the two parties get to investigate the lawsuit. The plaintiff usually will learn about the product and why it was defective. In return the defendant will have the chance to investigate the accident and the events that occurred to lead to the accident. During the Discovery process such methods of uncovering information can be interrogations, inspections, investigation, request for production of documents and other material, and depositions. All methods are very important to fully understanding the case.

4. *The Trial*

At trial each party is now allowed to present evidence, witnesses, and arguments to the judge and if chosen, a jury. Trials consist of a set of procedures that are followed throughout the trial, similar to the list below.

- Choosing the jury
- Opening statements
- Presentation of evidence and witnesses for the plaintiff
- Presentation of the defendants defense

- Final arguments
- The jury charge
- Jury Deliberation
- Verdict

This litigation process is what keeps our society civilized and intelligent.

2.6 - Chapter 6: Engineers And Engineering Information

Engineers and engineering information can be critical to the success of a products liability matter. Usually, engineering information is not reasonably known nor understood by the jurors or the judge. Thus, engineers are needed to assist the court in understanding the technical and scientific details of a matter. An engineer may testify as either a fact witness or as an expert witness. As a fact witness, he testifies to what he knows to be fact. As an expert witness, he is allowed to testify as to his opinion, where that opinion will assist the judge and/or the jury in understanding some technical information, or detail that is not common knowledge.

2.7 - Chapter 7: How The Engineer Can Help The Attorney

An engineer and an attorney may not always agree on all matters. However, if they try to understand each other and to cooperate, they will be significantly more successful. Attorneys tend to need broad information and knowledge in doing their work. Because they have to concentrate on the law, they seldom have time to become sufficiently expert in one area. Therefore, attorneys will turn to engineers to discuss the suitability of a product

or machine, and to explain why the design is or is not satisfactory. The same engineer will describe the processes of successful design and product development.

Engineers can help attorneys in many ways. The engineer can describe the technical processes and methods used in designing and making design choices. He also knows why designs are made the way they are. The stated legal reason for using an expert witness is to “help the court and the jury understand information and matters not generally understood by an average lay juror.” The engineer can explain products, systems, parts, and operation of a machine. He can also talk about how the product is developed, evaluated, and tested. The engineer can test or analyze to provide demonstrations and evidence for resolving technical questions. The relationship between the machine and its operator is often considered to be a factor in accidents. This relationship can be understood and explained by the engineer. The engineer is technically equipped to conduct accident reconstruction. Engineers involved in an industry should be able to testify about the “state of the art”. Engineers can summarize engineering literature for the court. They can also help the attorney find useful information, data, demonstrations, examples, and references in literature sources. The engineer can assist the attorney in the examinations, interviews, and depositions of those involved in a matter. The attorney will need to know what position the opposition is probably going to take. The engineer can help the attorney prepare by presenting the possible position of the opposing side.

2.8 - Chapter 8: The Discovery Process

Discovery is an important part of the litigation process. Presenting a case requires information, whether for the plaintiff or defendant. Each side of a case wants to know what

the other plans to present at trial. The law allows you to discover any information that is relevant to the matter. The methods of discovery are interrogatories, Requests for Production, Requests for Admissions, and the deposition. Interrogatories are questions that need to be answered, and the engineer can help prepare the answers to be written under the guidance of the attorney. It is important that the attorney direct and guide the handling of matters involved in discovery, for the law spells out the rules and procedures for the discovery activities. It is important to avoid words that are inflexible or infinite during interrogatories or requests for production. Rather than ask thousands of interrogatories to discover information, attorneys may file a Request for Production of Documents. By doing this, the attorney is discovering lots of data and information all at once.

2.9 - Chapter 9: The Deposition

The discovery process described above includes a very important tool for the attorney, the deposition. A deposition gives the attorney the opportunity to question witnesses before the actual trial. The questioning is less formal than in the courtroom trial but still very serious. The deposition could be taken at any time in the litigation process; however, it is usually conducted when the matter is getting close to trial.

There are several reasons for depositions. The first and most obvious is for the purpose of discovery. Depositions are also taken to establish facts and to determine the origins of and bases for those facts. The attorney can use a deposition to determine the opinion that an expert witness might offer at the trial. If the information and opinions the witness offers are damaging to the case of the questioner, he will want to use the deposition to seek information and bases to impeach the witness. The deposition may be used to pin

down testimony, so it may not be changed at trial. Last, the attorney may use the deposition as a means of learning the plans or strategy of his or her opponent.

These are some general rules that should be followed for deposition:

1. Listen to the question.
2. Pause before you answer the question.
3. Answer only the question asked.
4. Answer truthfully and completely, to the best of your ability.
5. Don't volunteer.
6. Don't argue or advocate.

2.10 - Chapter 10: The Trial

The trial is the last and most important part of the litigation process. The parties to the case cannot agree on a suitable resolution to the matter. They have decided to submit their claims, contentions, arguments, and beliefs to a court. All the preliminaries such as interrogatories, various requests, depositions, inspections have been completed. Each side is ready to present its case to convince the court why its position is correct. Trials are guided by rules and procedures set up by the court. The following are the general steps of a trial.

- Picking a Jury
- Opening Statements
- Plaintiff Presents his Case
- Defense Presents his Case
- Final Arguments

- The Charge to the Jury
- Jury Deliberation
- The Verdict

The engineer will be a witness in the presentation of a case. It is important to dress in a suit, dress shirt, and tie to look more proper and businesslike. The engineer should always conduct himself in a quiet, dignified manner. The direct examination will come first. This is when your attorney will ask you a series of questions. The more difficult part is the cross-examination where you are questioned by the opposing attorney.

2.11 - Chapter 11: Questions

Perhaps the most important job of a lawyer is to know how to ask questions. The ability of a lawyer to ask questions is directly related to how the jury is swayed in a case. A question can be asked many different ways, a question can be general or specific, open or closed, leading or non-leading, formal or casual, polite or serious and simple or complex. All these forms of questioning are extremely important to the case the lawyer is trying to build. A lawyer can also ask the questions in certain fashions, such as rapidly to get you to fall into a pattern of answers. Another method of questioning is changing the pitch or the emphasis placed on certain words or phrases. Careful phrasing and timing of questions is vital to the attorney's case. It is essential to know how to answer these questions to your best ability using the truth.

2.12 - Chapter 12: Accident Reconstruction

Accident reconstruction can be very useful in a litigation case because there is a dispute as to what took place when the accident happened. The claims that are made by both sides can be supported or destroyed by testimony by witnesses. Sometimes the dispute is so unresolved, an accident reconstructionist will be hired to give his expert advise. The reconstructionist will take all the available information and use science to determine the most likely scenario of the incident. Once all the testimonies, evidence, and personal recollections are taken into consideration the reconstructionist will give the most likely scenario that is believed in his expert opinion.

2.13 - Chapter 13: Definitions and Techniques Employed by Attorneys

In this chapter the author gives his definitions and rules of common use to guide attorneys.

Adverse Witness: Someone who is called in to testify by the opposing attorney.

Answer: Used interchangeably with the term “Response”.

Appearance: This means that someone has appeared somewhere in the litigation process of a certain case.

Arbitration/Mediation: Two alternate dispute resolution methods. Mediation involves a mediator who tries to bring the two parties to a compromise.

Arbitration involves an arbitrator who hears the entire case and makes a decision that both groups agreed to adhere to.

Balance of the Evidence: The information before the jury when they deliberate on the case.

Bar: Three meanings; location of legal activity, grouping of attorneys in a certain area of jurisdiction, and to prevent or keep out.

Bench: The location, person and authority of the judge in the courtroom. Basically where the judge sits.

Breach: The failure to perform or a break in a chain of action.

Burden of Proof: The respective responsibilities of the parties in a lawsuit to prove or disprove the claims in question in the trial.

Care: The responsibility to conduct ones product according to accepted levels of performance.

Charge: When the judge instructs the jury as to how it must proceed in deliberation.

Complaint: The formal name for the list of claims and requests for the court intervention.

Due Process: The proper legal steps in a procedure.

Duty: What someone is supposed to do.

Evidence: Information that tends to prove or disprove matters of disputed fact.

Exhibit: Evidence offered and admitted at trial.

