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LPI Materials Testing Information

Penetrant materials are classified in the various industry and government specifications by their physical characteristics and their performance. Aerospace Material Specification (AMS) 2644, Inspection Material, Penetrant, is now the primary specification used in the USA to control penetrant materials. Historically, Military Standard 25135, Inspection Materials, Penetrants, has been the primary document for specifying penetrants but this document is slowly being phased out and replaced by AMS 2644. Other specifications such as ASTM 1417, Standard Practice for Liquid Penetrant Examinations, may also contain information on the classification of penetrant materials but they are generally referred back to MIL-I-25135 or AMS 2644.

Penetrant materials come in two basic types. These types are listed below:

TYPE 1 - Fluorescent Penetrants

TYPE 2 - Visible Penetrants

Penetrants are then classified by the method used to remove the excess penetrant from the part. The four methods are listed below:

METHOD A - Water Washable

METHOD B - Post-Emulsifiable, Lipophilic

METHOD C - Solvent Removable

METHOD D - Post-Emulsifiable, Hydrophilic

Water washable (METHOD A) penetrants can be removed from the part by rinsing with water alone. These penetrants contain an emulsifying agent (detergent) that makes it possible to wash the penetrant from the part surface with water alone. Water washable penetrants are sometimes referred to as self-emulsifying systems.

Post-Emulsifiable lipophilic (METHOD B), the penetrant is oil soluble and interacts with the oil-based emulsifier to make removal possible.

Solvent removable (METHOD C) penetrants require the use of a solvent to remove the penetrant from the part.

Post-Emulsifiable, hydrophilic (METHOD D) use an emulsifier that is a water-soluble detergent which lifts the excess penetrant from the surface of the part with a water wash.

Penetrants are then classified based on the strength or detectability of the indication that is produced for a number of very small and tight fatigue cracks. The five sensitivity levels are shown below:

Level ½ - Ultra Low Sensitivity

Level 1 - Low Sensitivity

Level 2 - Medium Sensitivity

Level 3 - High Sensitivity

Level 4 - Ultra-High Sensitivity

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