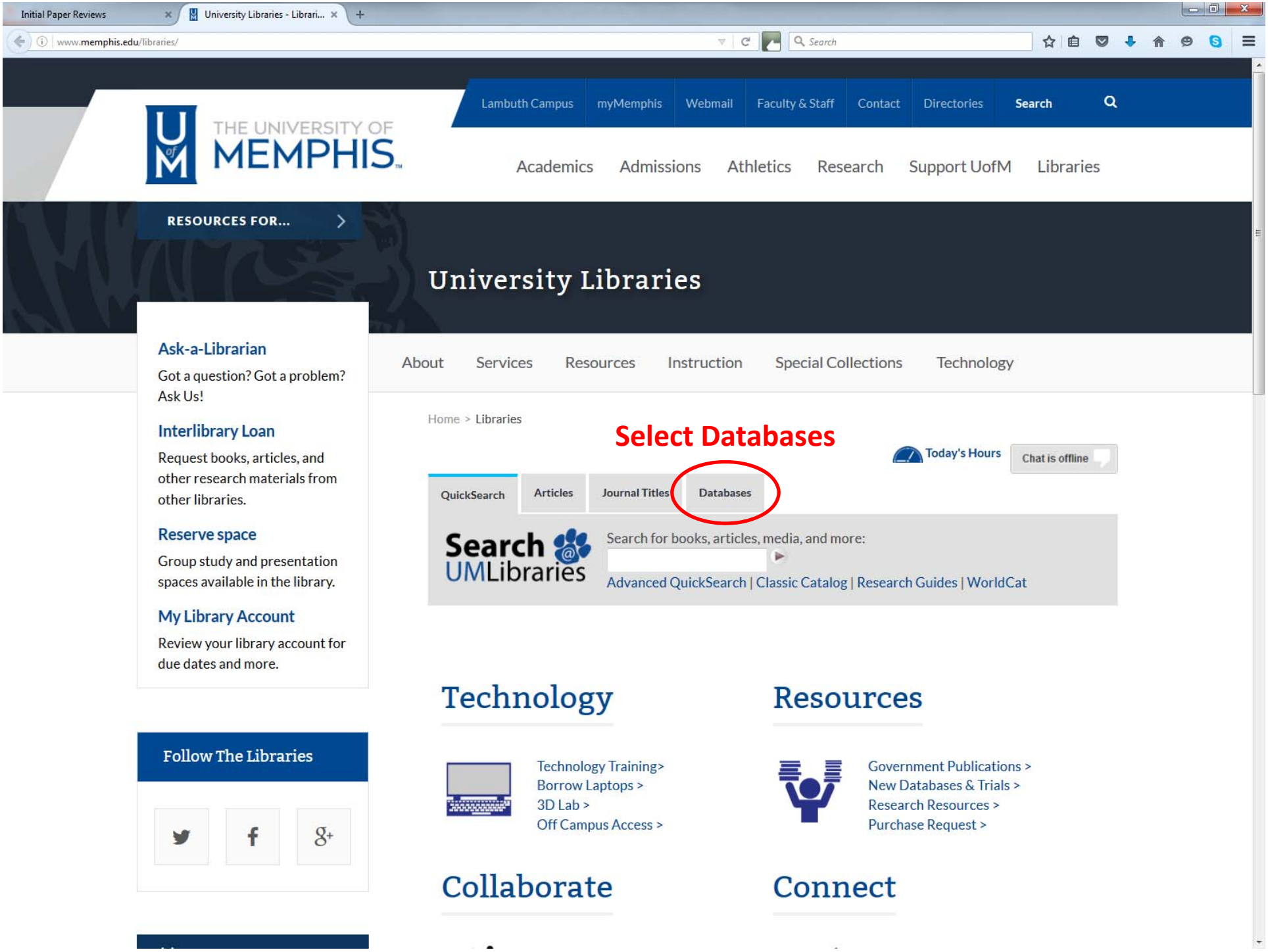
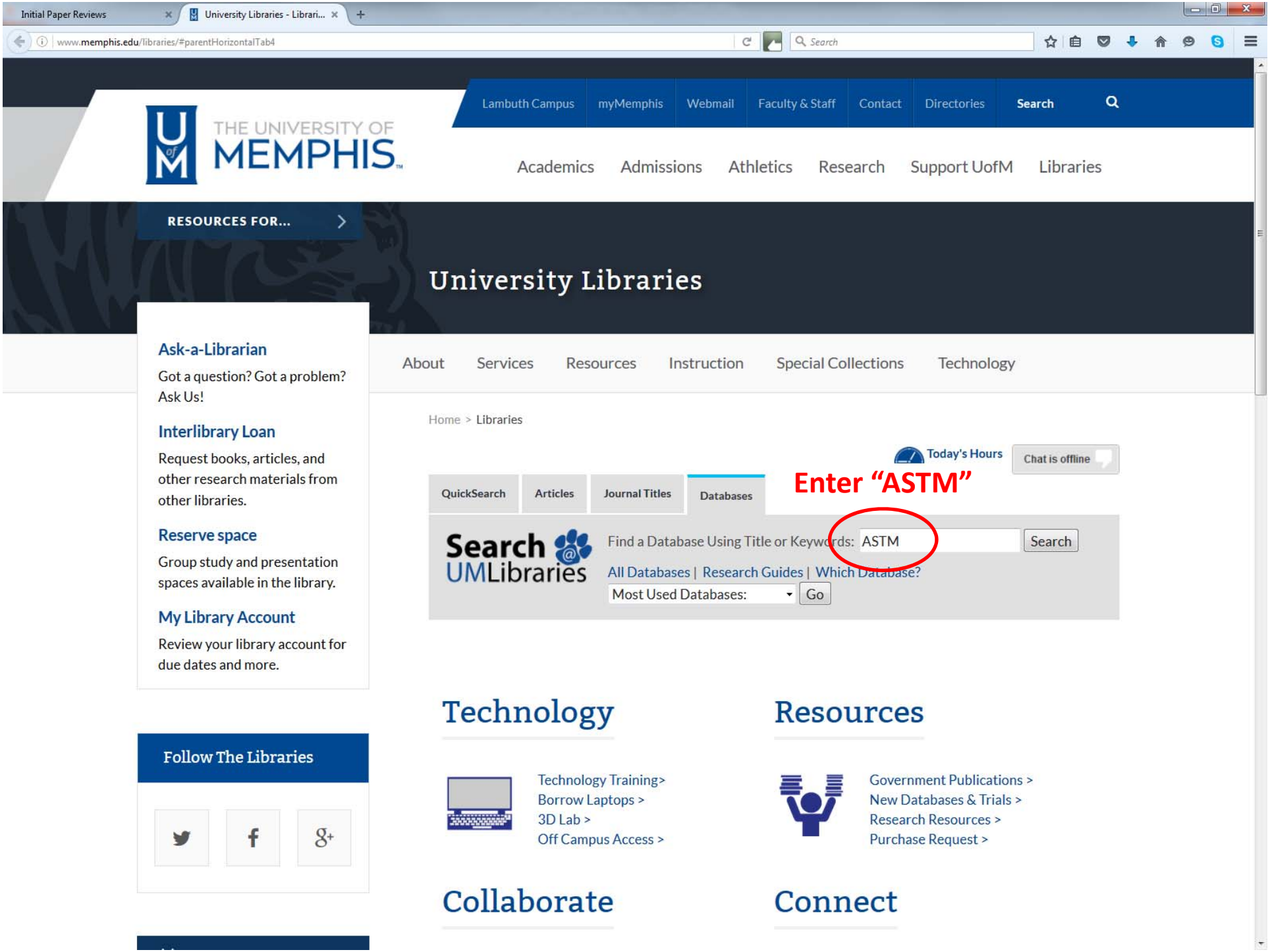
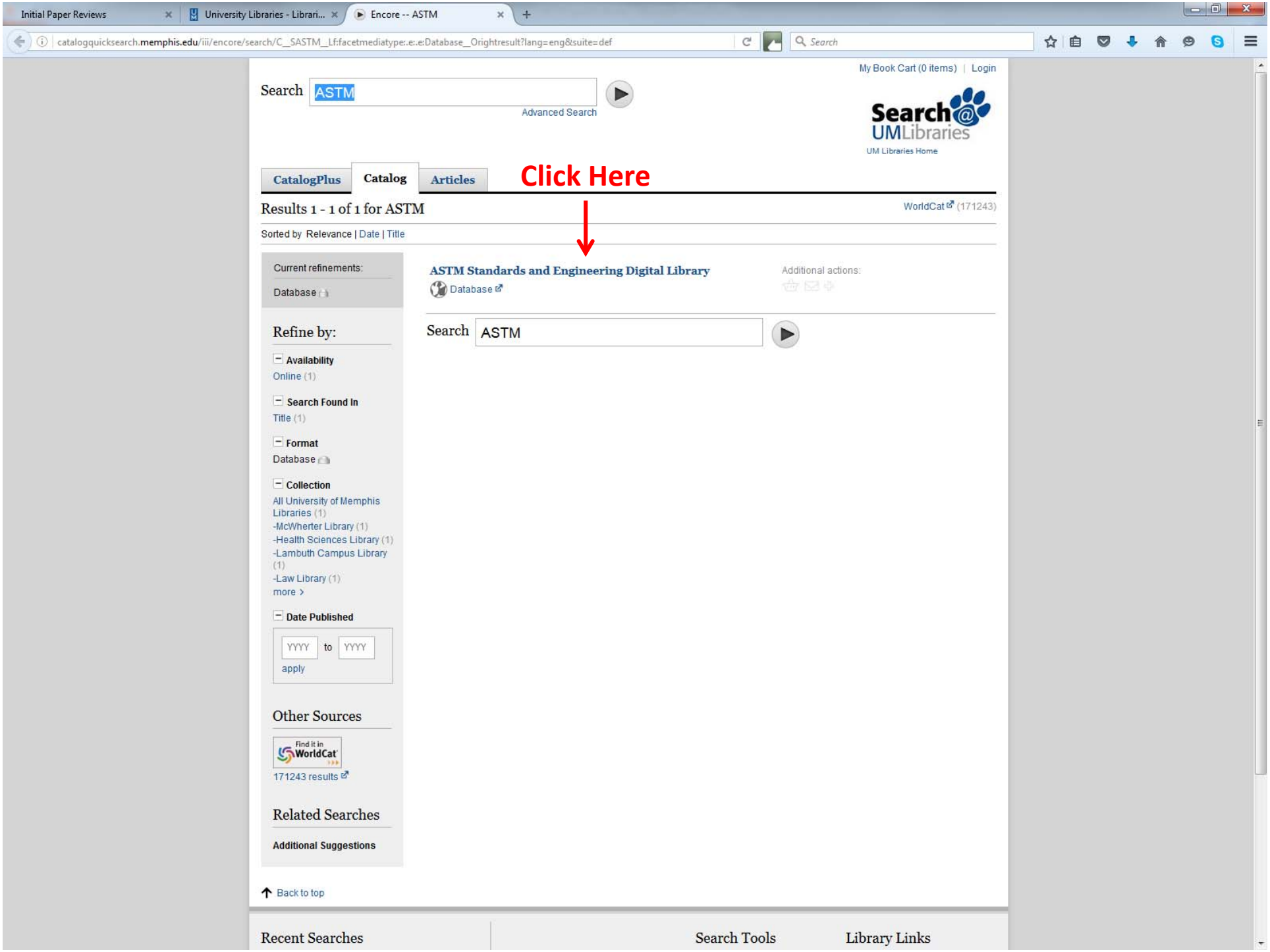