Expert Witness: A person who has the ability to assist the court and the jury in understanding the technical aspects of a matter because of their background.

Facts: Matters that truly exist.

Forensic: An engineer who applies engineering principles to the resolution of investigations.

Foreseeability: The ability of a matter, situation, condition, or action to be expected sometime in the future.

Hearsay: The admissibility of something a witness says, meaning a witness can only discuss what they have experienced through their own five physical senses.

Hostile Witness: A witness that demonstrates a hostile attitude towards either attorney.

Hypothetical Question: A question that a witness must respond to, by making his own personal opinion to answer.

Impeach: To show the testimony of the witness to be untrue or unbelievable.

Inadmissible: Information or evidence that is outside the rules of litigation and will not be of any concern in the particular case at bar.

Judicial Discretion: The power of a judge to make judgment on gray areas that arise during the trial which have little precedence.

Lay Witness: A witness for the facts.

Liability: Legal responsibility to pay or provide such remedies as the court decides.

Litigation: The total process of filing a lawsuit, pursuing the discovery and trial.

Mistrial: If the judge determines that a fair and proper resolution can no longer be reached a mistrial is called.

Negligence: The failure to use the ordinary amount of care that would be expected from a reasonably prudent person under the same or similar circumstances.

Oath: to swear to “tell the truth, the whole truth, and nothing but the truth”.

Punitive Damages: exemplary damages, over and above the damages intended to make the plaintiff whole, that arises in special cases and under certain circumstances.

Red Herring: A method of diversion or interruption.

Side Bar: Conferences held when the judge wishes to hear the reasons for and against the objection from both parties, which is away from the hearing of the jury.

Summons: The formal legal document notifying the defendant that an action has been filed against him/her.

Tort: A legal wrong committed or perceived to be committed against a person or other legal entity, a products liability case is a tort.

Techniques That Should be Used by Attorneys

- Never ask one question too many
- Don't fight or argue with the witness
- Keep cross-examination short
- Know the answer before you ask the question
- Tell a story – paint a picture for the court and jury
- When you have made your point – STOP
- Don't assume anything
- Listen to the answers
- Plan, plan, plan
- Don't try to fool the jury or the judge

2.14 - Chapter 14: War Stories

Attorneys often tell stories of things that have happened to them or someone they know. These stories are all true, but are sometimes exaggerated slightly to make their story better than the last story told. Despite the often humorous and entertaining nature of these “war stories”, each has a lesson that is valuable to the teller. These lessons can usually be useful to the listener. These stories can be useful to aid in an engineers understanding of

the litigation process. The author offers many examples of war stories, each with a different lesson that he has encountered.

2.15 - Chapter 15: Tips for the Engineer Involved in Litigation

- Don't forget that you are assisting the attorney. Do not try to run the game.
- Always be truthful. Don't do or say what you do not believe.
- Don't be frightened by the legal process.
- A good attorney will prepare you for your deposition. Listen to his direction.
- Follow instructions precisely and accurately.
- Know that the legal process is flawed but still an excellent and effective way for people and companies to get a good measure of equity in a dispute.
- As a professional always do your best work and use your best judgment.
- Be yourself, but do so in a professional way.
- Beware of traps and trick questions.
- Think. Even if you already know the answer, think. Then answer.
- If you make an error, correct it.
- Listen to advice, and use all of it that applies to your situation.

Chapter 3: Products Liability **In A Nut Shell**

3.1 - Chapter 1: Definition and Scope

A product is usually considered a tangible object that has been purchased from a seller. However, products liability also includes many intangible products or services, such as electricity, writings, and even animals. This means that in products liability cases not only the product but also the position the defendant holds in the prevention of the loss or injuries that occurred, should be analyzed.

3.1.1 - Defects

Determining if a product is defective can be a very difficult task. A product can be considered defective through negligence of the defendant, misrepresentation, or abnormally dangerous conduct. Thus the context of the products use must also be examined. Therefore it is possible for a perfectly sound product to be ruled defective.

Types of Defects and Their Interrelation

Product defects can be categorized into three main types, manufacturing or production flaws, design defects, and defective warnings. Manufacturing flaws are random flaws that take place and only affect few of the products. Design defects usually make a whole production line of products defective. Defective warnings are exactly that and can be considered a design defect because they can also affect a whole line of products. Some experts also include a fourth category, which was mentioned above, misrepresentation. Misrepresentation is the belief that a product has characteristics that it does not actually

have. In some cases these types can overlap, such as *Faucett v. Ingersoll-Rand Mining & Machinery Co.*

Conceptual Standards for Determining Defectiveness

A definitive definition for product defectiveness is that which exhibits “unreasonable danger”. This is defined as, “The article sold must be dangerous to an extent beyond that which would be contemplated by the ordinary customer who purchases it, with the ordinary knowledge common to the community as to its characteristics”. Basically a product can be considered defective if it displays a danger that would not be expected for that particular product by ordinary customers. However, the ordinary customer expectations of a product can fail to determine defectiveness when misrepresentation and/or a complicated product is being analyzed. When this occurs, expert testimony is usually called upon.

Morals are very important in producing and selling products to the public. If a seller knows that a particular product is harmful or can exhibit “unreasonable danger” it is up to that seller to make sure their product does not reach the market. Unfortunately, most products do have flaws, this is when risk-benefit balancing is used. A company or courtroom will analyze a product with this method to extract what is the cheapest, yet least risky way to produce a product. If the cost is less than the burden to change the defect, then the product is considered defective. There are seven steps involved in determining risk-benefit, these are:

1. The usefulness and desirability of the product
2. The likelihood and probable seriousness of injury from the product

3. The availability of a substitute product that would meet the same need and not be as unsafe
4. The manufacturer's ability to eliminate the danger without impairing usefulness or making the product too expensive
5. The user's ability to avoid the danger
6. The user's anticipated awareness of the danger
7. The feasibility on the part of the manufacturer of spreading the risk of loss by pricing or insurance.

This list is just a guideline and may not be followed in every products liability case.

Another consideration when examining a possible defective product is state of the art. This is basically the knowledge and capabilities of an industry at the time the product was released to the market. However, during a products liability case, state of the art can be considered as the date the case was filed. Thus a company must recall or repair any unreasonable dangerous products as soon as they discover or should have discovered it.

Defects and Unreasonable Danger

Understandably so, some products are unavoidably unsafe, no matter how it was designed. Products that are unavoidably unsafe can have known and unknown dangers. Usually medication falls into this category because there are many known and unknown dangers to certain medications. A product that falls into this category usually has benefits that outweigh the risks, thus the reason for its use.

The Relation of Defects to Causes of Action

In looking at the two basic types of tests for determining defectiveness the risk-balance method looks at fault, while the consumer expectations test uses strict liability. In

the future product law could possibly shift to focus more on causation of the defect or towards a more fault-orientated approach.

3.2 - Chapter 2: The Causes of Action and Damages

A very common cause of action and damages is negligence. Negligence can occur in many forms such as inadequate inspection, processing, packaging, warning, design, marketing, or any other form of failure by a manufacture to provide a sound product to a customer. For a defendant to prove his case he must prove that the produce was indeed made unsound through some form of negligence. Another form of negligence can arise from statutory violations. Other causes of action and damages can come in the form of reckless misconduct, concealment and deceit.

3.2-1 - Strict Liability

Strict liability makes the manufacturer responsible for the product, eliminating privity. This prevents retailers from have to take responsibility for selling an unsound product. Strict liability also includes implied obligations in which the Warranty of Merchantability protects the customer.

The Warrant of Merchantability:

1. Unless excluded or modified a warranty that the goods shall be merchantable is implied in a contract for their sale if the seller is a merchant with respect to goods of that kind
2. Goods to be merchantable must:
 - a) Pass without objection in the trade under the contract description.

- b) In the case of fungible goods, be of fair average quality within the description.
Be fit for the ordinary purposes for which such goods are used.
- c) Run, within the variations permitted by the agreement, of even kind, quality and quantity within each unit and among all units involved.
- d) Are adequately contained, packaged, and labeled as the agreement may require.
- e) Conform to the promises or affirmations of fact made on the container or label if any.

