ASME PTC 11-2008

(Revision of ASME PTC 11-1984)

REAFFIRMED 2018

Fans

Performance Test Codes

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME SETTING THE STANDARD

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This Code will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to PTC 11-2008.

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The American Society of Mechanical Engineers
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NOTICE

All Performance Test Codes must adhere to the requirements of ASME PTC 1, General Instructions. The following information is based on that document and is included here for emphasis and for the convenience of the user of the Code. It is expected that the Code user is fully cognizant of Sections 1 and 3 of ASME PTC 1 and has read them prior to applying this Code.

ASME Performance Test Codes provide test procedures that yield results of the highest level of accuracy consistent with the best engineering knowledge and practice currently available. They were developed by balanced committees representing all concerned interests and specify procedures, instrumentation, equipment-operating requirements, calculation methods, and uncertainty analysis.

When tests are run in accordance with a code, the test results themselves, without adjustment for uncertainty, yield the best available indication of the actual performance of the tested equipment. ASME Performance Test Codes do not specify means to compare those results with contractual guarantees. Therefore, it is recommended that the parties to a commercial test agree before starting the test and preferably before signing the contract on the method to be used for comparing the test results with the contractual guarantees. It is beyond the scope of any code to determine or interpret how such comparisons shall be made.

FOREWORD

PTC 11-1946, entitled Test Code for Fans, was published by the Society in 1946. As noted in its Foreword, the personnel of the committee that developed the Code consisted of members of the American Society of Heating and Ventilating Engineers, the National Association of Fan Manufacturers, and the American Society of Mechanical Engineers. The Code, as written, was a laboratory test standard in that it provided instructions for arrangement of test equipment, such as ducts, plenum chamber, and flow straighteners, as well as instruments. It even stated that the test could be conducted in the manufacturer's shops, the customer's premises, or elsewhere.

Most ASME Power Test Codes (later called Performance Test Codes) provided instructions for testing equipment after it was installed. Since PTC 11-1946 was a laboratory standard, it was allowed to go out of print with the expectation that a revised code would be written that would provide directions for site testing of fans.

In July of 1961, a new PTC 11 Committee was formed. Several drafts were prepared, but all of them essentially provided laboratory directions. This Committee still considered field or site testing to be impractical unless laboratory conditions could be duplicated.

The PTC 11 Committee was reorganized in 1971. It initially attempted to resolve the difficulties of site testing by resorting to model testing. This was not acceptable to the Society. Ultimately, procedures were developed that could be used in the field without the need to modify the installation so as to condition the flow for measurement. The Committee performed tests to determine the acceptability of these procedures. These tests included full-scale field tests of two large mechanical-draft fans, as well as various laboratory tests of various probes for measuring flow angles and pressures. Subsequent tests [3] performed independently of the Committee have demonstrated the practicability of this Code with regard to both manpower and equipment in a large power-plant situation.

The Committee also monitored the progress of an International Committee that was writing test codes for fans. While this Committee, ISO 117, had not completed its work, it was obvious that several things they were doing should be incorporated in PTC 11. The major item contributed by ISO 117 is the concept of specific energy (also called work per unit mass), which, when combined with mass flow rate, provides an approach to fan performance that can be used instead of the volume flow rate/pressure approach. ISO also recognizes the distributionality of velocity across the measuring plane, and PTC 11 incorporates provisions to account for this. This resulted in the second edition, published in 1984.

Work on the current revision began on January 17, 2002. The goal for this effort was to revise and update several sections to make the Code more universally accepted and user friendly. For example, additional points of agreement between parties to the test were developed. The number and geometry of the traverse grid elements were changed to allow greater variation in the aspect parameter. A statistical procedure was developed to guide the user in selection of traverse planes for defining fan flow. Greater emphasis was placed on the use of five-hole (three-dimensional) probes to completely characterize flow at the traverse plane(s). Guidance was included for establishing fan operation at test conditions so that it would be near specified conditions after all corrections have been applied. A procedure was developed to correct fan power from test conditions to specified conditions.

