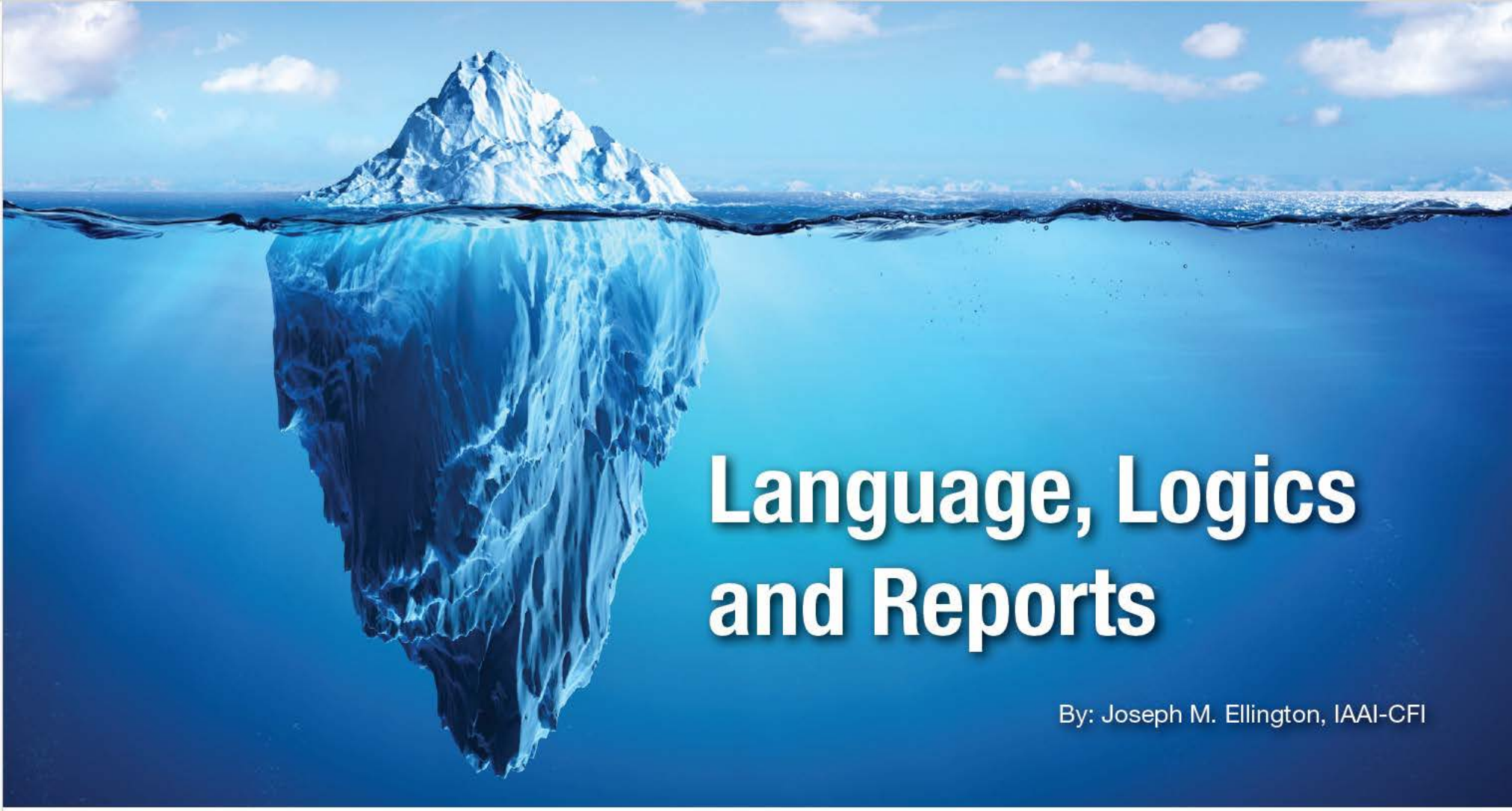


Language, Logics and Reports

By: Joseph M. Ellington, IAAI-CFI

Figure 1–An iceberg as a metaphor

ABSTRACT:

An iceberg is a metaphor used to illustrate that reports are only a small but visible part of fire and explosion investigations. NFPA 921 and NFPA 1033 are guidelines and a roadmap for fire and explosion reports. They provide a recommended organizational framework and a minimum scope of content that guides you and reassures you that you are following the best practices in the field. This guidance is invaluable in ensuring the quality and reliability of your reports.

