



AEROSPACE INFORMATION REPORT

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Portable Controlled Contamination Area (CCA)

RATIONALE

The purpose of this document is to provide guidelines for the construction of a portable CCA and its use to create a controlled climate (temperature, humidity) and contamination area that may be referenced in repair documents produced by airlines or airframe or engine manufacturers. In the absence of sufficient guidance in the repair document, these guidelines can be used to create and maintain a CCA. A CCA may be required for the repair so that oils, lubricants, dirt/dust, and other contaminants are at levels that are acceptable for structural bonding.

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1. SCOPE

This SAE Aerospace Information Report (AIR) provides guidelines for the design of portable Controlled Contamination Areas (CCAs) that can provide localized environmental control when processing a repair at the airplane or in a hangar environment. The use of a portable CCA may result in a better quality repair.

The use of a portable CCA may assist in achieving the environmental requirements for bonded repairs specified in an approved repair procedure. This provides an option to accomplish a repair on nonremovable structure or difficult to remove components.

1.1 Purpose

The purpose of this document is to provide guidelines for the construction of a portable CCA to achieve acceptable environmental conditions for performing on-aircraft repairs in a hangar or outside. Ambient atmospheric conditions can have a large effect on bonded repair quality. Bonded repairs should not be performed in areas where the air contains oil, release agents, mists, exhaust fumes, gasses, soot, rain, dusts, or other airborne contaminants. Airborne contaminants can reduce strength and durability of bonded repairs. Ambient temperature and humidity levels may affect the quality of bonded repairs and may result in reduced bond strength.

There are other sources of contaminants (for example, silicone contamination, small dust particles, etc.) that are not detectable using current NDI methods and may affect the quality of repair. The purpose of the portable CCA is to provide improved control of airborne contaminants, temperature, humidity, and UV light when the structure being repaired cannot be removed from the aircraft. Refer to the approved repair documents for the minimum and maximum environmental requirements. In the absence of sufficient guidance in the repair document, these guidelines can be used to maintain a CCA.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. In the event of a conflict between the Repair Procedure and this document, the Repair Procedure takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

ARP4916 Masking and Cleaning of Epoxy and Polyester Matrix Thermosetting Composite Materials

ARP5143 Vacuum Bagging of Thermosetting Composite and Metalbond Repairs

2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 14644-1 Cleanrooms and associated controlled environments - Part 1: Classification of air cleanliness by particle concentration

2.1.3 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

FED-STD-209E Airborne Particulate Cleanliness Classes in Cleanrooms and Clean Zones

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AIR4844 Composites and Metal Bonding Glossary

2.3 Definitions

REPAIR DOCUMENT: The OEM Manuals or an approved document produced by the local engineering organization. An engineering repair authority that has been approved by the Customer to perform work on a specific part or assembly. A structural repair manual provided by a customer to a repair station is an example of a Repair Document, as is any other regulatory approved engineering data listed as an approved manual or manual supplement that is maintained by the Customer in accordance with its regulatory approved Operations Specification. A Repair Document may include references to other external documents or specifications that control processes, materials, shop practices, etc. Comply with Repair Document's external specification references.

CONTROLLED CONTAMINATION AREA (CCA): An area that ensures levels of dirt, dust, oils, lubricants, humidity, and other containments as well as protection against UV light and temperature control for acceptable structural bonding.

3. GENERAL

This document provides construction recommendations for a portable CCA in a workshop, hangar, or outdoors where the repair is accomplished. The repair may include lay-up of repair plies, honeycomb core repairs, and/or metal bond adhesive lay-up and bagging.

This document discusses two types of portable CCAs:

TYPE 1: The first type of portable CCA is a larger enclosure that will allow one or more people to work inside. These enclosures are constructed using an impermeable plastic film and supported by a rigid framework or inflatable ribs. These enclosures are suitable for performing larger repairs. The intent is to create a clean and controlled environment by filtering the air, controlling temperature and humidity, and preventing the entry of contaminants from the surrounding area. See example in Figure 1.

TYPE 2: The second type is a "glove box" for performing small repairs. It consists of a transparent chamber with four walls and a lid. The sixth side of the box is open so that the box may be placed over the repair location and allow access to the repair surface. The edges surrounding the opening are equipped with a flexible seal that allows the box to be sealed to the structure. One wall of the box is equipped with built-in gloves that allow the user to manipulate objects inside the box without exposing them to the external environment. The glove box is equipped with a filtration system that removes contaminants from the incoming air supply. See example in Figure 2.

The CCA requirements begin once the moisture removal procedure has been completed. All major dust-generating operations such as damage removal and scarfing should be completed prior to construction of the portable CCA. Avoid all dust-generating operations after CCA installation. If a dust-generating operation must be performed, then it is recommended to remove the portable CCA, complete the dust-generating operation, clean the surfaces, and reinstall the portable CCA.