Historically, fan performance was typically based on design, or test block, conditions that represent the fan's ability to move a specific amount of gas at a specific system resistance. It is generally taken to be the fan's maximum performance capability. More recently, however, there has been increased emphasis in demonstrating fan performance at a power guarantee point usually corresponding to part load on a fan. This presents some unique testing challenges.

There have also been significant advancements in electronic technology. Readily available portable computers are now able to support off-the-shelf data acquisition systems to monitor key parameters and provide real-time trends of operational steadiness during a test. This capability extends to traverse data as well, where key pressures are electronically monitored to determine the alignment of directionally sensitive probes with flow, to average all pressures, and to archive all information. Repeatability of results is greatly improved because mental averaging and manual data logging are eliminated. Finally, data reduction turnaround time is greatly shortened, which increases the productivity of test personnel when multiple test runs are required or where test time may be limited.

While some installations may not meet ideal inlet and/or outlet conditions for flow distribution or geometry, the objective of this test code is to determine a fan's installed performance without listing any criteria for disqualification of this test procedure. The subcommittee has made every effort to include test and data reduction methods that will lead to results that will be acceptable to all parties to the test.

This Code was approved by the Council as a Standard practice of the Society by action of the Board on Standardization and Testing on April 7, 2008. It was also approved as an American National Standard by the ANSI Board of Standards Review on July 15, 2008.

ASME PTC COMMITTEE
PERFORMANCE TEST CODES

(The following is the roster of the Committee at the time of approval of this Code.)

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CORRESPONDENCE WITH THE PTC 11 COMMITTEE

General. ASME Codes are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Code may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, PTC 11 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Code to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Code. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Code. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Code, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Code to which the proposed Case applies.

Interpretations. Upon request, the PTC 11 Committee will render an interpretation of any requirement of the Code. Interpretations can only be rendered in response to a written request sent to the Secretary of the PTC 11 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his request in the following format:

Subject: Cite the applicable paragraph number(s) and a concise description.
Edition: Cite the applicable edition of the Code for which the interpretation is being requested.
Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

Attending Committee Meetings. The PTC 11 Standards Committee holds meetings or telephone conferences, which are open to the public. Persons wishing to attend any meeting or telephone conference should contact the Secretary of the PTC 11 Standards Committee or check our Web site at http://cstools.asme.org.

FANS

Section 1
Object and Scope

1-1 OBJECT

This Code provides standard procedures for conducting and reporting tests on fans, including those of the centrifugal, axial, and mixed flow types.

1-1.1 Objectives

The objectives of this Code are to provide:

(a) the rules for testing fans to determine performance under actual operating conditions

(b) additional rules for converting measured performance to that which would prevail under specified operating conditions

(c) methods for comparing measured or converted performance with specified performance

1-1.2 Principal Quantities

The principal quantities that can be determined are

(a) fan mass flow rate or, alternatively, fan volume flow rate

(b) fan specific energy or, alternatively, fan pressure

(c) fan input power

Henceforth, these parameters shall be inclusively covered by the term “performance.”

1-1.3 Additional Quantities

Additional quantities that can be determined are

(a) gas properties at the fan inlet

(b) fan speed

Henceforth, these parameters shall be inclusively covered by the term “operating conditions.”

1-1.4 Other Quantities

Various other quantities can be determined, including

(a) fan output power

(b) compressibility coefficient

(c) fan efficiency

(d) inlet flow conditions

1-2 SCOPE

The scope of this Code is limited to the testing of fans after they have been installed in the systems for which they were intended. However, the same directions can be followed in a laboratory test. (The laboratory test performance may not be duplicated by a test after installation because of system effects.) The term “fan” implies that the machine is used primarily for moving air or gas rather than compression. The distinction between fans, blowers, exhausters, and compressors in common practice is rather vague; accordingly, machines that bear any of these names may be tested under the provisions of this Code. (It is conceivable that these machines can also be tested under the provisions of PTC 10, Compressors and Exhausters.)