Reports should not just be a testament to your attention to detail but a reflection of it. They should possess chronology, language clarity, elucidation through visual aids, analysis explaining how opinions or conclusions were reached, and reinforcement of evidence. Reports should be clear, comply with standard definitions, and provide sufficient information for independent review for accuracy, particularly when referring to NFPA documents. This article addresses what should be in a fire or explosion report, how it should best be presented, and the forces shaping it.

INTRODUCTION

As professionals in the field, your role in the investigation process is crucial.

Reports should be developed and written in the same manner and sequence in which an investigation is conducted. Each step provides a foundation for the one that follows.

Figure 2—Reports should reflect the sequence of investigative activities

The final step in a fire or explosion investigation is frequently the preparation and submission of a written report. Mirroring the investigation process in the report ensures a logical flow, which in turn helps the reader

understand the steps taken to reach the conclusions. This logical flow provides reassurance and confidence in the thoroughness of the investigation.

While NFPA 921 does not prescribe or require a specific format or content, it does identify the purpose of a written report, recommend a framework for its organization, and suggest a minimum scope for its content. Reports should begin by stating their purpose and reflect, not simply cite, the investigator's observations, activities, analyses, and conclusions.

Every report should be considered an expert report. A witness who is qualified as an expert by knowledge, skill experience, training, or education may testify in the form of an opinion if the expert's scientific, technical, or other specialized knowledge helps the reader to understand the evidence or determine a fact in issue, the testimony is the product of reliable properties and methods, and the expert reliably applied the principles and techniques to the point of the case.[1]

Every sentence in a report comprises one type of data representing information. The specific type of information conveyed in reports is at the discretion of its author and employer. The reader interprets its relative importance. The kind of information expressed in reports includes:

- **Facts**—Facts are statements that can be objectively verified and proven true or false through evidence. They are based on reality and are universally accepted regardless of individual beliefs unless otherwise proven.
- **Opinions**—Opinions are subjective statements that express personal beliefs, feelings, or judgments. They cannot be proven true or false and often vary from person to person. An opinion is a view or judgment formed about something not necessarily based on facts or knowledge but on a personal perspective.
- **Conclusions**—Conclusions are logical inferences derived from facts. They involve reasoning and analysis to reach a decision or judgment based on available evidence. They are judgments resulting from a process and are reached after deliberation.
- **Expert opinions**—Expert opinions are based on the person's knowledge and experience after applying reliable methods to specific facts. They are beliefs, judgments, or conclusions reached or given by a person with comprehensive and authoritative knowledge in a particular area after systematically applying an acceptable methodology to the information, facts, and evidence examined. All final hypotheses are drawn according to the principles expressed in NFPA 921 and reported appropriately.

Understanding these distinctions helps evaluate information critically, ensuring that decisions or judgments are based on reliable evidence rather than subjective beliefs or unsupported assertions.

Framework of Written Reports:

This section outlines the typical structure and content of a fire or explosion report, providing a guide for organizing and presenting your findings. It is designed to help you understand the key components of a report and how to present your findings effectively.

The actual format and content of the report will depend in part on the needs of the organization or client on whose behalf the investigation was performed but generally revolves around the origin, cause, and responsibility for a fire. The client determines whether a report will be written, and its content based on their need and instruction. While conclusions from more than one expert can be contained in a report, the better choice is for each expert to prepare a separate report that presents their own opinions and conclusions and the basis for them rather than inject confusion and circular logic into its findings.

Many reports include a *disclosure* or *disclaimer*. Sometimes, the two are confused or combined, and the report writer and reader should understand their purpose and differences. A *disclosure* is more about transparency. It lists and describes the source of the information or methodology on which the report's findings are based. A *disclaimer* is more about protection and attempts to limit responsibility and accountability. Disclaimers set boundaries around the information that is provided.

Some organizations or clients require either one or the other to be included in reports. Neither guarantees the report's findings or the investigator's opinions and conclusions regarding the facts and evidence (hypothesis) as reliable and accurate nor protects them from liability or the consequence of being wrong. Neither is required by NFPA 921, NFPA 1033, nor the court. Although disclosure is important and even required, verification is the only way to guarantee the accuracy of a report's findings.

REQUIREMENTS OF NFPA 921 AND NFPA 1033[2]

These requirements are guidelines that ensure the quality and accuracy of your report.

- Nature or intent of the report.
- The date the report was submitted (i.e., written).
- Date, time, and location of the loss.
- The date and location of any examination(s)
- Name of person requesting the report
- Scope of the investigation (tasks assigned and completed)
- Conclusions

- Facts and data the investigator relied on to reach any opinions or conclusions, and the reasoning for each.
- Name of who prepared the report.