3. Unless excluded or modified other implied warranties may arise from course of dealing or usage of trade.

This warranty arises only when the seller is a merchant that deals in particular goods and holds skill or special knowledge in these particular goods.

Other warranties and torts involving strict liability include the Warranty of Fitness For A Particular Purpose, Strict Torts Product Liability, and Abnormal Danger. Warranty of Fitness is closely associated and similar to the Warranty of Merchantability. Strict Tort Products Liability protects the customer from anyone who sells an unreasonably dangerous product. Abnormal Danger also protects the consumer from sellers who perform activities that are abnormally dangerous. Many examples include the use or pollution of land.

Misrepresentation

1. Express Warranties by the seller are created as follows:

- a) Any affirmation of fact or promise made by the seller to the buyer that relates to the goods and becomes part of the basis of the bargain creates an express warranty that the goods shall conform to the affirmation or promise.

b) Any description of the goods that is made part of the basis of the bargain creates an express warranty that the goods shall conform to the description.

c) Any sample or model that is made part of the basis of the bargain creates an express warranty that the whole of the goods shall conform to the sample or model.

2. It is not necessary to the creation of an express warranty that the seller use formal words such as “warrant” or “guarantee” or that he have a specific intention to make a warranty.

If a merchant sells a product to perform a particular task and said product does not perform or causes loss or injury then they are subject to litigation under the above warranty.

3.2-2 - Overlapping Bases of Liability

Products liability has so many theories that a plaintiff has a few she can choose from for similar situations. Thus, in some cases the theories overlap which can sometimes help the plaintiff. A plaintiff can choose the theory that has the best chances of producing a successful case.

3.2-3 - Damages

The basic rule on collecting damages in a products liability case says that the damages must be foreseeable. Some states even place a cap on noneconomic damages that can be recovered in a case. These noneconomic damages include punitive or exemplary damages, pain and suffering, and emotional distress.

Punitive Damages

This type of recovery is determined by the wealth and behavior of the defendant.

Punitive damages are very controversial and usually do not get awarded.

Emotional Distress

Courts analyze if damages for emotional distress should be awarded by determining if the plaintiff is in fear of a future injury or at risk for a future injury. Both situations have won damages.

Joint and Several Liability

This type of recovery holds one defendant responsible for all the claims of a plaintiff. Even if there are co-tortfeasors that may hold some portion of responsibility, the defendant cannot, under joint liability, spread responsibility if the damages are indivisible.

3.3 - Chapter 3: The Parties

3.3-1 - Plaintiffs

A plaintiff can recover from any defendant, who sold an unsound product, for economic or personal losses. The plaintiff also can sue under any and all theories of products liability that may help her recover damages. This also includes bystanders, which arguably should be entitled to more protection than the consumer. A major example of this is the second hand smoke inhaled by non-smokers.

3.3-2 - Defendant Sellers of New Products

Manufacturers

Manufacturers can be sued for all of the above theories. Manufacturers can even be held responsible for components they produced that are used in other products and the misassembly of a new product by a dealer.

Middlemen and Retailers

A middleman or retailer is protected by strict liability in which case a manufacturer is responsible for a defective product in a sealed container. However, retailers can be sued through implied strict liability if they sell an unsound product that could have been detected by a reasonable inspection.

3.3-3 - Defendant Used-Products Sellers

Sellers of used products are protected from being strictly liable for continuing the use of the product. This however can be voided when the seller has misrepresented what is being sold.

3.3-4 - Defendant Successor Corporations of Products Sellers

Cases of products liability are sometimes disputed over the purchase or merger of two corporations, where the buyer inherits defects in products from previous owner. In these cases the buyer is fully responsible for the defects.

3.3-5 - Defendant Employer-Suppliers of Products

An employee has the right to sue her employer if she is hurt on the job. This holds true especially when the employer knew about the danger and did not inform anyone about the danger.

3.3-6 - Defendant Provider of Services

Sellers that provide services can also fall under strict liability. The reasoning is that a service can be provided with or without care. This separates it from a product that can be defective even if it was made with 100% care from the factory. However, professional services such as doctors can be treated differently from regular services.

Representational Conduct

If a seller misrepresents her product or service, there is no reason why the seller should not be held strictly liable.

Professional Services

A professional service is considered differently than an ordinary service for obvious reasons. A professional is providing a professional service that cannot be performed by an ordinary person.

Pure Service Transactions

If a seller provides strictly a service and no product she cannot be held strictly liable. This is true unless the seller alters the product to a defective form.

3.3-7 - Defendant Real Estate Suppliers

Builders – Vendors

Mass builder-vendors can be held strictly liable for defective construction of a house because the courts tend to see no difference between a mass producer of homes and a mass producer of automobiles. The buyer is relying on the expertise of the builder to produce a sound product.

Lessors

A lessor can be held liable if his housing does not pass housing codes. This will hold true as long as the tenants have paid the rent and not caused the reason for the failure in housing codes.

Occupiers Of Premises

Business and hotel owners have been found to owe a duty of care to the users of their premise.

3.3-8 - Contribution and Indemnity

Contribution can be awarded to parties that were not intentionally at fault. Basically, multiple companies will take the responsibility for the defect. Indemnity is similar and that it provides protection to sellers of products they did not produce.

Where Grounds Of Liability Differ

Grounds of liability differ when one tortfeasor is strictly liable and another tortfeasor is also held liable for negligence. When this situation occurs contribution is sometime awarded, the court determines the degree of fault.

The Effect Of Settlements

Once a victim has settled with one of multiple tortfeasors, she has legally settled with all tortfeasors and cannot sue or demand settlement from any of them. However, the co-tortfeasor does receive credit on his liability to the victim for any settlement that takes place.

3.4 - Chapter 4: Factors Affecting Choice Of Remedies, Jurisdiction, and Procedure

3.4-1 - Reliance

A person that is injured by a product that was misrepresented by the seller are afforded the right to sue for damages. However, the plaintiff must prove that she used the product in the correct way and the product did not perform, consequently injuring the plaintiff. A consumer can also sue if the warnings on the product are not appropriate or safe.

3.4-2 - Disclaimers and Limitations Of Remedies

General Requirements

A disclaimer will be invalidated if it is unclear or inconspicuous. A disclaimer must be completed and agreed upon at the time the contract is signed. If a contract is found to be unconscionable then it can be null and voided by a court.

Scope and Effect of Disclaimers

Disclaimers only apply to those who are directly or indirectly part of the parties that bought the product and agreed to the contract.

3.4-3 - Recovery Of Solely Economic Loss

The Rule And Its Rationale

A plaintiff cannot usually recover damages from a seller or manufacturer solely for economic loss.

Definition Of Solely Economic Loss

Economic loss is usually defined as loss in value, loss of use, cost of replacement, lost profits, and damage to business reputation. This is true only when a physical accident is not involved.

Exceptions To The Rule

Sometimes courts will overlook solely economic loss because of certain situations. Such a situation can be seen in Thompson v. Nebraska Mobile Homes Corp.

3.4-4 - Notice Of Breach

Notice of Breach protects the seller if the buyer fails to notify them of a breach. The buyer must, within a reasonable time after he discovers any breach, notify the seller of the breach or he shall be barred from “any remedy” for the breach. The purpose of this

requirement is to inform the defendant of a potential claim so that they can investigate and attempt settlement. This section has however been held inapplicable to an action in strict tort. It has apparently not been applied to a negligence suit in products liability.

3.4-5 - Wrongful Death

A wrongful death action is for a death resulting from a crime, negligence, carelessness, or wrongful act. A few courts have held that wrongful death statutes were not intended to be applicable for breach of warranty. However, the majority of courts will allow wrongful death action to be brought in warranty. They usually find that a breach of warranty may also be a wrongful act.

3.4-6 - Procedural Considerations

Jurisdiction

A statute may provide the basis for a cause of action. The statute may provide this basis either expressly or by implication. According to the due process clause of the United States Constitution, a defendant must have minimum contacts with a forum before he can be subjected to the jurisdiction of that forum.

Interest has developed in regards to the use of class actions as a means of handling situations where the same product may have caused hundreds and thousands of injuries. Class action has been thought to be an inappropriate manner for such mass tort claims. This is because of the vastly varying individual questions that affect liability and damages. There are currently four types of class actions.

