

2. NONDESTRUCTIVE INSPECTION RELIABILITY

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The need, rationale and basis for nondestructive inspection (NDI) reliability are discussed. The performance capabilities of applied NDI / measurement procedures is required to meet requirements for structural integrity of materials, components, structures and systems. The demand of quantification has resulted in development of new NDI engineering requirements, analysis methods, tools, and applications. The origin, development and application of the “Probability of Detection” (POD) metric as a measure of NDI capabilities, NDI procedure validation and verification, and application to varying NDI materials, instruments and processes are discussed. NDI engineering considerations, applications, calibration, process control, application and continuing validation of NDI measurements are necessary to provide both the reproducibility, repeatability and detection capability that are major elements of the reliability and confidence level for a NDI procedure.

Quantitative NDI capability performance is an essential element and tool in meeting “NDT-Basis of Safety”, life cycle analysis, and life extension requirements. Discussion is from an NDI engineering point of view. The POD metric requires a basic understanding of statistical methods used in analyzing, plotting and analysis of NDI measurement capabilities. The focus of this discussion is on NDI engineering and the use of statistical methods as analysis tools. The requirements and constraints inherent to NDI measurements applications are discussed along with methods and protocols for estimating NDI performance using small sample sets.