# ASTM Specifications

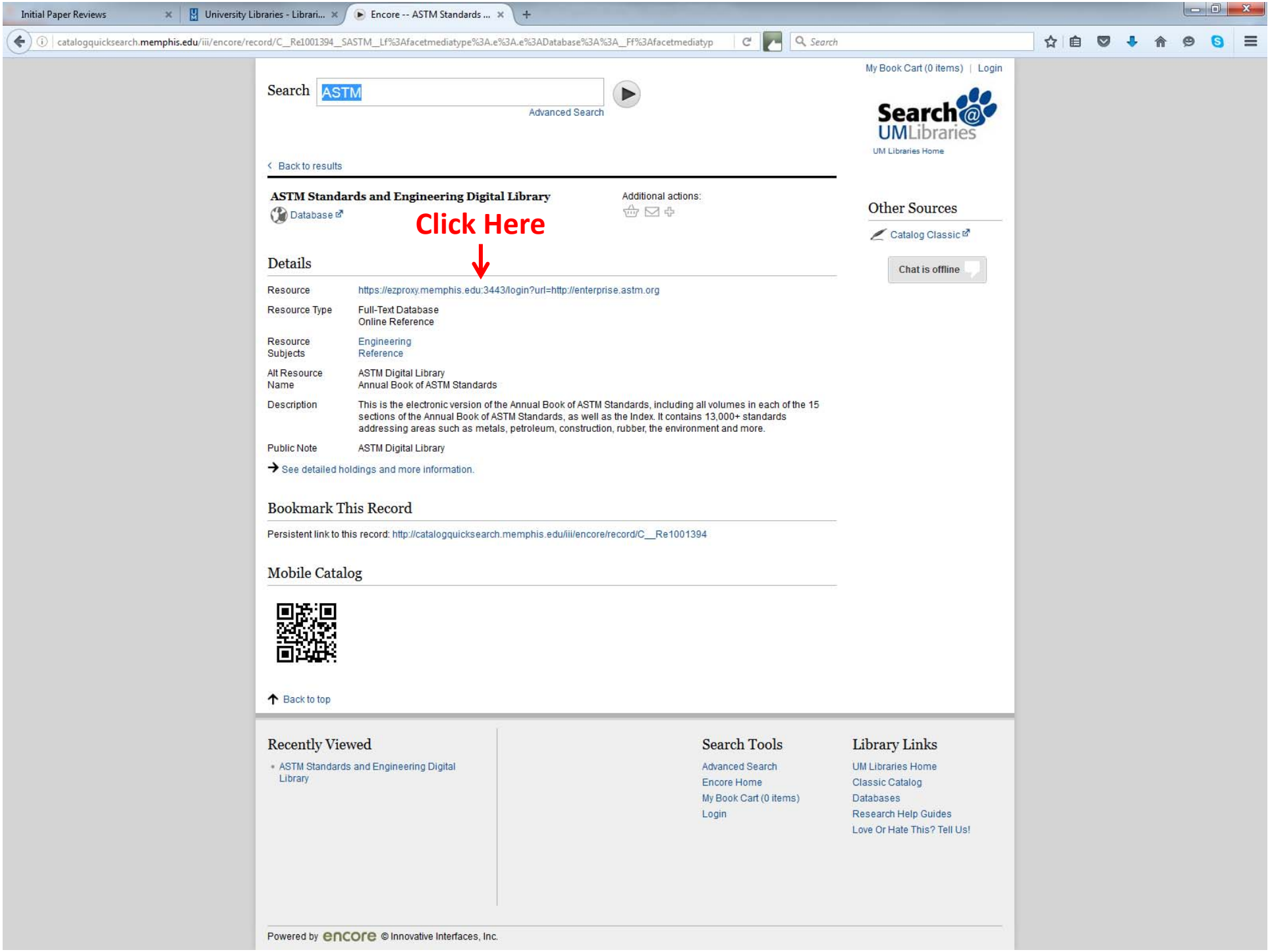
# To Access ASTM Specifications

1. Go to www.memphis.edu/libraries
2. Select the “Databases” search tab
3. Enter “ASTM” in the search box
4. Click on “ASTM Standards and Digital Library”
5. Click on the Resource link.