1. Where there is a risk of inconsistent or varying adjudications;
2. Where adjudication of some claims will as a practical matter be dispositive of the claims of others not a party to the litigation;

3. Where the defendant has acted or refused to act on grounds generally applicable to a class, making final injunctive or declaratory relief appropriate;
4. Where questions of fact or law common to the members of the class predominate over questions affecting only individual members.

In the first three types of classes every member is bound by the judgment. The fourth, however, is optional, in that any individual member can request to be excluded from the class.

Inconsistent Verdicts And Erroneous Instructions

Cases can be submitted to a jury on more than one count. Some courts hold that if one count is supported by the evidence and another is not, then a general verdict for the plaintiff must be reversed and remanded for a new trial. Not all jurisdictions follow this rule. These other courts hold that “If any counts in a declaration are good, a verdict for entire damages shall be applied to such good counts.”.

Res Judicata

Estoppel, by judgment, does not allow relitigation of the same cause of action that has been previously litigated to a final judgment between the same parties. A defendant can, however, be sued by numerous plaintiffs.

Choice Of Law

A federal court must apply the choice of law rules from the forum state if the issues are distinguished from questions of procedure. When an issue is procedural, a federal court would not reach the question of how the state court would treat the issue. Hence, it would apply its own procedural rule.

3.4-7 - Statutory Compliance

Usually compliance with state or federal statutes is some evidence that the defendant did exercise care and the product was not defective. However, this compliance to statutes is not normally considered conclusive because government standards only provide minimum requirements. Unless the plaintiff introduces evidence that the standard is inadequate in some way, a verdict on the issue should be for the defendant.

3.4-8 - Contract Specifications Defense

Nongovernment specifications

Some feel that if a product is manufactured within specifications of a nongovernment purchaser the manufacturer is not liable for a defect in the design unless the danger is obvious. If a contractor rebuilds something to the specifications of the owner, they could be held liable for injuries caused by the lack of safety devices on the machine.

Government Specifications

Contractors that design a defective product can be immune from liability for injuries caused by that product if it is supplied to the government in accordance with government contract specifications. Although the contractor may not need to warn the government of dangers associated with a product, some courts have held that it is the contractor's duty to warn third persons of those dangers.

3.4-9 - Statutes Of Limitations

The Applicable Statute

In a products liability case there may be several statutes of limitations that apply to a cause of action. When this occurs there are two approaches that can be taken. One is to allow the plaintiff to rely on the statute for which the claim was made. For example,

plaintiffs should rely on a warranty statute for a warranty claim and a tort statute for a tort claim. The other approach is to look at the gist of the action caused by the statute and apply only the tort statute, even to a warranty claim.

Date Of Accrual

The date of accrual is the time at which the period of the statute of limitations begins to run. These statutes generally begin to run at one of three times:

1. Date of injury;
2. Date when the plaintiff had reason to know of the claim;
3. Date when the plaintiff in the exercise of reasonable care should have known of the claim.

Sometimes a plaintiff will suffer an injury, and the injury will later develop into a different injury or disease. In this case, courts have ruled that the statute of limitations for the developed injury begins when it is diagnosed.

Tolling Exceptions

The statutory period can be delayed, or tolled, if something happens that keeps the statutory period from beginning or from continuing to run as it would if the event did not occur.

Constitutional Questions

Many questions arise about the constitutionality of statutes of limitations. The largest number of cases where these questions arise deal with general statutes in product liability.

3.4-10 - Statutory Retrenchments

In an attempt to meet a “perceived” crisis in the availability and affordability of liability insurance, many state legislatures have statutes that cut back on consumer rights. The retrenchments vary greatly and cover many different subjects, including: “limitations on the amount of chargeable contingent fees; provision for periodic payment of judgments; elimination of strict liability and the adoption of a product state-of-the-art defense; elimination or restriction of recovery for punitive damages; adoption of statutes of repose; and placing a limit on the recoverable amount of damages for pain and suffering, mental distress, and the like”.

3.5 - Chapter 5: Production And Design Defects

3.5-1 - Production Defects

Courts often treat a manufacturing or production flaw as something different than a design defect. In cases involving a manufacturing defect, the plaintiff proves that there is a defect because the product does not conform to the manufacturer's specifications. This does not necessarily mean that the manufacturer did not exercise due care. In fact, they can still be held liable even if there is not easy way of discovering or preventing the defect. This rule seems to say that manufacturers can set its own standard of failure to something high. Therefore, a slight failure would be within their standard and wouldn't be considered defective. A better approach to determine defectiveness is to determine if it departs materially from the design specifications or the performance of the other units. Sometimes

expert testimony is necessary to establish what is defective and what isn't, however consumer expectations can sometimes determine defectiveness.

3.5-2 - Design Defects

The Theory of Liability

The most widely used method in deciding cases involving a defective design is some kind of risk-utility analysis. Many courts insist that these tests are not negligence tests because the analysis is based on the product rather than the conduct of the manufacturer. It is the duty of the jury to weigh all the evidence about the conduct of the manufacturer to determine their liability in the defective design. Nonmanufacturing sellers lack the expert knowledge to assess the risk-benefit relationship of a product's safety. Therefore their liability would be less than a manufacturer.

In a case involving negligence, the manufacturer's choice of design in light of the knowledge that was available at that time must be taken into account. Knowledge and skills may have greatly improved since the time of manufacturing. Under strict liability, however, knowledge of a potential danger would lead to negligence on the part of the manufacturer.

Polycentricity

Polycentricity is used to describe the situation where a design has many centered problems. When one small thing fails it would cause a chain reaction for everything else related to it to fail. Juries are usually instructed to weigh the probability and magnitude of a potential injury, the ability of the manufacturer to eliminate the problem without affecting the usefulness of the product or greatly increasing its cost, and the extent beyond that an ordinary consumer could expect the danger taking into account any warning labels. Some

courts have struggled with the fact that in many liability cases the jury is presented with complex design issues for which they lack the expert knowledge needed to pass judgment on.

The Relation of Design and Warning Defects

The lack of a mechanically engineered warning is sometimes considered a design defect. However a warning is not considered an effective method of eliminating potential injuries due to “instinctual reactions, momentary inadvertence, or forgetfulness on the part of a worker.” Safety devices are designed to guard against injury caused by these situations.

Obviousness Of Danger

The obviousness of danger is not always an easy thing to identify. The only defense to an obvious danger is to prove that the plaintiff was aware of the defect, fully understood the danger it presented, and despite knowing of the danger voluntarily exposed themselves to it.

Crashworthiness

Crashworthiness is a term used to describe how well a product will protect from injury when it is involved in an accident caused by someone or something else other than the product. Automobile collisions are where these cases are most frequently found.

3.6 - Chapter 6: Inadequate Warnings And Instructions, And Misrepresentations

3.6-1 - Warnings and Instructions

Plaintiffs are allowed to pursue a case on a strict products liability theory of either design defect or failure to warn. A warning is designed to insure the safe use of a product. In order for a warning to be considered adequate, it must describe the exact nature and extent of the danger that is involved. Warnings are not required for obvious dangers. Instructions are used primarily to secure the efficient use of a product.

The Standard Of Liability

In cases where the manufacturer fails to warn of danger, there is a division as to whether a negligence or strict liability standard is to be used. The strict liability approach recognizes that consumers can do little to protect themselves from the risk of serious injury caused by defects in products that they purchase.

Persons To Be Reached

In general, experts do not need to be warned of dangers that are associated with the products for which they have expert knowledge. However, this does not usually relieve the manufacturer's duty to warn the employer's employees of the danger.

Countervailing Representations

A normally adequate warning can be made inadequate by countervailing representations that downplay the actual danger or mislead the user as to the nature or extent of the danger. Warnings may be neutralized by pictures or appearances of safety.

Post-Sale Duties To Warn

If a product is found to have a defect, the manufacturer has the duty to warn those that they have made previous sales to. This duty might not arise until sometime after the sale of the product. In extreme cases a recall of the product may be required to repair the defect.

