

# American National Standard

*Estimating Emission Factors  
from Open Molding  
Composite Processes*

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**ANSI/ACMA/ICPA  
UEF-1-2004**

American National Standard  
for Estimating Emission Factors  
from Open Molding Composite Processes

Secretariat

**American Composites Manufacturers Association**

Approved August 20, 2004

**American National Standards Institute, Inc.**

## American National Standard

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**Foreword** (This foreword is not part of American National Standard  
ANSI/ACMA/ICPA UEF-1-2004.)

From 1996 through 1998, the American Composites Manufacturers Association (ACMA), formerly named the Composites Fabricators Association (CFA), conducted styrene emissions testing. The ACMA testing program consisted of three test phases, which investigated the effects of process parameters on the styrene emissions from the open molding of composites. The test protocol used in the ACMA testing is described in the November 18, 1998 ACMA report entitled "Styrene Emissions Test Protocol & Facility Certification Procedures, Revision 2.1." The results of the ACMA Phase I testing are detailed in the September 1996 CFA report entitled "Phase I - Baseline Study; Hand Lay-up, Gel Coating, Spray Lay-up including Optimization Study." The results of the ACMA Phase II and III testing are detailed in the report "Technical Discussion of the Unified Emission Factors for Open Molding of Composites."

On February 28, 1998, Engineering Environmental Consulting Services (EECS) released a report entitled "CFA Emission Models for the Reinforced Plastics Industries" that details a set of equations developed from the ACMA test data. These equations predicted the styrene emission rates from typical lamination processes employed by the reinforced plastics industry. The report was subsequently posted on the EPA CHIEF website as a possible replacement for the obsolete AP-42 factors for reinforced plastics.

In 1997, the National Marine Manufacturers Association (NMMA) also conducted styrene emission testing using the CFA test protocol. The results of this testing are described in the August 1997 NMMA report entitled "Baseline Characterization of Emissions from Fiberglass Boat Manufacturing." The NMMA report was also posted on the EPA CHIEF website as part of the AP-42 replacement process.

In November 1998, the CFA and NMMA agreed to merge the data from their respective test programs. The merged data sets were used to develop a new set of equations and factors that unify the methodology employed by boat builders and non-boat builders for estimating the VOC and HAP emissions from the open molding of composite parts. These new emission factors have been named the "Unified Emission Factors" (UEF).

The Unified Emission Factor Table is the base data for this standard.

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ACMA does not "approve", "rate" or "endorse" any item or proprietary device described in this standard. Participation by federal/state agency representative(s) or persons associated with industry is not to be interpreted as ACMA, government, or industry endorsement of this standard.

Requests for interpretations or suggestions for revision should be sent to Larry Craigie, American Composites Manufacturers Association, 1010 North Glebe Road, Ste. 450, Arlington, VA 22201.

This standard was developed under procedures accredited as meeting the criteria for American National Standards. The list of canvassees that are reviewing this proposed standard is balanced to assure that individuals from competent and concerned interests have had an opportunity to participate.

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Kurt Anderson, Monaco Coach Corporation (Molder)  
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## American National Standard

# for Estimating Emission Factors from Open Molding Composite Processes

## 1. Scope and Purpose

### 1.1. Scope

The Emission Factors will include emission estimates from the open molding processes used in the composites industry. They will provide the user with a mechanism to estimate emissions based on the production process, materials being used and techniques employed. The final emission estimates will satisfy state and federal requirements for permit compliance and reporting emissions on Form R as required by the Emergency Planning and Community Right-to-Know Act.

### 1.2. Purpose

Manufacturers are required to estimate their air emissions for permit application and permit compliance reports and as may be required by local health officials. Also they must report air emissions from their facilities mandated by the federal Toxic Substance Control Act. Without these sanctioned factors, each facility may be required to conduct cost prohibitive emissions testing to satisfy all these reporting requirements.

## 2. Referenced Standards and Publications

Technical Resources Section of [www.acmanet.org](http://www.acmanet.org)

40 CFR 63, Subpart WWW – National Emission Standards for Hazardous Air Pollutants: Reinforced Plastic Composites Production

Table 1 – The MACT Rule

Appendix A – Test Method for Determining Vapor-Suppressant Effectiveness

SCAQMD Rule 1162, The Indiana Styrene Rule

## 3. Terms and Definitions

### 3.1. Atomized

Atomized spray is any kind of spray application that is not non-atomized spray, but typically includes conventional air atomizing, high-pressure airless, air-assisted airless, and high-volume low-pressure applicators.

### 3.2. Controlled Spray

Controlled spray is a specific set of three work practices that can be used to reduce material usage, worker exposures, and emissions. The three work practices included in a controlled spray program are spray gun set-up and pressure calibration, training in proper