Initial Paper Reviews
University Libraries - Librari...
www.memphis.edu/libraries/
Search
Lambuth Campus
myMemphis
Webmail
Faculty & Staff
Contact
Directories
Search
THE UNIVERSITY OF MEMPHIS
Academics
Admissions
Athletics
Research
Support UofM
Libraries
RESOURCES FOR...
University Libraries
About
Services
Resources
Instruction
Special Collections
Technology
Ask-a-Librarian
Got a question? Got a problem? Ask Us!
Interlibrary Loan
Request books, articles, and other research materials from other libraries.
Reserve space
Group study and presentation spaces available in the library.
My Library Account
Review your library account for due dates and more.
Follow The Libraries
Home > Libraries
Select Databases
Today's Hours
Chat is offline
QuickSearch
Articles
Journal Titles
Databases
Search @ UMLibraries
Search for books, articles, media, and more:
Advanced QuickSearch | Classic Catalog | Research Guides | WorldCat
Technology
Technology Training>
Borrow Laptops >
3D Lab >
Off Campus Access >
Resources
Government Publications >
New Databases & Trials >
Research Resources >
Purchase Request >
Collaborate
Connect


Initial Paper Reviews
University Libraries - Librari...
www.memphis.edu/libraries/#parentHorizontalTab4
Search
Lambuth Campus
myMemphis
Webmail
Faculty & Staff
Contact
Directories
Search
THE UNIVERSITY OF MEMPHIS
Academics
Admissions
Athletics
Research
Support UofM
Libraries
RESOURCES FOR...
University Libraries
About
Services
Resources
Instruction
Special Collections
Technology
Home > Libraries
Today's Hours
Chat is offline
Enter "ASTM"
QuickSearch
Articles
Journal Titles
Databases
Search @ UMLibraries
Find a Database Using Title or Keywords:
ASTM
Search
All Databases | Research Guides | Which Database?
Most Used Databases:
Go
Ask-a-Librarian
Got a question? Got a problem? Ask Us!
Interlibrary Loan
Request books, articles, and other research materials from other libraries.
Reserve space
Group study and presentation spaces available in the library.
My Library Account
Review your library account for due dates and more.
Follow The Libraries
Technology
Technology Training>
Borrow Laptops >
3D Lab >
Off Campus Access >
Resources
Government Publications >
New Databases & Trials >
Research Resources >
Purchase Request >
Collaborate
Connect


Initial Paper Reviews
University Libraries - Librari...
Encore -- ASTM
catalogquicksearch.memphis.edu/iii/encore/search/C__SASTM__Lf:facetmediatype:.e:.e:Database__Orightresult?lang=eng&suite=def
Search
My Book Cart (0 items) | Login
Search ASTM
Advanced Search
Search@UMLibraries
UM Libraries Home
CatalogPlus
Catalog
Articles
Click Here
Results 1 - 1 of 1 for ASTM
WorldCat (171243)
Sorted by Relevance | Date | Title
Current refinements:
Database
Refine by:
Availability
Online (1)
Search Found In
Title (1)
Format
Database
Collection
All University of Memphis Libraries (1)
-McWherter Library (1)
-Health Sciences Library (1)
-Lambuth Campus Library (1)
-Law Library (1)
more ›
Date Published
YYYY to YYYY
apply
Other Sources
Find it in WorldCat
171243 results
Related Searches
Additional Suggestions
ASTM Standards and Engineering Digital Library
Database
Additional actions:
Search ASTM
Back to top
Recent Searches
Search Tools
Library Links


Initial Paper Reviews
University Libraries - Librari...
Encore -- ASTM Standards ...
catalogquicksearch.memphis.edu/iii/encore/record/C__Re1001394__SASTM__Lf%3Afacetmediatype%3A.e%3A.e%3ADatabase%3A%3A__Ff%3Afacetmediatyp
Search
My Book Cart (0 items) | Login
Search ASTM
Advanced Search
Search@UMLibraries
UM Libraries Home
Back to results
ASTM Standards and Engineering Digital Library
Database
Additional actions:
Click Here
Other Sources
Catalog Classic
Chat is offline
Details
Resource https://ezproxy.memphis.edu:3443/login?url=http://enterprise.astm.org
Resource Type Full-Text Database
Online Reference
Resource Subjects Engineering
Reference
Alt Resource Name ASTM Digital Library
Annual Book of ASTM Standards
Description This is the electronic version of the Annual Book of ASTM Standards, including all volumes in each of the 15 sections of the Annual Book of ASTM Standards, as well as the Index. It contains 13,000+ standards addressing areas such as metals, petroleum, construction, rubber, the environment and more.
Public Note ASTM Digital Library
See detailed holdings and more information.
Bookmark This Record
Persistent link to this record: http://catalogquicksearch.memphis.edu/iii/encore/record/C__Re1001394
Mobile Catalog
Back to top
Recently Viewed
ASTM Standards and Engineering Digital Library
Search Tools
Advanced Search
Encore Home
My Book Cart (0 items)
Login
Library Links
UM Libraries Home
Classic Catalog
Databases
Research Help Guides
Love Or Hate This? Tell Us!
Powered by encore © Innovative Interfaces, Inc.

Initial Paper Reviews | University Libraries - Librari... | ASTM Compass

compass.astm.org/CUSTOMERS/index.html

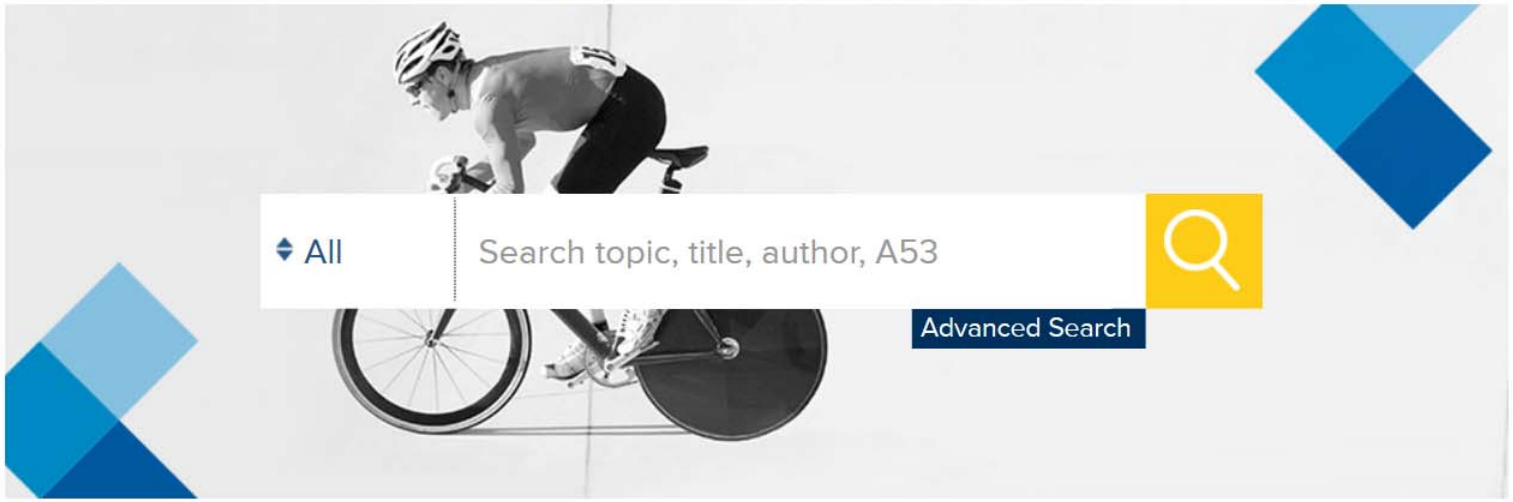
# ASTM COMPASS®

Your Portal for Standards, Testing, Learning, & More

SIGN IN

HOME REGISTER LANGUAGES HELP

## Welcome University of Memphis




### STANDARDS

Book of Standards

Passport to Steel

Research Reports

Related Materials

Digital Adjuncts New!

Alphanumeric Listings of Standards

A B C D E F G

Translated Standards

Chinese

### DIGITAL LIBRARY

Journals

Special Technical Publications

Manuals/Monographs

Data Series

Proceedings New!

Bulletins New!

Materials Research and Standards New!