There are also legal considerations concerning court-mandated reports. Most of these are found in the federal system but mirrored in statutes or rules and procedures of courts in many states. The judge of a particular court of a matter will determine whether these criteria are met.

The conclusions of most reports are, at least potentially, expert opinions to be accepted by the judge and jury of the court to which they are submitted. As a result, every report should be considered an expert report, particularly if it claims to adhere to the recommendations of NFPA 921 and the requirements of NFPA 1033. The requirements of all reports in the federal system[3] include:

- A list of materials reviewed and investigative activities that are conducted.
- A list of opinions the expert intends to express at trial.
- A list of publications by the expert in the last 10 years.
- A list of testimony given either at trial or in a deposition for the last 4 years.
- The compensation the witness received for his or her work.

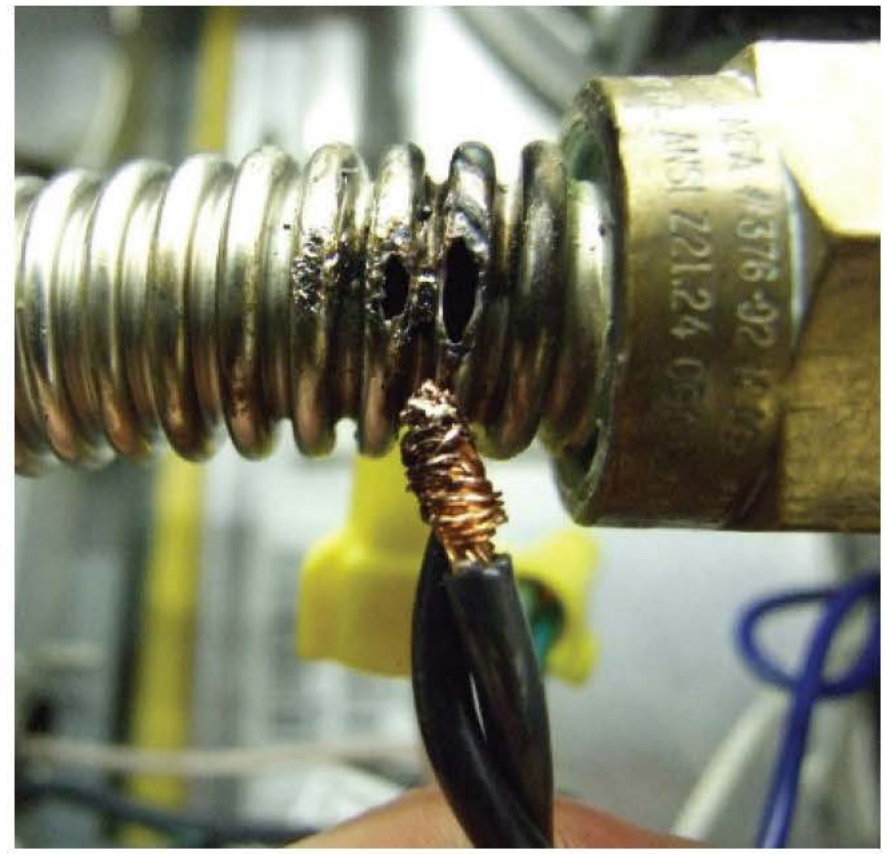
AUTHORING GOOD REPORTS

Using the first letter of a word to help remember a concept is called a mnemonic. An excellent way to remember the elements that make up a good report is to remember the word **CLEAR**, which stands for **C**hronology, **L**anguage, **E**lucidation, **A**nalysis, and **R**einforcement.

CHRONOLOGY—Good reports do not come from divine inspiration but from planning, organization, critical thinking (i.e., logic), and language. An excellent report starts at the beginning and ends at the end. The reader should not have to flip or turn elsewhere to clarify a question and return. The reader should not have to search for expert conclusions in a separate narrative or analysis.

LANGUAGE—Clarify for the reader and do not confuse! Language, words, and phrases should comply with standard adopted definitions and refer to footnotes within the document for further explanation if needed.

ELUCIDATION—Notes, diagrams, and photographs should be used to clarify a data point or concept.



A good picture is worth a thousand words. Visual representations often convey complex ideas more effectively than lengthy written explanations, emphasizing the power of visual communication over words.

For example, the illustration at the left clarifies an arc site involving localized damage caused by an uncapped, energized conductor that came into contact with a gas line. The graphic visualizes rather than describes in words to the reader what happened.

