

AMCA 802-19

Industrial Process/Power Generation Fans: Establishing Performance Using Laboratory Models



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Industrial Process/Power Generation Fans: Establishing Performance Using Laboratory Models

1. Purpose

The purpose of this publication is to outline present methods used by fan manufacturers to determine the performance of full-size industrial process and power generation fans. These methods include:

- Predicting full-size fan ratings using a standard model's existing base performance data.
- Building and testing a model of a proposed fan or existing full-size fan to verify the full-size fan's performance.

This publication provides detailed insight into the variables that influence a fan rating and establishes the rules to be used as well as their limitations in converting performance from one fan to another geometrically similar fan. It also defines dimensional tolerances that must exist for two fans to be considered geometrically similar. It does not cover the detailed procedures a manufacturer uses to select a particular fan or modify a standard fan to achieve a specific rating. That information is confidential to each manufacturer and based on many years of experience and individual company research.

This publication, along with other documents contained in AMCA's 800 series, forms the basis for fan-related concepts and practices.

2. Scope

This publication applies to centrifugal and axial fans. Criteria are provided for establishing geometric and dynamic similarity between the model and the full-size fan, including appurtenances and drives.

This document does not deal with structural details, mechanical properties or components if they do not affect fan performance.

3. Definitions and Symbols

The following list covers definitions and symbols used in fan testing and rating. These are standard definitions as adopted by the fan industry. Certain definitions are similar to those used in general engineering practice and have been adapted for specific use in this publication.

3.1 Rating criteria

3.1.1 Fan

A device that utilizes a power-driven rotating impeller for moving air. A fan may have various appurtenances provided by the fan manufacturer as part of the fan equipment that affect performance. It is necessary to establish what appurtenances are to be considered part of the fan.

In many instances, a customer lists the system requirements and requests that the fan manufacturer supply additional appurtenances, such as silencers or dampers. The pressure losses for appurtenances must be accounted for if the system is to operate properly. If the fan manufacturer supplies these items and they are connected directly to the fan, appropriate losses are added to the system requirements and a fan is selected for the sum of the overall pressure losses.

3.1.2 Fan inlet

The plane perpendicular to the airstream where it first meets the inlet cone or the inlet box furnished by the fan manufacturer. In this publication, the fan inlet is indicated by "Plane 1" (see Figure 1).

3.1.3 Fan outlet

The plane perpendicular to the airstream at the outlet opening of the fan or the outlet opening of the evasé or diffuser. In this publication, the fan outlet is indicated by "Plane 2" (see Figure 1).

3.1.4 Fan airflow rate

The volumetric airflow rate at fan air density at the fan inlet.

3.1.5 Total pressure

The air pressure that exists by virtue of the degree of compression and the rate of motion. It is the algebraic sum of the velocity pressure and the static pressure at a point.

3.1.6 Velocity pressure

The portion of the air pressure that exists by virtue of the rate of motion only. It is always positive.

3.1.7 Static pressure

The portion of the air pressure that exists by virtue of the degree of compression only. It may be positive or negative relative to the ambient static pressure.

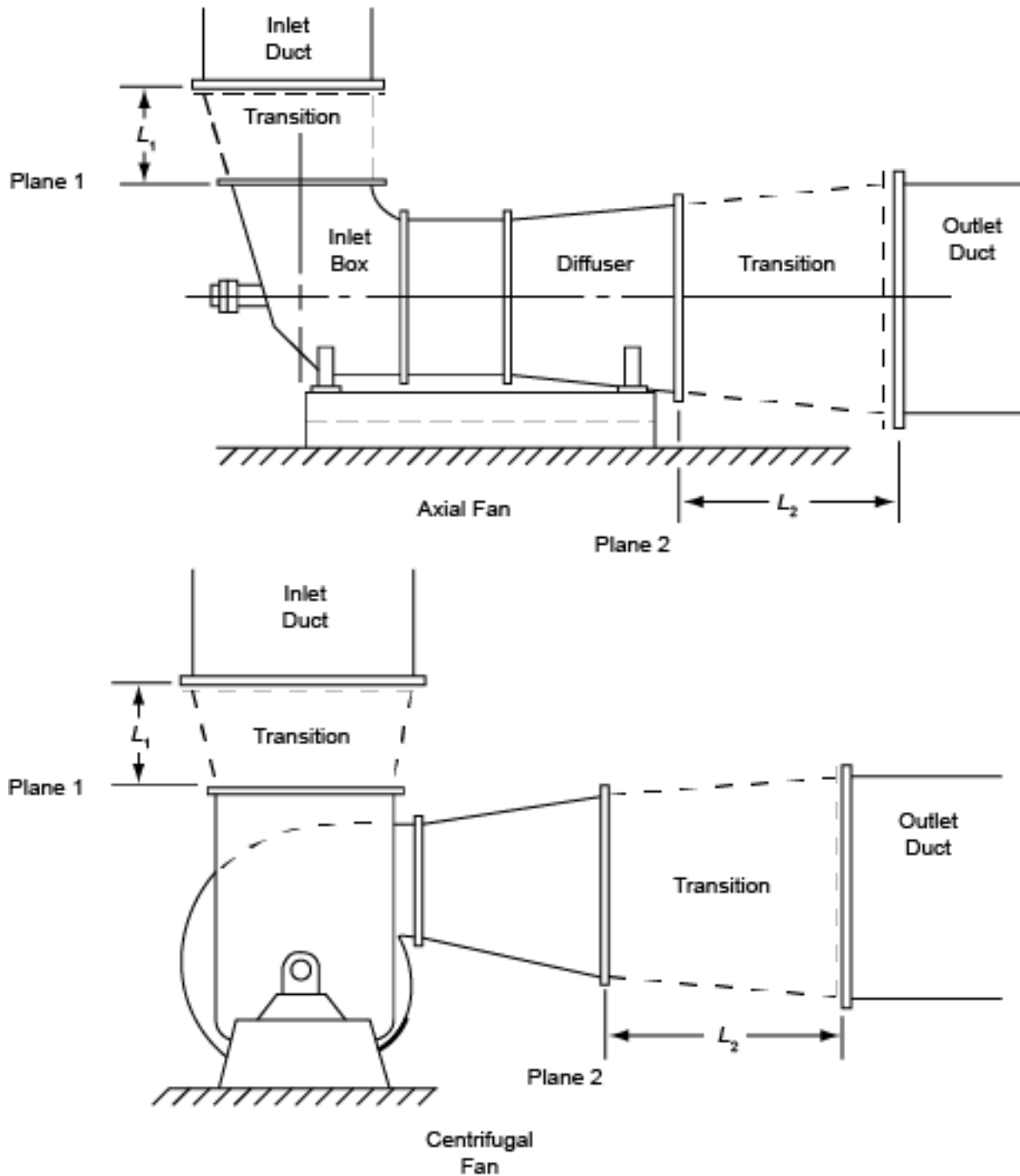


Figure 1 — Fan Inlet and Outlet Planes