Allergic Users

When an allergy is shared by a substantial number of people, it is the duty of the defendant to know of and provide warning for the risk. There rule as to what constitutes a substantial number of people, however in one case 373 complaints out of 82 million sales was held to be a sufficient number.

Misrepresentations

Misrepresentations can be based on deceit, negligence, strict tort, or strict warranty. The plaintiff does not need to prove the defect as long as the misrepresentation was made and caused the injury.

3.7 - Chapter 7: Problems Of Proof

3.7-1 - Cause-In-Fact

The plaintiff must prove many things before a case is submitted to the jury. He must show that the product was defective and that it caused the injury. He must also prove that the defect was present when the product left the defendant's hands. Therefore, he must eliminate any possible causes that can not be traced back to the defendant. The plaintiff will be better able to make a case with only circumstantial evidence of the defect if the product is new. If the defect has been reasonably proven to be attributable to the defendant, courts are more likely to allow the causation question go to the jury.

Several Possible Causes

Often there is more than one cause to an injury in product liability cases. If these causes involve different defendants there is a potential problem. If one of the factors actually caused the injury then the burden of proof lies on the defense to prove that their factor was not the cause. If all the factors contributed to the injury then it is each defense of each factor to prove the extent of their contribution to the cause.

3.7-2 - Proximate Cause And Foreseeability

Foreseeability is a term used to describe an occurrence that can be reasonable anticipated. Injuries resulting from an obvious danger or from a product that is considered dangerous is usually described as unforeseeable. Proximate cause is an occurrence that is the probable result of another event. If an injury is caused by a complex chain of events then the cause is described as proximate. The courts usually treat these terms as essentially synonymous.

Misuse

Some courts use misuse as an argument for the defense. Others place the burden on the plaintiff to show that there was no misuse. Unforeseeable misuse will usually hinder a plaintiff's case where foreseeable misuse will not. Unforeseeable misuse is closely related to contributory negligence and assumption of the risk.

Alteration

If the alteration of a product causes the accident, it is seen as an unforeseeable misuse thus barring recovery. The exception to this is if the alteration should have been anticipated because the characteristics of the product invite or encourage the alteration.

Damages

Often injuries are the result of a defect which the manufacturer neither foresaw nor should have foreseen the extent of the harm or the manner in which it occurred does not prevent him from being liable. However, the conduct of the manufacturer may not be held as a legal cause of harm if it appears to the court highly extraordinary that it should have brought about the harm.

3.7-3 - Plaintiff Misconduct, And Comparative Fault

The Types of Misconduct

Plaintiff misconduct can bar or limit the plaintiff's right to recover any losses. The three major miscondacts are contributory negligence, assumption of the risk, and misuse including alteration of the product. Contributory negligence is when the plaintiff takes an action in which he fails to take reasonable care for his own safety. Assumption of risk is when the plaintiff is fully aware of a risk yet voluntarily confronts it despite the danger. These two types of plaintiff misconduct are usually treated as defenses, with the burden of proof on the defendant.

The Effect of Plaintiff Misconduct In Strict Liability

Contributory negligence is not a defense when the negligence trying to be proved by defense is simply a failure to discover the defect or guard against its possible existence. A product is considered defective when it is unreasonably dangerous for normal use. If the plaintiff discovers the defect, is aware of the danger it presents, and proceeds irresponsibly to make use of the product and is then injured by it, he is barred from recovery.

Comparative Fault

There two ways to look at comparative fault. Modified or partial comparative fault is where the plaintiff is barred entirely from recovery if his fault equals or exceeds that of

the defendant. Pure comparative fault is where the plaintiff can recover if the defendant is at fault in any degree. This is the method usually chosen. Some courts compare relative fault and relative causation in determining comparative fault. Some courts hold that in strict liability, contributory negligence should not be compared.

3.7-4 - Subsequent Remedial Measures

Often a defect is discovered and steps are taken to prevent an accident. In federal rule, this action may not be used as evidence to prove negligence in connection with an injury. Many state laws contain similar provisions. The rule does not exclude evidence of these remedial measures taken after the accident from being used if the measures taken are involuntary such as a government-mandated recall.

3.7-5 - Miscellaneous Problems Of Proof

History Of Unsafe And Safe Use

Evidence of previous accidents with similar products is admissible in liability cases. This evidence shows that the defendant was aware of the defect, the magnitude of the danger, and the foreseeability of user conduct.

Spoilation

Spoilation is when a person disposes of product evidence that is vital to a litigant's case. Such a person may be held liable for damages that he likely could have recovered had he not disposed of said evidence.

Expert Testimony

Expert testimony is often vital in a products liability lawsuit. Expert testimony can be used to help the court understand complex issues of defectiveness, causation, damages,

or any other complex issue. If the subject matter is that of common knowledge, an expert may not be permitted to testify.

State of the Art and Industry Custom

Often courts have difficulty in distinguishing between state of the art and industry custom. Most courts will permit evidence of industry custom to display state of the art. State of the art can be defined as technical knowledge that was available at the time a product is marketed.

Codes, Reports, and Technical Literature

Industry-sponsored associations often draw up safety codes for the industry to follow. These are admissible on issues of defectiveness and due care. This evidence can be submitted without presenting the authors of the codes as witnesses. Government created codes and regulations are often admitted to establish the elements of a products case.

Discovery

The use of Discoveries has become a controversial issue in products liability. Some believe that the discovery is widely overused, while others think that it is underutilized.

Chapter 4: Bartow vs. Extec Screen and Crushers LTD. **et al.**

On December 16, 1994, Kenneth R. Bartow, an employee of O'Conner Brothers Inc. in Sheffield, Massachusetts, was attempting to tighten a screen on the Extec Screen Plant Machine, 5000S, serial No. 3525. While attempting to tighten the screen, Mr. Bartow claims he fell off a 2' x 6' platform on the machine, sustaining back and other injuries.

Mr. Bartow and his family are suing Extec Screen and Crushers LTD et al. for his injuries and damages. Because of Mr. Bartow's loss of function, he cannot return to usual activities and occupation. He is suing for negligence, breach of implied warranty of merchantability, breach of express warranty, breach of implied warranty of fitness for a particular purpose, and loss of consortium. Collectively Mr. Bartow is suing for approximately 35 million dollars.

According to Mr. Bartow's deposition, on the day of the accident around 7:30 a.m. he decided one of the screens on the Extec machine needed tightening. To gain access to the bolts that tighten the screen he needed to get to a 15' high platform. He claims that he climbed up the main conveyor belt to get to this platform. To tighten the bolts Mr. Bartow says he used a ratchet and socket. The bolts were a few inches above the platform, so to get better leverage, Mr. Bartow said he used his foot to tighten the bolts. With his free hands he held on to a railing that was on the main conveyor. While tightening the bolts, his foot slipped off the wrench causing him to fall off the platform. On the way to the ground he allegedly hit his head on the side conveyor belt. Mr. Bartow fell approximately 15 feet to the ground below. He was found around 9:00 a.m. by Harold Green, who called the

ambulance. Mr. Bartow believes that the Extec should have had a guard rail surrounding the platform to prevent falls.

On the 21st of December, Mr. Bartow, while in the hospital, gave an injury report over the phone to Virginia Drummond. She worked for the Hartford insurance company and was in charge of his worker's compensation claim. On the injury report it states that Mr. Bartow said he fell off the ladder and hit his head on the side conveyor belt, then continued to fall to the ground. He also stated that there was excessive frost on the machine at the time of the accident.

This ladder that Mr. Bartow spoke of is one of two additions to the Extec machine that he had made since its purchase. Mr. Bartow claims that he never used the ladder after realizing that it wasn't tall enough to give him easy access to the platform. Dickie Bassett, the mechanic who helped Mr. Bartow build the custom ladder, said the ladder was usually attached to the machine. The other addition was a wooden cover over the conveyor belt. The purpose of the cover was to prevent frost and snow from gathering on the belt. The wooden cover made it impossible to climb up the conveyor belt. Although neither Harold Green, Dickie Bassett Jr., or Ronald Marchant, three of Mr. Bartow's co-workers, can verify that the wooden cover and ladder were on the machine the day of the accident, they all do admit that both additions were usually on the machine. According to these men the wooden cover was very heavy and cumbersome so it was seldom removed from the machine.