### BROWSE BY INDUSTRY SECTOR

Standards

Publications

### OTHER CONTENT

AASHTO

UOP

Qatar Construction Specifications 2014

Unified Numbering System (UNS)

API

### E-LEARNING

### TERMINOLOGY

A B C D E F G H I J K L M N O
P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9

### MY TOOLS

My Annotations

My Bookmarks

My Groups

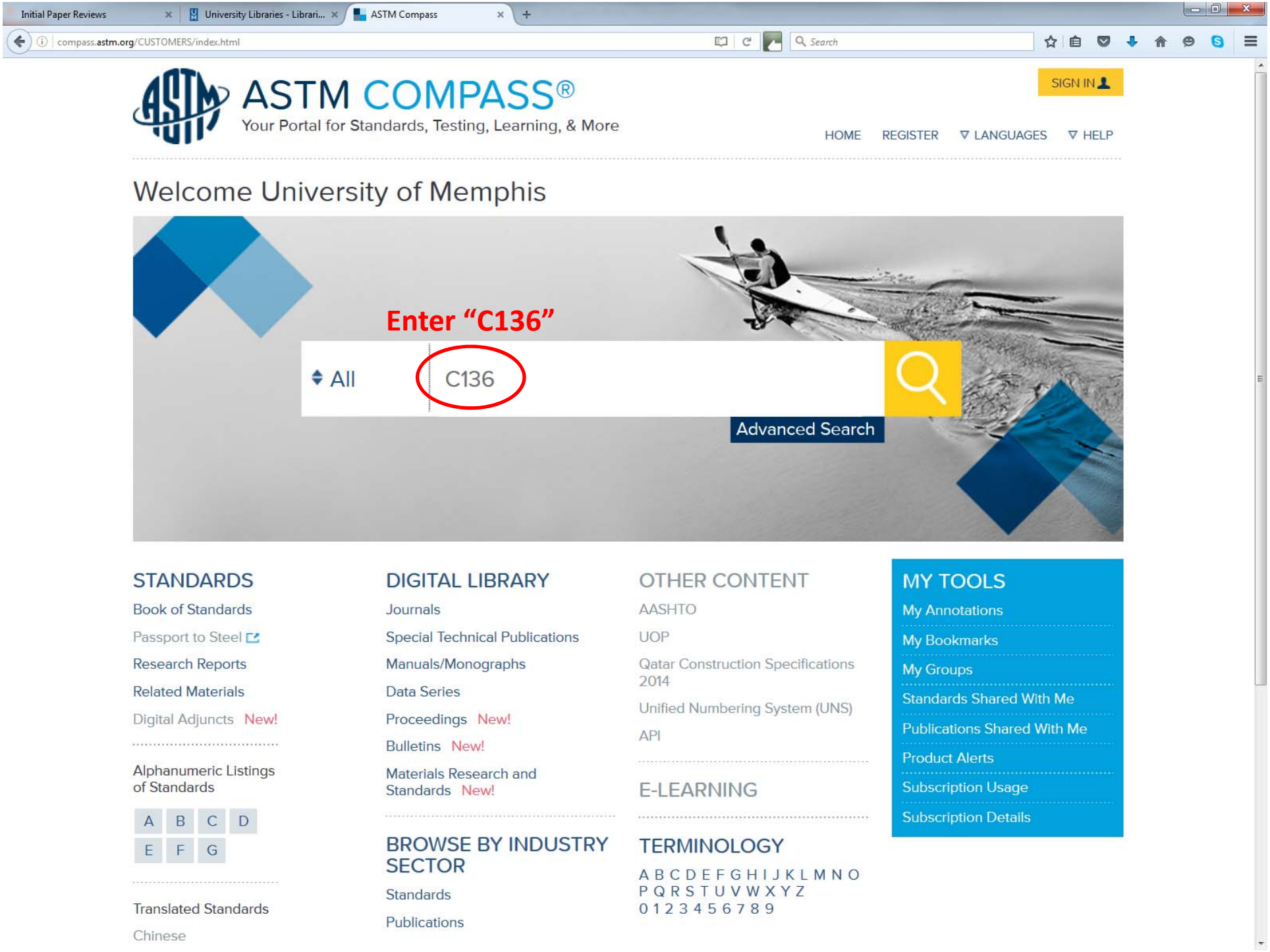
Standards Shared With Me

Publications Shared With Me

Product Alerts

Subscription Usage

Subscription Details


Initial Paper Reviews
University Libraries - Librari...
ASTM Compass
compass.astm.org/CUSTOMERS/index.html
Search
ASTM COMPASS®
Your Portal for Standards, Testing, Learning, & More
SIGN IN
HOME
REGISTER
LANGUAGES
HELP
Welcome University of Memphis
Enter "C136"
All
C136
Advanced Search
STANDARDS
Book of Standards
Passport to Steel
Research Reports
Related Materials
Digital Adjuncts New!
Alphanumeric Listings of Standards
A B C D E F G
Translated Standards
Chinese
DIGITAL LIBRARY
Journals
Special Technical Publications
Manuals/Monographs
Data Series
Proceedings New!
Bulletins New!
Materials Research and Standards New!
BROWSE BY INDUSTRY SECTOR
Standards
Publications
OTHER CONTENT
AASHTO
UOP
Qatar Construction Specifications 2014
Unified Numbering System (UNS)
API
E-LEARNING
TERMINOLOGY
A B C D E F G H I J K L M N O
P Q R S T U V W X Y Z
0 1 2 3 4 5 6 7 8 9
MY TOOLS
My Annotations
My Bookmarks
My Groups
Standards Shared With Me
Publications Shared With Me
Product Alerts
Subscription Usage
Subscription Details

Initial Paper Reviews | University Libraries - Librari... | ASTM Compass

compass.astm.org/CUSTOMERS/search/search.html?query=C136&dltype=all

# ASTM COMPASS®

Your Portal for Standards, Testing, Learning, & More

SIGN IN

HOME REGISTER LANGUAGES HELP

## Search ASTM Compass

All C136

Advanced Search

We have found
452 results

Page 1 of 46

Sort By

Best Match

### REFINE YOUR RESULTS

**Library**

- MySubscription Only

**Result Type**

- **Standards** (416)
- **Digital Library** (25)
- **Other Content** (11)

**Document Type**

- Online Version (387)
- PDF Version (441)

**Category**

- **Applications** (261)
- **Materials** (343)
- **Process** (111)
- **Properties and Measurements** (178)
- **Test Methods** (96)

**Technical Committees**

**Topic**

**Industry Sectors**

## ASTM C136/C136M-14 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

Active Standard (Latest Version)

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregat... More

Developed by Subcommittee C09.20 | Book of Standards Volume: 04.02

Historical Versions - previous version(s) of standard

**Other Searches:**

ICS 91.100.30 (Concrete And Concrete Products)

| Format | Pages | |
|---|---|---|
| Online Version | – | VIEW ONLINE |
| PDF Version | 5 | DOWNLOAD PDF |
| Online E-Learning | – | E-LEARNING |

## ASTM C136 - 06 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

Historical Standard

SUPERSEDED BY C136

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this method co... More

Developed by Subcommittee C09.20 | Book of Standards Volume: 04.02

**Other Searches:**

Coarse Aggregates • Fine Aggregates • Particle Size Distribution • Sieve Analysis • More...

Format Pages

# Types of Standards

**Standard Specification** - requirements to be satisfied by a system, material, product, or service.

ASTM C 33 Standard Specification for Concrete Aggregates

**Standard Test Method** - instructions for performing one or more specific operations that produces a test result.

ASTM C29 Standard Test Method for Bulk Density and Voids in Aggregate

**Standard Practice** - instructions for performing specific operations that do not produce a test result.

ASTM C 702 Standard Practice for Reducing Samples of Aggregate to Testing Size

# Types of Standards

**Standard Guide** - information or a series of options that does not recommend a specific course of action.

ASTM E 2392 Standard Guide for Design of Earthen Wall Building Systems

**Standard Classification** - arrangement of systems, materials, products, or services into groups based on shared characteristics.

