

IEEE Standards Interpretation for IEEE Std 493™-1997 IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems

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Interpretation Request #1

A question has come up as to which value to use for downtime per failure (MTTR) in a light manufacturing facility which operates 24 hours a day. For instance, Summary Table 3-2 presents two values in the actual hours per downtime column: Industry Average, and Median Plant Average. This same information is presented in Tables 2 through 19 of Annex A, along with two additional columns called clock time to repair a component, and clock time to replace a component.

An example of the wide variation is thermosetting cable terminations, 601-15,000 volts on page 207. The MTTR ranges from 11.3 to 451 hours. The supporting text to Appendix A on page 202 suggests that the best value to use is "simply the average of the observed outage durations". It is not clear which of these four values should be used. An interpretation of this would be greatly appreciated.

On a different matter, there appears to be a typographical error in Table 3-2, page 40. Under Circuit Breakers, Metalclad drawout type-All, there are four categories. I believe the second and third lines should be indented to distinguish between breakers that are 0-600V, and those above 600V as they were in the 1980 and 1990 editions. They are also shown this way (indented) in Table 2 on page 205.

Interpretation Response

The industry average value was recommended for use in reliability calculations. However, if the sample size of the data is small then the average value is significantly distorted (i.e., 11.3 to 451 h) implying the underlying statistical distribution of the data is seriously skewed... When the underlying statistical distributions are either severely skewed or multimodal then the average value takes on a value that does not correspond to reality.

In these cases the median plant average should be used in the analysis.

Regarding the typographical error in Table 3-2, page 40, the typographical error does lead to some confusion.