Mr. Bartow claims John Guilfoyle, the sales representative for Extec Screen, instructed him to walk up a conveyor belt, to get to a platform, where he would have access to the screens. He also says that he was never provided with an owner's manual or a

maintenance manual. His co-workers all stated that both of these claims are incorrect. All three men agreed that John Guilfoyle had instructed them to use a bucket truck or scaffolding to gain access to the screens. All three men also stated that they never saw Mr. Bartow use the ladder or climb up the main conveyor belt to gain access to the platform. However, their usual procedure for changing or tightening the screens would not require him to. Standard procedure for changing or tightening the screens required two people. One person would operate the bucket truck and the other person would perform work on the machine. Dickie Bassett also stated that he had seen an owner's manual for the Extec on the seat of the truck that was usually driven by Mr. Bartow.

In Mr. Bartow's deposition he claims that there was no frost on the machine that morning. This statement is contradicted in two places. Mr. Bartow specifically said to Virginia Drummond that there was frost on the ladder which caused him to slip. Also, Mr. Green claims in his deposition that when he found Mr. Bartow on December 16th the Extec machine was covered with frost.

In this case we believe that Mr. Bartow is at fault because of the many discrepancies in his account of the accident. In Mr. Bartow's injury report he claims that he fell off this ladder due to frost. This contradicts what he claimed in his deposition. Also in his deposition, he says that there was no frost on the machine the day of the accident. This is completely opposite from what he claimed in his injury report and from what Mr. Green said in his deposition. Another flaw in Bartow's deposition is his claim that Mr. Guilfoyle instructed him to climb the main conveyor belt to gain access to the screen bolts. All three men that are also involved in the use of this machine said they had never seen anyone climb the main conveyor belt to do this job. They agreed that the proper method

was to use a bucket truck. Even if Mr. Bartow had tried to climb the main conveyor, all three men said that the wooden cover over it would make it impossible to climb. Perhaps the most difficult thing to believe is that Mr. Bartow fell from the platform and hit his head on the side conveyor. The platform is very far away from the side conveyor. It is so far that to fall off the side of the platform and hit the side conveyor would have been nearly impossible. Mr. Green found Mr. Bartow on the ground twelve feet away from the platform. This spot, however, is only five feet from the ladder.

It is our belief that Mr. Bartow is lying about falling from the platform that morning. We believe that he fell backwards from the top of his custom made ladder and hit his head on the side conveyor on his way to the ground. Also, the wrench that he used to tighten the bolts was found next to his body. If the wrench and socket were on the bolt when Bartow slipped they would most likely have stayed up on the platform.

In this case we believe that Bartow should not receive any of his claims. We think that he is lying about the accident. However, we also think the Extec machine is defective for not having a guard rail around the platform. Also, since the screens required tightening and changing so often, Extec should have provided a safe way to get to the platform. If this platform was indeed meant to be stood on, it should have had some sort of guard rail or toe board. However, Extec argues that the platform should be used for transportation uses only. If this is true, it is hard to understand why the platform would have traction bumps.

We would give Mr. Bartow nothing because he tried to lie about his accident. Unfortunately, he was correct about the Extec being a defective machine. Even though we believe the machine to be defective, Mr. Bartow was not injured by the defect. We conclude that Bartow was at fault in this case for the use of his added ladder and blatant disregard for safety.

Chapter 5: Perkins v. Rodgers

On September 3, 1999 a motorcycle struck a car in front of Elishas's Restaurant on 101A in Milford, NH. The motorcycle was a 1996 Harley Davidson, driven by Bruce S. Perkins. The car was a 1999 Mercury Sable, driven by Eric J. Rodgers. Figure 1 shows the position of the car and motorcycle immediately after the accident.

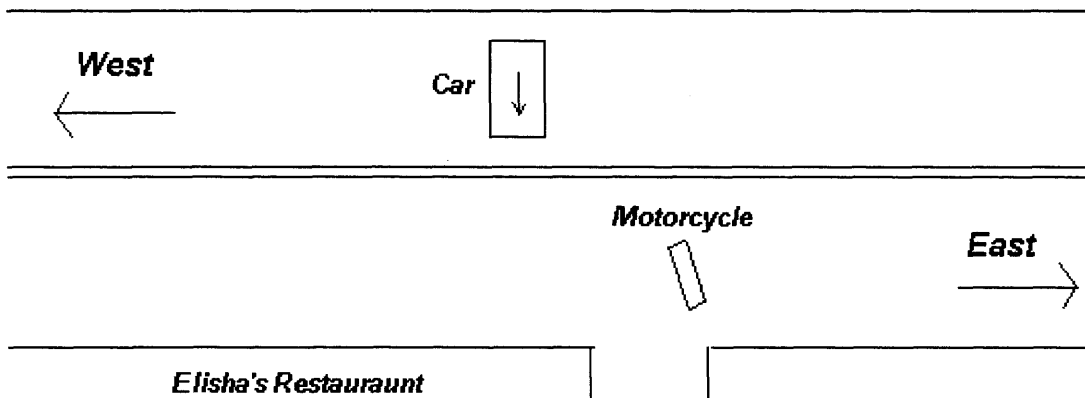


Figure 1: Accident Scene

According to Eric Rodger's deposition, he was in Elisha's having a few beers. Around 7:00 he decided to leave the restaurant. He was going to head back toward Milford, which would cause him to take a left onto 101A West. When he pulled up to the street he says that there were several blind spots created by two poorly positioned telephone poles. He edged his way out and looked right, left, right again and then pulled out. In his deposition he says that he saw and heard the motorcycle as a blur at the same time that the impact occurred. The motorcycle struck the rear of his car and caused it to swing around into the other lane as you can see in figure 1. He says that his car was

traveling about 5 mph at the time of impact. The accident caused \$15,000 damage to his car. Mr. Rodgers did not receive a citation.

According to Mr. Perkins he left his house which is approximately 530 ft West from where the accident occurred. He pulled out of his driveway behind Stephen Neil, the only witness to the accident, and began traveling East on 101A. He claims in his deposition that he saw Mr. Rodgers in the parking lot when he was about 60 to 70 feet away. Mr. Perkins felt that he was going between 30 and 40 mph at that time. According to him, Mr. Rodgers started to go immediately after Mr. Neil passed the parking lot. He says Mr. Rodgers saw the motorcycle and stopped, but then thought he could make it and tried to go again. At this time Mr. Perkins hit both of his breaks hard, sending him into a skid. He claims that he went out and measured the skid mark a couple of weeks later and it was 57 ft. long. At the end of the skid he hit the car, spinning it into the other lane. He injured his left leg in the accident. After the accident Mr. Perkins admitted that he had two beers with his dinner. Detective Chovanec claimed that he could smell alcohol on Bruce's breath. He requested that Mr. Perkins take a breathalyzer test. When he refused to take the test, Detective Chovanec was forced to arrest him for driving under the influence.

The only witness to the accident was Stephen Neil. He was driving East on 101A and saw the accident through his rear view mirror. He said that he remembered the motorcycle pulling out of a driveway at an excessive rate of speed. He thinks that the motorcycle was traveling approximately 65 mph at the time of the accident. He says that he looked back into his mirror right as the accident was occurring. Upon seeing the accident, he drove back to help out. He claims that Mr. Perkins had a strong alcohol smell on his breath.

There are several factors that must be considered when deciding who was at fault in this accident. They had both “had a few beers”. If only one of them had had a few beers then this factor might effect the decision. However, since they were both slightly under the influence we feel it balances out. Another factor is the speed of the motorcycle. The only witness does claim that he was traveling extremely fast. Also, the skid mark was measured by the police to be 103 feet long. This would mean that the motorcycle was traveling faster then Mr. Perkins is leading on. An expert calculated that the minimum speed he could have been traveling was 47 mph. The poorly positioned telephone poles are also a factor. Mr. Perkins even admits that the telephone poles were in the way of Mr. Rodgers’ view. If Mr. Rodgers started to go, then stopped, and then went again then it may be his fault. Because Mr. Perkins was speeding, we have determined that it is 75% his fault. Since Mr. Rodgers could have avoided the accident by staying stopped after he started to go, we believe that he is 25% responsible.