ASTM E 2103 Standard Classification for Bridge Elements

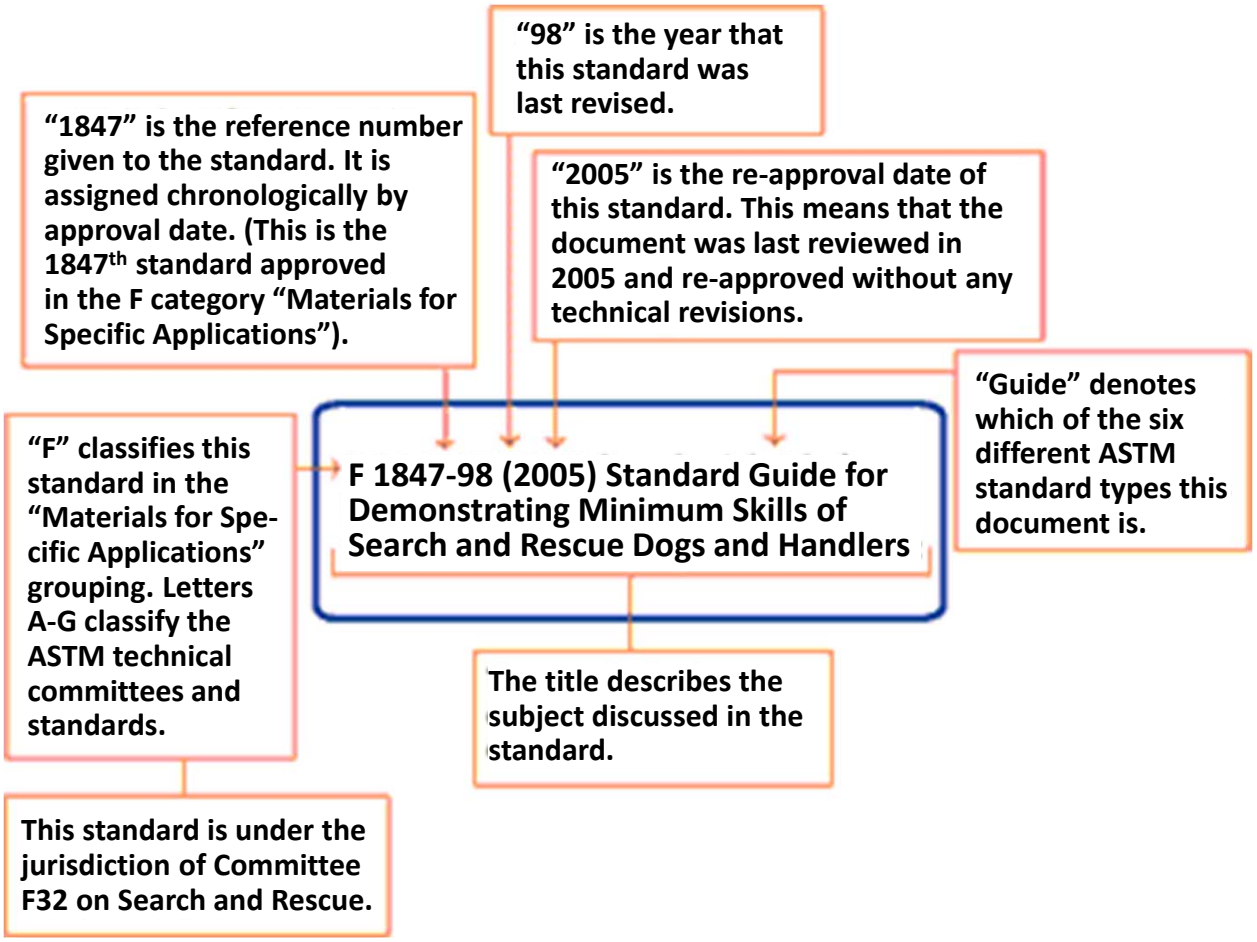
**Terminology Standard** - definitions of terms; explanations of symbols, abbreviations, or acronyms.

ASTM D 653 Standard Terminology Relating to Soil, Rock, and Contained Fluids

# Standard Test Methods

- A—Ferrous metals and products
- B—Nonferrous metals and products
- C—Cementitious, ceramic, concrete, and masonry materials
- D—Miscellaneous materials and products
- E—Miscellaneous subjects
- F—End-use materials and products for specific applications
- G—Corrosion, deterioration, weathering, durability, and degradation of materials and products

# Decoding a Standard Title



# Anatomy of a Test Specification

1. Scope
2. Referenced Documents
3. Terminology
4. Summary of Test Method
5. Significance and Use
6. Apparatus
7. Sampling
8. Procedure
9. Calculations
10. Report
11. Precision and Bias

Designation: C 136 – 06

# Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates[1]

This standard is issued under the fixed designation C 136; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope*

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only. Specification E 11 designates the size of sieve frames with inch units as standard, but in this test method the frame size is designated in SI units exactly equivalent to the inch units.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

2.2 *AASHTO Standard:*

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates[3]

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology C 125.

## 4. Summary of Test Method

4.1 A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specifica-

Designation: C 136 – 06

What is the purpose of the standard?
Does it have any known limitations?

# Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates[1]

This standard is issued under the fixed designation C 136; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope*

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only. Specification E 11 designates the size of sieve frames with inch units as standard, but in this test method the frame size is designated in SI units exactly equivalent to the inch units.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

2.2 *AASHTO Standard:*

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates[3]

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology C 125.

## 4. Summary of Test Method

4.1 A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specifica-

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 117 Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

C 125 Terminology Relating to Concrete and Concrete Aggregates

C 637 Specification for Aggregates for Radiation-Shielding Concrete

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

C 702 Practice for Reducing Samples of Aggregate to Testing Size

D 75 Practice for Sampling Aggregates

[1] This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.20 on Normal Weight Aggregates.

Current edition approved Feb. 15, 2006. Published March 2006. Originally approved in 1938. Last previous edition approved in 2005 as C 136 – 05.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specification requirements and to provide necessary data for control of the production of various aggregate products and mixtures containing aggregates. The data may also be useful in developing relationships concerning porosity and packing.

5.2 Accurate determination of material finer than the 75-µm (No. 200) sieve cannot be achieved by use of this test method alone. Test Method C 117 for material finer than 75-µm sieve by washing should be employed.

5.3 Refer to methods of sampling and testing in Specification C 637 for heavyweight aggregates.

## 6. Apparatus

6.1 *Balances*—Balances or scales used in testing fine and coarse aggregate shall have readability and accuracy as follows:

6.1.1 For fine aggregate, readable to 0.1 g and accurate to 0.1 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

[3] Available from American Association of State Highway and Transportation Officials, 444 North Capitol St. N.W., Suite 225, Washington, DC 20001.

What documents are referenced within this standard?

*A Summary of Changes section appears at the end of this standard.

Designation: C 136 – 06

References may be to standards from other organizations (e.g., AASHTO).

# Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates[1]

This standard is issued under the fixed designation C 136; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope*

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only. Specification E 11 designates the size of sieve frames with inch units as standard, but in this test method the frame size is designated in SI units exactly equivalent to the inch units.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

2.2 *AASHTO Standard:*

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates[3]

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology C 125.

## 4. Summary of Test Method

4.1 A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specifica-

Designation: C 136 – 06

What terms in this standard have very specific meanings that may differ from their common definition.

# Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates[1]

This standard is issued under the fixed designation C 136; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope*

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only. Specification E 11 designates the size of sieve frames with inch units as standard, but in this test method the frame size is designated in SI units exactly equivalent to the inch units.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

2.2 *AASHTO Standard:*

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates[3]

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology C 125.

## 4. Summary of Test Method

4.1 A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specifica-

Designation: C 136 – 06

Provides a very brief synopsis of the test method

# Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates[1]

This standard is issued under the fixed designation C 136; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope*

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only. Specification E 11 designates the size of sieve frames with inch units as standard, but in this test method the frame size is designated in SI units exactly equivalent to the inch units.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

2.2 *AASHTO Standard:*

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates[3]

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology C 125.

## 4. Summary of Test Method

4.1 A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specifica-

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 117 Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

C 125 Terminology Relating to Concrete and Concrete Aggregates

C 637 Specification for Aggregates for Radiation-Shielding Concrete

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

C 702 Practice for Reducing Samples of Aggregate to Testing Size

D 75 Practice for Sampling Aggregates

[1] This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.20 on Normal Weight Aggregates.

Current edition approved Feb. 15, 2006. Published March 2006. Originally approved in 1938. Last previous edition approved in 2005 as C 136 – 05.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specification requirements and to provide necessary data for control of the production of various aggregate products and mixtures containing aggregates. The data may also be useful in developing relationships concerning porosity and packing.