Figure 3–An example that emphasizes the power of visual communications.

ANALYSIS—An analysis should explain how an opinion or conclusion was arrived at or determined. The crucial test for a report is that it contains sufficient data that it may be independently verified to confirm its findings.

REINFORCE—Types of evidence—A report may contain information, facts, opinions, conclusions, or expert opinions. The level of certainty used to express an expert opinion should be identified as probable or possible, and based on acceptable and identifiable methodology. Terms of art such as “to a degree of engineering certainty’ or ‘scientific certainty’ should be avoided.

REVIEW

The content of any report is initially dependent on the organization or client requesting it and its purpose. However, the review of reports that take place before a report’s release often determines its value and impact. The review process, including technical, administrative, and peer reviews, ensures adherence to standards and the accuracy of opinions and conclusions. Reviews should be conducted without bias and demonstrate

compliance with both NFPA 921's guidelines and NFPA 1033's requirements.

Neither NFPA 921 nor NFPA 1033 explicitly requires the review of fire investigation reports. However, both documents emphasize the importance of thorough documentation and adherence to professional standards in fire investigations.

Figure 4—The Purpose of a Review

Purpose of a Review

It is not unusual for an organization to perform either a technical or administrative review of a report or to have the same individual perform both reviews.

Technical reviews generally focus on the report's content, whether it complies with basic fire science, the methodology and guidelines of NFPA 921 and NFPA 1033, the facts and evidence presented in the report, and whether its findings are within the scope of the investigator's role or instructions. A proper technical review must include access to the same documentation available to the initial investigator, usually performed by an investigator's colleague, supervisor, or manager.

Administrative reviews are generally performed to ensure the report complies with the organization's required format, policies, procedures, and standards. Large organizations sometimes have a separate department or division that performs administrative reviews and checks for spelling, composition, grammar, and formatting.

Peer reviews differ from technical or administrative reviews of reports in that they are truly objective. Their main aim is to ensure compliance with professional standards. There are organizations and individuals with the knowledge, experience, and expertise to perform peer reviews. Actual peer reviews, however, seldom occur because they require someone unfamiliar with the author and without a vested interest in the outcome.

An important point to remember about reviews is that they are part of a broader process that includes the underlying investigation. The crucial test for a report is that it contains sufficient information, allowing an independent reviewer to arrive at a similar, if not the same, conclusion. The report and its findings must stand up to the reasonable examination of others, usually another expert. Reviews demonstrate compliance with the recommendations of NFPA 921, the requirements of NFPA 1033, and the principles of fire science, which gives validity to the findings of a report.

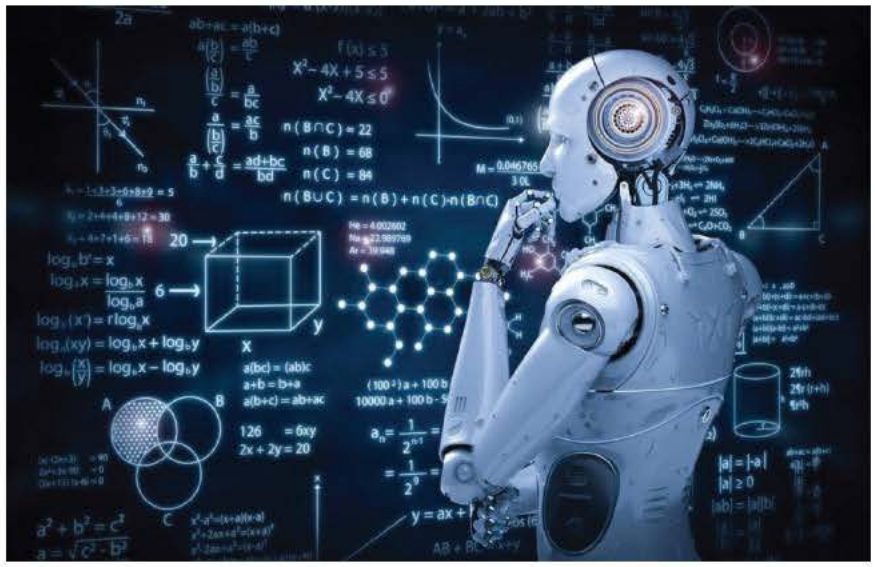
The Present and the Future—Templates & Artificial Intelligence

Writing reports based on the analysis of a documented investigation involves time and money in the real world. Fire and explosion investigations and documentation are lengthy and complex, and the specific processes resulting from a report are not necessarily efficient or cost-effective. Accordingly, much effort has been invested in developing ways and means to investigate a scene and generate a report more efficiently.