Chapter 6: Vermont Yankee Nuclear Power Corp. vs
Cianbro Corp.
&
Rodney Hunt Corp.

Vermont Yankee is a nuclear power plant in Brattleboro, Vermont. Water from the Connecticut River is diverted through the plant for heat removal. During hot months, this water is circulated through cooling towers before being discharged back into the river. This discharge is controlled by two 11' x 13' hydraulically operated sluice gates. The original gates had many problems over the years such as binding within the travel guides, cracking of cast pieces, and general sealing inadequacies. After twenty-five years of dealing with these problems, Vermont Yankee decided to have them replaced. They hired Cianbro Corporation to supply and install the new gates. The design and manufacturing of the new gates was contracted to Rodney Hunt Corporation. The gates were installed and tested during Vermont Yankee's 1998 refueling outage and were placed in service on May 28, 1998. Within one year of operation the gates failed.

Vermont Yankee found the gates to be having problems opening and closing simultaneously. On May 31, 1998, only three days after they were placed in service, Vermont Yankee personnel noted that the gates would not rise against a full head of water. Because of this problem Vermont Yankee decided to revise the OP-2180 procedure so that the discharge gates could be raised one at a time. Vermont Yankee made this change under the suspicion that the hydraulic system was not powerful enough to raise both at the same time. Vermont Yankee did not report any more problems with the gates until eleven

months later in April of 1999, at which time the South gate was deemed inoperable. On April 5, 1999, Paul Stucchi, the field representative for Rodney Hunt, observed a problem with the gates while performing a yearly inspection of the hydraulic pumps used to raise them. Rodney Hunt had installed this hydraulic pump years earlier when the mechanical system Vermont Yankee had been using failed to provide enough power to the old gates. During this inspection, he found the tongue liners on the South gate were severely worn and that a large amount of water was leaking at an unacceptable rate, approximately fifteen to thirty gallons per minute. At this time the South gate was deemed inoperable. On May 17, 1999, Vermont Yankee determined that the North gate was also severely damaged. At this time, they downgraded the gate and determined it could only be used in emergency situation. It was discovered that the screws holding the tongue liners to the gate had severed. These screws were later found at the bottom of the water basin.

At this point Vermont Yankee filed a lawsuit against Cianbro and Rodney Hunt. The grounds for their suit against Cianbro were breach of contract and negligence in the installation of the gates. The suit against Rodney Hunt was for negligence of design and manufacturing. They are asking for \$1.2 to \$1.8 million in damages and compensation for removal of the Rodney Hunt gates and the purchase and installation of new ones. We will explore every aspect of the case and come to a conclusion as to why the gates failed and who is at fault.

Many different expert witnesses have come up with many different opinions as to why the gates failed. The screws were one major issue in the case. Arguments about screw type, over torquing of screws, stress corrosion cracking, hydrogen embrittlement, and galvanic corrosion invoke questions about the negligence of the design and manufacturing

done by Rodney Hunt Corporation. The existence of wall thimble distortion presents the possibility that Cianbro was negligent in their installation of the gates. Vermont Yankee is not entirely without fault. The change in the operation procedure by increasing the pressure that the hydraulic pumps supplied, may point to negligence on the part of Vermont Yankee.

One of Vermont Yankee's claims was that the gates failed because the wrong types of screws were used to fasten the tongue liners to the gate. The screws were found in the bottom of the water basin after it had been drained. They appeared to have been sheared off from too much stress. Vermont Yankee had Robert Oliver investigate the situation. He found that the wrong type, or what he thought was wrong, had been used in the manufacturing. Furthermore, he theorized that the material the screws were made from did not agree with the environment in which they were placed. In the original drawings which Vermont Yankee had approved, the screws that were on the bill of materials were type 304 stainless steel threaded screws. However, the screws that were found in bottom of the basin were type 410 stainless steel self-tapping screws. The type 410 screw is a martensitic type of stainless steel. Martensitic stainless steels have a body centered tetragonal structure. These alloys are chromium stainless steels with medium to high carbon levels. These screws can be heat-treated to very high tensile strengths. The type 304 screw is an austenitic stainless steel. Austenitic stainless steels have a face centered cubic structure. These alloys are chromium-nickel stainless steels. They are hardenable only by cold environments and have excellent corrosion resistance especially to stress corrosion cracking. Basically the difference between the two is that the type 410 is harder and more brittle than the type 304.

The two types of screws also differ in their tensile strengths. The type 410 screw has a slightly lower tensile strength than the type 304. However, the calculations below prove that the type 410 screws should have been able to withstand the maximum stress produced by the gate on the screws, provided that the stress was evenly distributed throughout all the screws. For a 1/4" screw the shear stress capacity is 3000 pounds. Therefore the maximum shear stress that the gate could have withstood can be found from multiplying the number of screws used by the amount of shear stress each can hold. This can be seen in Equation 1.

$$54 \times 3000\text{lbs} = 162,000\text{lbs}$$

Equation 1

Although it is obvious that the screws failed and there is some debate as to whether the correct screws were used, Rodney Hunt made a special change to their basic design when they produced the drawings for these sluice gates. This change in design was made due to Vermont Yankee's concern for replacability of tongue liners. Vermont Yankee believed that the tongue liners would wear out quickly, requiring them to be replaced often. However, replacing the tongue liners would have been very difficult if they used the self-tapping screws. Thus Rodney Hunt opted to use the type 304, which is a flat head machine screw and could easily be removed. Unfortunately the type 304 was not available and Rodney Hunt made the decision to use the type 410. This decision may seem rash, however, the type 410 still met the safety factor requirement of Rodney Hunt and all Ebasco specifications. Finally, according to Paul Gallo, Vice President of Engineering at Rodney Hunt, approximately 25,000 of these same screws have been used in their gates and they have never had a problem prior to this gate failure.

The metallurgical examination of fracture samples removed from the discharge gate says that it is very likely that hydrogen, generated by mixing of steel and the copper silicon tongue covers, induced cracking at the root of the threads of the screws. This phenomenon is known as hydrogen embrittlement. Hydrogen embrittlement is one of the most significant limitations of the use of high strength steel components. Tensile stresses, susceptible material, and the presence of hydrogen are necessary to cause hydrogen embrittlement. Under normal circumstances, hydrogen atoms recombine to form hydrogen molecules which accumulate and bubble off the surface of the material (the steel screws in this case). However, in the presence of “recombination poisons” that can be present in the environment, the hydrogen atoms don’t recombine and enter the material. Once in the material, hydrogen can affect the mechanical performance of the material. It causes a reduction in the tensile ductility of the material and can cause a brittle fracture when under a tensile stress. When this happens, the material will show an intergranular break. Only one of the screws analyzed during the metallurgical examination showed this type of break. Kenneth Willens, a consultant for Vermont Yankee, also believed this to be part of the cause of the failure. However, he never performed any tests to back up his belief.

Kenneth Willens had two other ideas as to why the screws failed, stress corrosion cracking and galvanic corrosion. Stress corrosion cracking is cracking induced from the combined influence of tensile stress and a corrosive medium. The stress at failure is typically much lower than the normal yield strength of the material. Although Willens introduced the idea of stress corrosion, he did not conduct any tests to determine if it occurred. Stress corrosion cracking can usually be identified by intergranular fracture

surfaces with branching shown in figure 2. The SEM pictures taken of the screws that failed showed no branching of the cracks

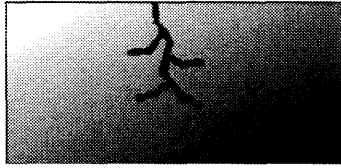


Figure 2

Willens also mentioned Galvanic Corrosion as a possible reason of the failure of the screws. Galvanic Corrosion occurs when dissimilar metals are in contact or electrically connected together. The different electrical potential existing between the two metals produces currents that have a great effect on metal corrosion. Galvanic corrosion is most easily recognized on the surface where the two metals are joined. The 300-series alloys will usually show no appreciable corrosion in fresh water or sea atmosphere. The 400-series ferritic and the martensitic alloys are usually magnetic, stronger, and less corrosion resistant than the austenitic alloys. Although the less resistant 400 screws were used, we believe that galvanic corrosion did not occur because it was not visible on the surface of the screws.