5.2 Accurate determination of material finer than the 75-µm (No. 200) sieve cannot be achieved by use of this test method alone. Test Method C 117 for material finer than 75-µm sieve by washing should be employed.

5.3 Refer to methods of sampling and testing in Specification C 637 for heavyweight aggregates.

## 6. Apparatus

6.1 *Balances*—Balances or scales used in testing fine and coarse aggregate shall have readability and accuracy as follows:

6.1.1 For fine aggregate, readable to 0.1 g and accurate to 0.1 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

[3] Available from American Association of State Highway and Transportation Officials, 444 North Capitol St. N.W., Suite 225, Washington, DC 20001.

Why is this standard relevant, how is it typically used, when is it not applicable?

*A Summary of Changes section appears at the end of this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 117 Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

C 125 Terminology Relating to Concrete and Concrete Aggregates

C 637 Specification for Aggregates for Radiation-Shielding Concrete

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

C 702 Practice for Reducing Samples of Aggregate to Testing Size

D 75 Practice for Sampling Aggregates

[1] This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.20 on Normal Weight Aggregates.

Current edition approved Feb. 15, 2006. Published March 2006. Originally approved in 1938. Last previous edition approved in 2005 as C 136 – 05.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

determination of particle size distribution.

## 5. Significance and Use

5.1 This test method is used primarily to determine the grading of materials proposed for use as aggregates or being used as aggregates. The results are used to determine compliance of the particle size distribution with applicable specification requirements and to provide necessary data for control of the production of various aggregate products and mixtures containing aggregates. The data may also be useful in developing relationships concerning porosity and packing.

5.2 Accurate determination of material finer than the 75-µm (No. 200) sieve cannot be achieved by use of this test method alone. Test Method C 117 for material finer than 75-µm sieve by washing should be employed.

5.3 Refer to methods of sampling and testing in Specification C 637 for heavyweight aggregates.

## 6. Apparatus

6.1 *Balances*—Balances or scales used in testing fine and coarse aggregate shall have readability and accuracy as follows:

6.1.1 For fine aggregate, readable to 0.1 g and accurate to 0.1 g or 0.1 % of the test load, whichever is greater, at any point within the range of use.

[3] Available from American Association of State Highway and Transportation Officials, 444 North Capitol St. N.W., Suite 225, Washington, DC 20001.

What equipment is required and how accurate does it need to be?

*A Summary of Changes section appears at the end of this standard.

a portion of the sample if used for a small sample of coarse aggregate or fine aggregate.

6.4 *Oven*—An oven of appropriate size capable of maintaining a uniform temperature of 110 ± 5 °C (230 ± 9 °F).

## 7. Sampling

7.1 Sample the aggregate in accordance with Practice D 75. The size of the field sample shall be the quantity shown in Practice D 75 or four times the quantity required in 7.4 and 7.5 (except as modified in 7.6), whichever is greater.

7.2 Thoroughly mix the sample and reduce it to an amount suitable for testing using the applicable procedures described in Practice C 702. The sample for test shall be approximately the quantity desired when dry and shall be the end result of the reduction. Reduction to an exact predetermined quantity shall not be permitted.

NOTE 3—Where sieve analysis, including determination of material finer than the 75-µm sieve, is the only testing proposed, the size of the sample may be reduced in the field to avoid shipping excessive quantities of extra material to the laboratory.

7.3 *Fine Aggregate*—The size of the test sample, after drying, shall be 300 g minimum.

7.4 *Coarse Aggregate*—The size of the test sample of coarse aggregate shall conform with the following:

| Nominal Maximum Size, Square Openings, mm (in.) | Test Sample Size, min, kg (lb) |
|---|---|
| 9.5 (⅜) | 1 (2) |
| 12.5 (½) | 2 (4) |
| 19.0 (¾) | 5 (11) |
| 25.0 (1) | 10 (22) |
| 37.5 (1½) | 15 (33) |
| 50 (2) | 20 (44) |
| 63 (2½) | 35 (77) |
| 75 (3) | 60 (130) |
| 90 (3½) | 100 (220) |

than 12.5 mm (½ in.), use a single test sample as described in 7.7.1, or optionally use separate test samples for Test Method C 117 and this test method.

7.7.3 Where the specifications require determination of the total amount of material finer than the 75-µm sieve by washing and dry sieving, use the procedure described in 7.7.1.

## 8. Procedure

8.1 Dry the sample to constant mass at a temperature of 110 ± 5 °C (230 ± 9 °F).

NOTE 4—For control purposes, particularly where rapid results are desired, it is generally not necessary to dry coarse aggregate for the sieve analysis test. The results are little affected by the moisture content unless: (*1*) the nominal maximum size is smaller than about 12.5 mm (½ in.); (*2*) the coarse aggregate contains appreciable material finer than 4.75 mm (No. 4); or (*3*) the coarse aggregate is highly absorptive (a lightweight aggregate, for example). Also, samples may be dried at the higher temperatures associated with the use of hot plates without affecting results, provided steam escapes without generating pressures sufficient to fracture the particles, and temperatures are not so great as to cause chemical breakdown of the aggregate.

8.2 Select sieves with suitable openings to furnish the information required by the specifications covering the material to be tested. Use additional sieves as desired or necessary to provide other information, such as fineness modulus, or to regulate the amount of material on a sieve. Nest the sieves in order of decreasing size of opening from top to bottom and place the sample on the top sieve. Agitate the sieves by hand or by mechanical apparatus for a sufficient period, established by trial or checked by measurement on the actual test sample, to meet the criterion for adequacy or sieving described in 8.4.

8.3 Limit the quantity of material on a given sieve so that all particles have opportunity to reach sieve openings a number of times during the sieving operation. For sieves with openings

a portion of the sample if used for a small sample of coarse aggregate or fine aggregate.

6.4 *Oven*—An oven of appropriate size capable of maintaining a uniform temperature of 110 ± 5 °C (230 ± 9 °F).

## 7. Sampling

7.1 Sample the aggregate in accordance with Practice D 75. The size of the field sample shall be the quantity shown in Practice D 75 or four times the quantity required in 7.4 and 7.5 (except as modified in 7.6), whichever is greater.

7.2 Thoroughly mix the sample and reduce it to an amount suitable for testing using the applicable procedures described in Practice C 702. The sample for test shall be approximately the quantity desired when dry and shall be the end result of the reduction. Reduction to an exact predetermined quantity shall not be permitted.

NOTE 3—Where sieve analysis, including determination of material finer than the 75-µm sieve, is the only testing proposed, the size of the sample may be reduced in the field to avoid shipping excessive quantities of extra material to the laboratory.

7.3 *Fine Aggregate*—The size of the test sample, after drying, shall be 300 g minimum.

7.4 *Coarse Aggregate*—The size of the test sample of coarse aggregate shall conform with the following:

| Nominal Maximum Size, Square Openings, mm (in.) | Test Sample Size, min, kg (lb) |
|---|---|
| 9.5 (⅜) | 1 (2) |
| 12.5 (½) | 2 (4) |
| 19.0 (¾) | 5 (11) |
| 25.0 (1) | 10 (22) |
| 37.5 (1½) | 15 (33) |
| 50 (2) | 20 (44) |
| 63 (2½) | 35 (77) |
| 75 (3) | 60 (130) |
| 90 (3½) | 100 (220) |

than 12.5 mm (½ in.), use a single test sample as described in 7.7.1, or optionally use separate test samples for Test Method C 117 and this test method.

7.7.3 Where the specifications require determination of the total amount of material finer than the 75-µm sieve by washing and dry sieving, use the procedure described in 7.7.1.

## 8. Procedure

8.1 Dry the sample to constant mass at a temperature of 110 ± 5 °C (230 ± 9 °F).

NOTE 4—For control purposes, particularly where rapid results are desired, it is generally not necessary to dry coarse aggregate for the sieve analysis test. The results are little affected by the moisture content unless: (*1*) the nominal maximum size is smaller than about 12.5 mm (½ in.); (*2*) the coarse aggregate contains appreciable material finer than 4.75 mm (No. 4); or (*3*) the coarse aggregate is highly absorptive (a lightweight aggregate, for example). Also, samples may be dried at the higher temperatures associated with the use of hot plates without affecting results, provided steam escapes without generating pressures sufficient to fracture the particles, and temperatures are not so great as to cause chemical breakdown of the aggregate.