Organizations may adopt the generation of reports through external parties and incorporate them as their own. Using a template is a method by which organizations have classically approached the generation of reports. These methods typically involve an organization-wide acceptance of a specific format with internal references that comply with external protocols and standards (e.g., NFPA 921, NFPA 1033, ASTM standards)[4]. The approach is generally implemented along with internal administrative and technical reviews. It is essentially a quality control approach to ensuring the content and format of reports through review before the report is published or released.

The template technique may be replaced or supplemented with an 'active document' approach that automates the process by combining data extracted from the scene with the accepted internal format to produce a finished report. Organizations may also choose to reach out to external parties who specialize in developing reports based on these approaches and attempt to balance internal and external demands.

Besides fire, language may be the most important of men's complex and evolutionary discoveries. Logic, which arises from language and is the basis for opinions and conclusions in reports, has traditionally been arrived at through human means and is threatened now by Artificial Intelligence (AI). AI is the most promising and perhaps the most hazardous of man's recent technological developments. AI expert systems are not widely used or tested, are limited, and raise practical, legal, and ethical concerns.



AI replicates human cognitive functions, creates algorithms that detect patterns in data, and applies these patterns to automate specific tasks.

AI refers to the ability of a computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. It is the simulation of human intelligence in machines that are programmed to think and act like humans.

Figure 5—Artificial Intelligence

AI is currently incorporated into the technology used by fire and explosion investigators and has already found its way into the current report-writing process on some levels. It will continue to evolve into other aspects of fire and explosion investigation and litigation in the future. While AI can improve the efficiency and speed of report writing, it falls short of meeting existing legal requirements and lacks transparency.

Major word processing programs, for example, incorporate AI and claim to scrutinize writing to improve clarity and word choice. The availability is free or can be purchased through fee-based services. How the choice of words affects the substance (opinions and conclusions) of such reports, not just their appearance or form, is subject to debate.

Logic is always intertwined with language. While currently, most reports are subject to technical and peer review to guarantee their accuracy, it is unknown to what degree AI plays a part in the current evaluation of reports simply because few reports contain a disclosure that AI tools were used, even if used only to check for spelling and punctuation.

AI can solve many difficult choices in finding information and establishing whether a guideline or standard has been consulted and adhered to. AI will likely play a more significant role in the fire and explosion investigation process in the near future. AI is already quickly replacing humans in the review of reports. In addition, it overcomes writer's block, creates content faster than many people, and is cost-effective, which is probably the most significant benefit.

The term Artificial Intelligence, however, is not found in either NFPA 921–Guide for Fire and Explosions or the NFPA 1033–Standard for Professional Fire Investigators. Despite this, these NFPA documents indirectly recognize the potential impact of AI on enhancing investigative practices.

Figure 6—Artificial Intelligence often reveals data but not its source.

SUMMARY

In summary, the content and format of an excellent report determine the course and destiny of a fire and explosion investigation. Guidelines provided by existing standards and federal requirements offer a minimum base for the content for these, but the adaptation of language and logic dictates its survival and success.

Although not required, the Federal Plain Language Guidelines[5] offer advice on writing clearly, ensuring that users can find, understand, and use information effectively. The guidelines cover audience considerations, organization, writing principles, and testing techniques.

Do not be naïve or believe you can brilliantly maneuver through a poorly performed investigation or badly prepared report. The odds may be in your favor and the risk may be low. It is real, however, and it only takes one failure to cause permanent damage.

Strive to be professional and exercise integrity in your work. Use and apply only known and documented facts based on accepted scientific analysis methods appropriate to a particular problem to arrive at a verifiable conclusion. Conform to formally adopted professional and ethical standards and guidelines.

Figure 7—Strive for integrity, not winning; you will win!

---

1. Fed. R. Evid. 702 - Federal Rule of Evidence 702 governs the admissibility of expert witness testimony in federal courts.
2. NFPA 921–Guide for Fire and Explosion Investigations, Chapter 16, Section 16.5.2 Report Organization and Content, Section 16.5.3 Descriptive Information
3. The Federal Rules of Procedure (Rule 26(a)(2)(B)) require experts who will be called trial witnesses to prepare reports, which may form the basis for cross-examination during the witness's deposition or trial testimony. The judge of a particular court of a matter will determine whether these criteria are met.
4. ASTM E620–Reporting Opinions of Scientific or Technical Experts.
5. https://www.plainlanguage.gov/media/FederalPLGuidelines.pdf