

How to Write a Forensic Engineering Expert Report

Part 1: Causation - What Happened and Why it Happened

prepared by

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When a failure analysis investigation by a forensic engineer has progressed to the point that a report is needed, the following methodology may be employed to assist the engineer in the process of documenting the results of the investigation. Note that this methodology is concerned with the process of documenting an investigation. Methods for conducting an investigation are outside the scope of this document and are addressed elsewhere. In addition, should a matter proceed to litigation, the Federal Rules of Civil Procedure, Rule 26(2)(B)(i) states that expert witness reports must contain, “A complete statement of all opinions the witness will express and the basis and reasons for them.”¹

1. Consider what action the client needs to take. Typical goals are to:
 - a. Determine if peril is covered or determine responsibility/liability.
 - b. Answer the question, “What information does the client need that will allow the client to take appropriate action?” If the client needs to know what happened (the circumstance resulting in loss), or why it happened (the cause of the loss).

2. Enter client information, reference information, header information, page 1 synopsis, statement of purpose, and outline of report.

¹ The reader is referred to Rule 26 of the Federal Rules of Civil Procedure, which contains numerous additional requirements for expert reports and testimony

3. Write the background detail.
 - a. This will contain the reason that investigation was initiated.
 - b. May include date forensic engineer was contacted and date forensic engineer took initial action.
 - c. May include additional information to improve readability.
 - d. May include post-failure circumstances from relevant authorities to establish a timeline of events.

4. Lay out documents that help tell the story. Examples of these include:
 - a. Photographs
 - b. Data collected
 - c. Field notes
 - d. Standards
 - e. Calculations
 - f. Modeling results
 - g. Laboratory exam results
 - h. Equipment manuals
 - i. Reports by others
 - j. Etc.

5. Write the draft conclusions that address the client's needs determined in Step 1.
 - a. Use the "result, result, result" format of sequential statements.
 - b. Write single sentences that are declarative.
 - c. The statements should be understood without the rest of the report.

6. If a cause is needed, utilize the "Determination of Cause Method"² journal article and flow chart to write a summary analysis to establish the cause. This analysis may or may not be included in the final report.

² M.D. Russell and T.A. Jur, "Engineering Analysis of Failure: A Determination of Cause Method." Journal of Failure Analysis and Prevention, DOI 10.1007/s1 1668-016-0224-9, 03 January 2017.

- a. Answer each question and provide brief explanation.
 - b. State the cause:
 - i. Long-term wear and tear
 - ii. Person or entity
 - iii. Act of nature
 - iv. Unknown
7. Add final draft conclusion stating cause and establishing “Why it happened?”
- a. Use the “result, result, result, cause” format of sequential statements.
 - b. Write single sentences that are declarative.
 - c. Cause Stated
 - i. Long-term wear and tear
 - ii. Person or entity
 - iii. Act of nature
 - iv. Unknown
 - d. The statements should be understood without the rest of the report.

Consider obtaining an internal peer review prior to further work on report. Revise as needed.

8. Write “Work of Investigation” section in body of report.
 - a. Describe what was done (investigative or evaluative activities).
 - b. Include dates, locations, people contacted, etc.
9. Write “Observations” section in body of report.
 - a. Facts found, what was seen, heard, measured, etc.
 - b. Organize in a manner to assist understanding and readability.

- c. Observations should be the result of actions documented in the “Work of Investigation” section of the report.
10. Write “Discussion” section of report.
 - a. Provide a bridge from the facts to the conclusions.
 - b. Each conclusion should be found verbatim in the “Discussion” section of the report (or sometimes elsewhere in the report).
11. Revise the draft conclusions and make consistent with the discussion section.
12. Write “Other Considerations” (if needed).
 - a. Use this for information that does not fit elsewhere in report.
 - b. Theories of others sometimes addressed here.
13. Some reports require additional sections.
 - a. These to be added at the discretion of the investigating engineer.
 - b. Examples could include:
 - i. Chronology (inserted before or after the observations)
 - ii. Additional background regarding something involved in analysis - for instance how a piece of equipment is used (inserted before or after the observations).
 - iii. Test results.
14. Create figures with captions.
15. Determine whether or not the actionable information detailed in Step 2 has been provided by the report.

16. Limit the use of adjectives (also known as –ly words which often convey lack of certainty or equivocation), words that express absolutes (always, never, must, etc. which often are exaggerations), and undefined jargon.
17. Use acronyms with caution as necessary for readability.

Final internal review prior to submission to client. Revise as needed.