INSTITUTE OF ENVIRONMENTAL SCIENCES AND TECHNOLOGY

Product Reliability Division Recommended Practice 001.1

IEST-RP-PR001.1

Management and Technical Guidelines for the ESS Process

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This Recommended Practice was prepared by and is under the jurisdiction of Working Group 001 of the Institute's Product Reliability Division.

Fourth printing, July 2017

ISBN 978-1-877862-70-0

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1 SCOPE AND LIMITATIONS

1.1 Scope

This Recommended Practice (RP) supersedes the Environmental Stress Screening of Electronic Hardware (ESSEH) *Environmental Stress Screening Guidelines for Assemblies* (1990). This RP provides an overview of the techniques and considerations needed to define a viable Environmental Stress Screening (ESS) program. This RP uses language that can be used by the military, government, and commercial communities alike.

This RP is intended to be an important tool that can be used by the electronics industry for conducting ESS. This document applies to a knowledgeable ESS practitioner as well as to those individuals who are new to ESS. Additionally, it provides the practitioner all of the tools required to successfully plan, develop, and implement a viable ESS program.

The process elements required to successfully implement ESS will be discussed in this document. Those process steps necessary to keep the ESS process dynamic will be discussed, i.e., successful planning, implementation of ESS, the collection of failure data, the analysis of failures, and implementation of corrective action.

This document is not intended to describe engineering development or formal verification environmental tests. These subjects are valuable parts of the product development process, but because of their depth and complexity are beyond the scope of this document.

This document describes the application of thermal, vibration, and electrical performance forcing functions during the ESS process because of their nearly universal utility. However, other types of forcing functions (such as pressure cycling or acoustic noise) or performance evaluation (such as X-ray and infrared scanning) may be appropriate in special circumstances for particular products. This document should not be construed as discouraging the application of other relevant forcing functions when appropriate.

This document stresses the need to expose product to forcing functions as early in the life of the product as possible. This will ensure that the best product possible, given requisite economic considerations, is produced.

This document recognizes that a product will likely be composed of several different assemblies. As these assemblies are integrated and the product becomes more and more complex, the level of environmental loading that the lower level assemblies may experience can be greatly attenuated (i.e., thermal path restrictions and vibration dampening). With this in mind, and realizing that all assemblies are prone to process anomalies, this document emphasizes the need to perform ESS at the lowest practical assembly level.

This document discusses the screening environments of temperature cycling, random vibration, and power cycling. For each of these environments, a discussion of the steps required to successfully incorporate them into the ESS program will be provided. This discussion includes: facility requirements, establishing screening parameters based on product response to a forcing function, and how to keep the ESS process dynamic. Furthermore, every opportunity is given to tailor ESS parameters to account for both the inherent design capability and the customer environment of the product.

This document was prepared by the ESSEH Technical Committee Working Group over a three-year period. This document will make available to in-

