

APPENDIX 2

LOAD TIME HISTORIES

The signals from a dynamic test generally present a half-cycle time history. That is, they present a non-cyclic loading/unloading behavior, due the half-cycle deceleration forcing function imposed during the test.

Figure 5 presents a hypothetical comparison between experimental and analytical time history results. For this example, it is not important what actual measurand is being compared. It is identified simply as a hypothetical load.

The peak load between test and analysis correlates to within 10 percent. In addition, in relation to the entire time history, it is clear the character of the loading event is preserved. Although parts of this AC provide guidance on performing a comparison using quantifiable criteria, it may be difficult to rely only on these criteria. In other words, part of the validation should include asking the following question: “Does the comparison **look** reasonable?” This qualitative assessment is a part of the validation.

Figure 5 would support a validation claim by the applicant. This curve shows that the applicant has met the quantitative guidelines (i.e., peak load within 10 percent). The applicant has also established a good correlation of the time-history plot. In addition, note that the analysis tends to be conservative, at least during the loading portion of the time-history. That is, for a selected time, the analytical load is greater than the test load. Therefore, not only do the peaks loads correlate well, the analysis is also conservative.

Regarding the unloading portion of the curve, this part of the event is usually not important to model validity, thus little effort is expended to get precise correlation. In many instances, it would not be reasonable to require tight correlation for this particular portion of the time history curve.

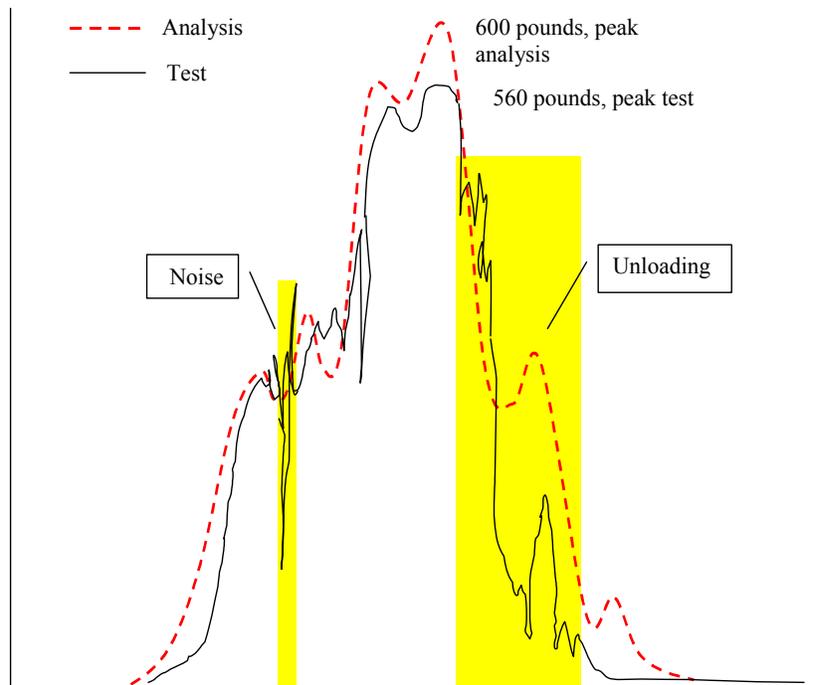


Figure 5 – Hypothetical Load vs. Time (Good correlation)

As a stark contrast, Figure 6 shows it is not always sufficient to rely on peak value to determine correlation. Model validation may require the peak load to correlate within 10 percent. The data in Figure 6 meets that criterion. However, there are other elements to consider that are not easily verbalized, described, or quantified. One such item focuses on how the analytical time history tracks with the test time history. The data in Figure 6 does not satisfy this element. From a qualitative view, the analysis fails to adequately reproduce the test measurement.

It is not the intent of this AC to suggest that the applicant is burdened to preserve the dynamic response of a parameter throughout the full time history and within a strict tolerance. While Figures 5 and 6 are simple examples, they serve to demonstrate this important point.

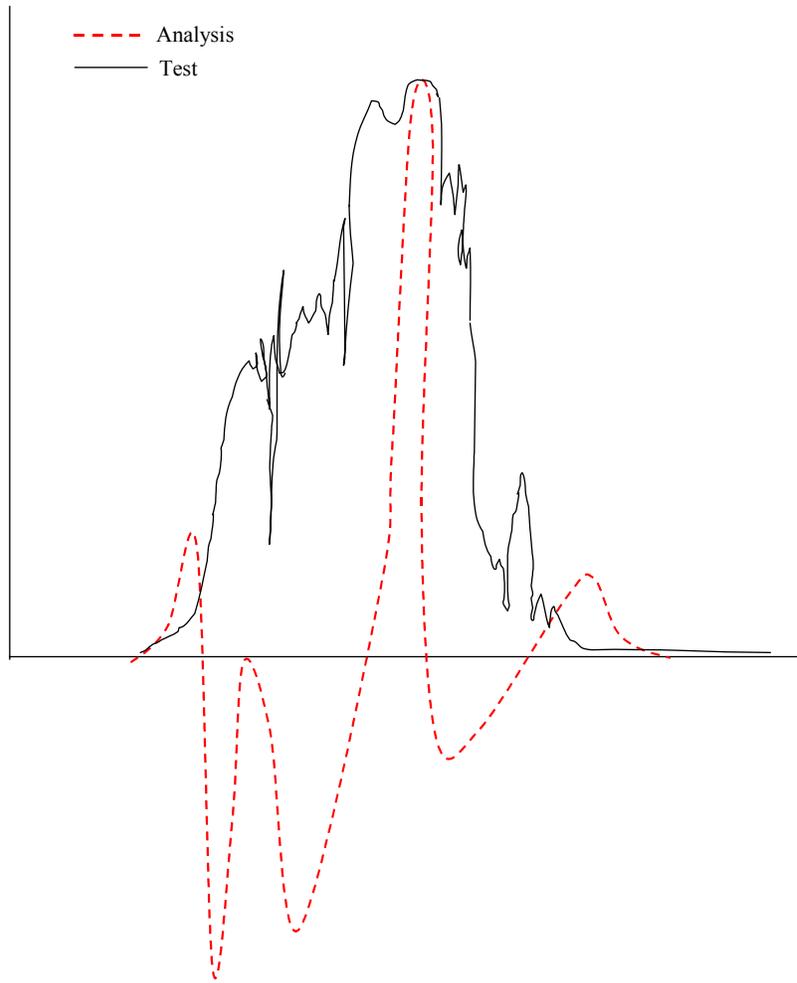


Figure 6 – Hypothetical Load vs. Time (Obvious poor correlation)

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