Another theory that has been attributed to the failure of the gates is the over-torqueing of the screws when they were installed. According to Robert Oliver, Kenneth Willens, and the metallurgical examination of fracture samples removed from the discharge gate, it is a distinct possibility that when the screws were installed they were over-torqued. These reports claim that the screws were over-torqued to the point where the pre-drilled holes made for the screws were stripped. To counter this claim of over-torqueing Rodeny Hunt conducted an experiment to determine if the screws could have been over-torqued.

Rodney Hunt produced a video to demonstrate the construction of a sluice gate. Paul Gallo discusses and explains the experiment conducted by Rodney Hunt in his deposition. In the experiment one of the same screw guns that was used in the construction of the original sluice gates was used. These screw guns were fitted with torque limiters, however in the experiment they turned the torque limiter up all the way. In every case the person injecting the screws with the gun could not damage the screw. This makes sense because the type 410 steel is much harder than cast iron. This is due to the higher carbon content in the type 410 screws. This evidence, along with the experiment and the metallurgical properties of the metals involved, shows that the cast iron would strip before the type 410 screw would be damaged. Thus, it is very unlikely that during installation the screws were damaged.

We believe that the most important aspect of the case is the wall thimbles that were in place since the last gates were installed. The original wall thimbles were installed when the original concrete wall was constructed. These wall thimbles are basically a way to form a place in the cement for the gate to be held in place. Figure 3 shows a typical wall thimble.

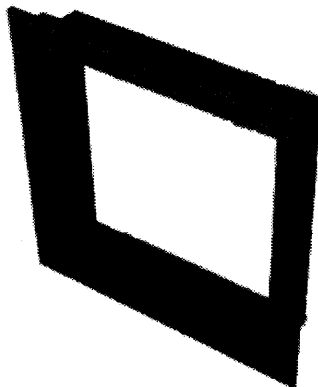


Figure 3: Wall Thimble

When Rodney Hunt released the gate to Cianbro it was accompanied with an instruction manual, which had all the pertinent information about the gate that Rodney Hunt built. This information included the installation procedures. Rodney Hunt, in the manual, instructs the installer of the gate to check the flatness of the wall thimbles before installation. In this case Cianbro did not perform a valid check of the flatness of the wall thimble before installing the gates at Vermont Yankee. According to Keith Beardsly during the installation of the gates at Vermont Yankee he says that the flatness of the thimbles were not checked before installation. After the installation, there was a visible gap between the wall and the wall thimble that both the installers and Mr. Beardsly could see. Mr. Beardsly said the Cianbro workers filled the gap that was between the wall and the wall thimble with expandable foam. Expandable foam has to be the worst possible idea to try to fill that gap.

After installation when the gap was visible, the wall thimbles were checked using an informal test with a string. The results were inconclusive and the gap was filled with expandable foam. Because of the gap between the gate and the wall, the shear stress that was placed on the gate was not distributed evenly among all the screws on the gate. This caused the screws nearest to the bind in the gate to fail first and then it is a domino effect from there. Eventually, because of the unevenly concentrated loads on the screws, they all failed.

When Vermont Yankee placed the order for the gates they specially requested a bronze on bronze for the tongue covers and guide liners. This was because they were looking to have better replaceability and corrosion protection than the bronze on cast iron would provide. They placed this order even though the standard at the time was bronze on

cast iron. However, in Robert Oliver's report he claims that the coefficient of friction would have been too high with the bronze on bronze and that is what he thinks caused the failure of the gate. In his deposition Robert Oliver says he found the coefficient of friction to be .88 for bronze on bronze. This, however, was an estimate because he could find no bronze on bronze information. Instead he used the data he found for brass on brass. He did so because he thought that since they seemed to be similar alloys that they would have similar friction properties. This data was acquired from Mark's Engineering Handbook. Oliver also goes on to state that brass on cast iron would have had a much lower coefficient of friction on the order of .22. Although he is correct when he claims that the coefficient for brass on brass is higher, it is not as high as he thought. In a test done by Hagglund Engineering Associates they found that the coefficient of friction for a wet bronze on bronze is .494. Considerably lower than Robert Oliver's estimation. This shows poor professionalism and engineering practices on the behalf of Robert Oliver. Perhaps if he had done his own calculations and performed the proper tests he would have had some evidence to back up his so-called professional opinion. This also strengthens the case that friction was not the cause of this failure.

Cianbro and Vermont Yankee are both responsible for the failure of the gates. We believe the actual cause of the failure of these gates was the distortion of the wall and that this is due to Cianbro's negligence. It is clearly stated in the instruction manual which Rodney Hunt provided to Cianbro that the wall must be checked for distortion before the installation. This quote is taken directly from this instruction manual.

"Where the gate is being mounted on a steel flange that has been welded to a pipe or adaptor, the front surface of the pipe or adaptor will not be sufficiently flat unless

it has been machined after welding....Be sure that neither surface is distorted. A feeler gauge should be used to check the clearance completely around the periphery of the gate...In no case should the gate flange be firmly tightened against a flange that is not flat...If the spacing is very large, the gate should be shimmed a small distance away from the flange. Space between the flanges can be caulked with lead wool. This will allow the gate to be tightened to the steel flange without distortion or leakage between the flanges.”

This clearly explains that the wall must be checked for flatness before installation. It also explains what to do if it s not flat. Cianbro did not check for flatness prior to installation. When they discovered that the gaps were $\frac{3}{8}$ inch to $\frac{1}{2}$ inch they simply filled them with expandable foam to prevent leakage. We believe that they had excessively tightened the flange in an attempt to close the gaps. However, the gaps were still so large that even this tightening wasn't enough. This tightening caused the wall thimble to become distorted. Since the gap between the tongue and the liner was only $\frac{1}{8}$ in and the gates were distorted $\frac{3}{8}$ inch to $\frac{1}{2}$ inch, excessive binding occurred between the tongue and liner. This binding caused the screw holes in the tongue liner to elongate as excessive pressure was put on them. The screws eventually sheared rendering the gates virtually useless.

Also, this severe binding is probably why the gates did not operate properly the first time Vermont Yankee tried to use them. It makes sense that if there was significant binding more pressure would be needed to raise and lower the gates. They were forced to increase the pressure supplied by the hydraulic pumps the first time they tried to operate the gates. Vermont Yankee was required to report any problems with the operation of the gate

as soon as they occurred. They obviously didn't do this so we believe that Vermont Yankee was also somewhat negligent.

There is also evidence to support the distortion theory in the old gates and in the gates that replaced the Rodney Hunt gates. Vermont Yankee had many problems with the old gates which they blamed on their age. They may have needed to replace original electric operator with the more powerful hydraulic operators because the old gates were also binding due to distortion. When the new ARMCO gates were installed, the flatness of the wall was finally checked. They found that the walls were not flat and took the necessary steps to correct the problem. The gates are still fully operational today.

Rodney Hunt is a very established company in the field of building gates, especially sluice gates. We do not believe that the Rodney Hunt Corporation did anything negligent in the design or manufacturing of the gates. Half of Rodney Hunt's business focused mainly on manufacturing sluice gates, they manufactured 1100 sluice gates in the year 2000. According to Paul Gallo, now vice president of engineering and manufacturing at Rodney Hunt, all gates manufactured by Rodney Hunt meet the American Water Works Association (AWWA) standards, the EBASCO standards, and Rodney Hunts own standards. The Rodney Hunt standards are used in cases where the manufacture feels that the other standards AWWA and EBASCO are not high enough. For example, the EBASCO standards require a safety factor of five, there shall be a difference between the ultimate tensile strength and the calculated load equal to five or more on the stress on the subject component. Rodney Hunt Standards uses a safety factor of six. Paul Gallo also informs in his deposition that Rodney Hunt does not "design" gates, they simply take any special requirements that a company gives them and builds the gate to those requirements and to

the set standards above. Mr. Gallo explains that after Rodney Hunt won the bid for the gates they submitted a set of drawings that were in accordance to Vermont Yankees specifications.

Our final conclusion is that Cianbro and Vermont Yankee were equally negligent. Therefore, they should equally split the cost of the damages and the cost of removing the old gates and having new ones installed.