8.2 Select sieves with suitable openings to furnish the information required by the specifications covering the material to be tested. Use additional sieves as desired or necessary to provide other information, such as fineness modulus, or to regulate the amount of material on a sieve. Nest the sieves in order of decreasing size of opening from top to bottom and place the sample on the top sieve. Agitate the sieves by hand or by mechanical apparatus for a sufficient period, established by trial or checked by measurement on the actual test sample, to meet the criterion for adequacy or sieving described in 8.4.

8.3 Limit the quantity of material on a given sieve so that all particles have opportunity to reach sieve openings a number of times during the sieving operation. For sieves with openings

the material retained on any individual sieve will pass that sieve during 1 min of continuous hand sieving performed as follows: Hold the individual sieve, provided with a snug-fitting pan and cover, in a slightly inclined position in one hand. Strike the side of the sieve sharply and with an upward motion against the heel of the other hand at the rate of about 150 times per minute, turn the sieve about one sixth of a revolution at

**TABLE 1 Maximum Allowable Quantity of Material Retained on a Sieve, kg**

| Sieve Opening Size, mm | Nominal Dimensions of Sieve[A] | | | | |
|---|---|---|---|---|---|
| | 203.2-mm dia[B] | 254-mm dia[B] | 304.8-mm dia[B] | 350 by 350 mm | 372 by 580 mm |
| | Sieving Area, $m^2$ | | | | |
| | 0.0285 | 0.0457 | 0.0670 | 0.1225 | 0.2158 |
| 125 | C | C | C | C | 67.4 |
| 100 | C | C | C | 30.6 | 53.9 |
| 90 | C | C | 15.1 | 27.6 | 48.5 |
| 75 | C | 8.6 | 12.6 | 23.0 | 40.5 |
| 63 | C | 7.2 | 10.6 | 19.3 | 34.0 |
| 50 | 3.6 | 5.7 | 8.4 | 15.3 | 27.0 |
| 37.5 | 2.7 | 4.3 | 6.3 | 11.5 | 20.2 |
| 25.0 | 1.8 | 2.9 | 4.2 | 7.7 | 13.5 |
| 19.0 | 1.4 | 2.2 | 3.2 | 5.8 | 10.2 |
| 12.5 | 0.89 | 1.4 | 2.1 | 3.8 | 6.7 |
| 9.5 | 0.67 | 1.1 | 1.6 | 2.9 | 5.1 |
| 4.75 | 0.33 | 0.54 | 0.80 | 1.5 | 2.6 |

[A] Sieve frame dimensions in inch units: 8.0-in. diameter; 10.0-in. diameter, 12.0-in. diameter; 13.8 by 13.8 in. (14 by 14 in. nominal); 14.6 by 22.8 in. (16 by 24 in. nominal).

[B] The sieve area for round sieve frames is based on an effective diameter 12.7 mm (½ in.) less than the nominal frame diameter, because Specification E 11 permits the sealer between the sieve cloth and the frame to extend 6.35 mm (¼ in.) over the sieve cloth. Thus the effective sieving diameter for a 203.2-mm (8.0-in.) diameter sieve frame is 190.5 mm (7.5 in.). Sieves produced by some manufacturers do not infringe on the sieve cloth by the full 6.35 mm (¼ in.).

[C] Sieves indicated have less than five full openings and should not be used for sieve testing except as provided in 8.6.

necessary, in order to determine whether they will pass through a particular opening; however, do not force particles to pass through an opening.

8.7 Determine the mass of each size increment on a scale or balance conforming to the requirements specified in 5.1 to the nearest 0.1 % of the total original dry sample mass. The total mass of the material after sieving should check closely with original mass of sample placed on the sieves. If the amounts differ by more than 0.3 %, based on the original dry sample mass, the results should not be used for acceptance purposes.

8.8 If the sample has previously been tested by Test Method C 117, add the mass finer than the 75-µm (No. 200) sieve determined by that test method to the mass passing the 75-µm (No. 200) sieve by dry sieving of the same sample in this test method.

## 9. Calculation

9.1 Calculate percentages passing, total percentages retained, or percentages in various size fractions to the nearest 0.1 % on the basis of the total mass of the initial dry sample. If the same test sample was first tested by Test Method C 117, include the mass of material finer than the 75-µm (No. 200) size by washing in the sieve analysis calculation; and use the total dry sample mass prior to washing in Test Method C 117 as the basis for calculating all the percentages.

9.1.1 When sample increments are tested as provided in 7.6, total the masses of the portion of the increments retained on each sieve, and use these masses to calculate the percentages as in 9.1.

9.2 Calculate the fineness modulus, when required, by adding the total percentages of material in the sample that is coarser than each of the following sieves (cumulative percentages retained), and dividing the sum by 100: 150-µm (No.

100), 300-µm (No. 50), 600-µm (No. 30), 1.18-mm (No. 16), 2.36-mm (No. 8), 4.75-mm (No. 4), 9.5-mm (⅜-in.), 19.0-mm (¾-in.), 37.5-mm (1½-in.), and larger, increasing in the ratio of 2 to 1.

## 10. Report

10.1 Depending upon the form of the specifications for use of the material under test, the report shall include the following:

10.1.1 Total percentage of material passing each sieve, or

10.1.2 Total percentage of material retained on each sieve, or

10.1.3 Percentage of material retained between consecutive sieves.

10.2 Report percentages to the nearest whole number, except if the percentage passing the 75-µm (No. 200) sieve is less than 10 %, it shall be reported to the nearest 0.1 %.

10.3 Report the fineness modulus, when required, to the nearest 0.01.

## 11. Precision and Bias

11.1 *Precision*—The estimates of precision for this test method are listed in Table 2. The estimates are based on the results from the AASHTO Materials Reference Laboratory Proficiency Sample Program, with testing conducted by Test Method C 136 and AASHTO No. T 27. The data are based on the analyses of the test results from 65 to 233 laboratories that tested 18 pairs of coarse aggregate proficiency test samples and test results from 74 to 222 laboratories that tested 17 pairs of fine aggregate proficiency test samples (Samples No. 21 through 90). The values in the table are given for different ranges of total percentage of aggregate passing a sieve.

**TABLE 2 Precision**

| | Total Percentage of Material Passing | | Standard Deviation (1s), %[A] | Acceptable Range of Two Results (d2s), %[A] |
|---|---|---|---|---|
| *Coarse Aggregate:*[B] | | | | |
| Single-operator precision | <100 | ≥95 | 0.32 | 0.9 |
| | <95 | ≥85 | 0.81 | 2.3 |
| | <85 | ≥80 | 1.34 | 3.8 |
| | <80 | ≥60 | 2.25 | 6.4 |
| | <60 | ≥20 | 1.32 | 3.7 |
| | <20 | ≥15 | 0.96 | 2.7 |
| | <15 | ≥10 | 1.00 | 2.8 |
| | <10 | ≥5 | 0.75 | 2.1 |
| | <5 | ≥2 | 0.53 | 1.5 |
| | <2 | >0 | 0.27 | 0.8 |
| Multilaboratory precision | <100 | ≥95 | 0.35 | 1.0 |
| | <95 | ≥85 | 1.37 | 3.9 |
| | <85 | ≥80 | 1.92 | 5.4 |
| | <80 | ≥60 | 2.82 | 8.0 |
| | <60 | ≥20 | 1.97 | 5.6 |
| | <20 | ≥15 | 1.60 | 4.5 |
| | <15 | ≥10 | 1.48 | 4.2 |
| | <10 | ≥5 | 1.22 | 3.4 |
| | <5 | ≥2 | 1.04 | 3.0 |
| | <2 | >0 | 0.45 | 1.3 |
| *Fine Aggregate:* | | | | |
| Single-operator precision | <100 | ≥95 | 0.26 | 0.7 |
| | <95 | ≥60 | 0.55 | 1.6 |
| | <60 | ≥20 | 0.83 | 2.4 |
| | <20 | ≥15 | 0.54 | 1.5 |
| | <15 | ≥10 | 0.36 | 1.0 |
| | <10 | ≥2 | 0.37 | 1.1 |
| | <2 | >0 | 0.14 | 0.4 |
| Multilaboratory precision | <100 | ≥95 | 0.23 | 0.6 |
| | <95 | ≥60 | 0.77 | 2.2 |
| | <60 | ≥20 | 1.41 | 4.0 |
| | <20 | ≥15 | 1.10 | 3.1 |
| | <15 | ≥10 | 0.73 | 2.1 |
| | <10 | ≥2 | 0.65 | 1.8 |
| | <2 | >0 | 0.31 | 0.9 |

[A] These numbers represent, respectively, the (1s) and (d2s) limits described in

100), 300-µm (No. 50), 600-µm (No. 30), 1.18-mm (No. 16), 2.36-mm (No. 8), 4.75-mm (No. 4), 9.5-mm (⅜-in.), 19.0-mm (¾-in.), 37.5-mm (1½-in.), and larger, increasing in the ratio of 2 to 1.

## 10. Report

10.1 Depending upon the form of the specifications for use of the material under test, the report shall include the following:

10.1.1 Total percentage of material passing each sieve, or

10.1.2 Total percentage of material retained on each sieve, or

10.1.3 Percentage of material retained between consecutive sieves.

10.2 Report percentages to the nearest whole number, except if the percentage passing the 75-µm (No. 200) sieve is less than 10 %, it shall be reported to the nearest 0.1 %.

10.3 Report the fineness modulus, when required, to the nearest 0.01.

## 11. Precision and Bias

11.1 *Precision*—The estimates of precision for this test method are listed in Table 2. The estimates are based on the results from the AASHTO Materials Reference Laboratory Proficiency Sample Program, with testing conducted by Test Method C 136 and AASHTO No. T 27. The data are based on the analyses of the test results from 65 to 233 laboratories that tested 18 pairs of coarse aggregate proficiency test samples and test results from 74 to 222 laboratories that tested 17 pairs of fine aggregate proficiency test samples (Samples No. 21 through 90). The values in the table are given for different ranges of total percentage of aggregate passing a sieve.

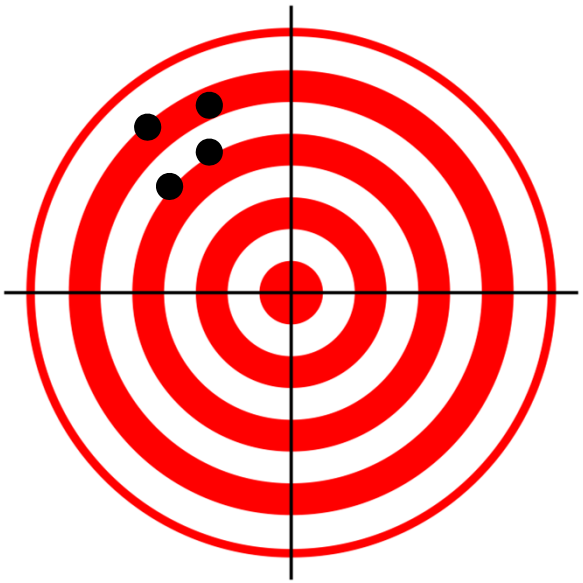
**TABLE 2 Precision**

| | Total Percentage of Material Passing | | Standard Deviation (1s), %[A] | Acceptable Range of Two Results (d2s), %[A] |
|---|---|---|---|---|
| *Coarse Aggregate:*[B] | | | | |
| Single-operator precision | <100 | ≥95 | 0.32 | 0.9 |
| | <95 | ≥85 | 0.81 | 2.3 |
| | <85 | ≥80 | 1.34 | 3.8 |
| | <80 | ≥60 | 2.25 | 6.4 |
| | <60 | ≥20 | 1.32 | 3.7 |
| | <20 | ≥15 | 0.96 | 2.7 |
| | <15 | ≥10 | 1.00 | 2.8 |
| | <10 | ≥5 | 0.75 | 2.1 |
| | <5 | ≥2 | 0.53 | 1.5 |
| | <2 | >0 | 0.27 | 0.8 |
| Multilaboratory precision | <100 | ≥95 | 0.35 | 1.0 |
| | <95 | ≥85 | 1.37 | 3.9 |
| | <85 | ≥80 | 1.92 | 5.4 |
| | <80 | ≥60 | 2.82 | 8.0 |
| | <60 | ≥20 | 1.97 | 5.6 |
| | <20 | ≥15 | 1.60 | 4.5 |
| | <15 | ≥10 | 1.48 | 4.2 |
| | <10 | ≥5 | 1.22 | 3.4 |
| | <5 | ≥2 | 1.04 | 3.0 |
| | <2 | >0 | 0.45 | 1.3 |
| *Fine Aggregate:* | | | | |
| Single-operator precision | <100 | ≥95 | 0.26 | 0.7 |
| | <95 | ≥60 | 0.55 | 1.6 |
| | <60 | ≥20 | 0.83 | 2.4 |
| | <20 | ≥15 | 0.54 | 1.5 |
| | <15 | ≥10 | 0.36 | 1.0 |
| | <10 | ≥2 | 0.37 | 1.1 |
| | <2 | >0 | 0.14 | 0.4 |
| Multilaboratory precision | <100 | ≥95 | 0.23 | 0.6 |
| | <95 | ≥60 | 0.77 | 2.2 |
| | <60 | ≥20 | 1.41 | 4.0 |
| | <20 | ≥15 | 1.10 | 3.1 |
| | <15 | ≥10 | 0.73 | 2.1 |
| | <10 | ≥2 | 0.65 | 1.8 |
| | <2 | >0 | 0.31 | 0.9 |

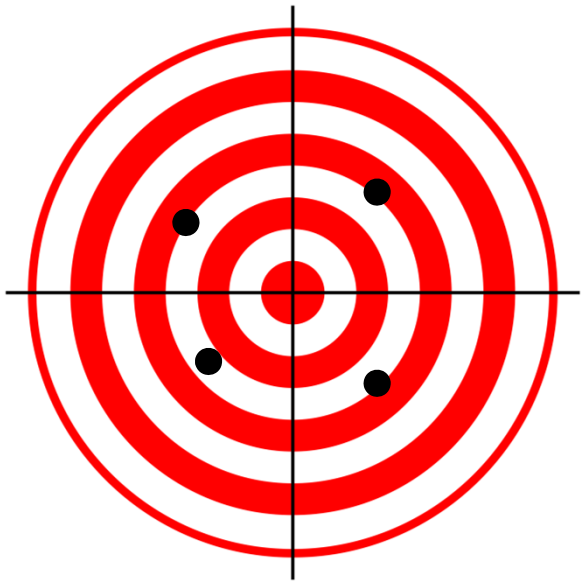
[A] These numbers represent, respectively, the (1s) and (d2s) limits described in

# Precision

The closeness of agreement among test results obtained under prescribed conditions.



Precise but not Accurate



Accurate but not Precise

# Repeatability and Reproducibility

**Repeatability** - addresses variability between independent test results gathered from within a single laboratory ("intralaboratory testing").

**Reproducibility** - addresses variability among single test results gathered from different laboratories ("interlaboratory testing").

100), 300-µm (No. 50), 600-µm (No. 30), 1.18-mm (No. 16), 2.36-mm (No. 8), 4.75-mm (No. 4), 9.5-mm (⅜-in.), 19.0-mm (¾-in.), 37.5-mm (1½-in.), and larger, increasing in the ratio of 2 to 1.

## 10. Report

10.1 Depending upon the form of the specifications for use of the material under test, the report shall include the following:

10.1.1 Total percentage of material passing each sieve, or

10.1.2 Total percentage of material retained on each sieve, or

10.1.3 Percentage of material retained between consecutive sieves.

10.2 Report percentages to the nearest whole number, except if the percentage passing the 75-µm (No. 200) sieve is less than 10 %, it shall be reported to the nearest 0.1 %.

10.3 Report the fineness modulus, when required, to the nearest 0.01.

## 11. Precision and Bias

11.1 *Precision*—The estimates of precision for this test method are listed in Table 2. The estimates are based on the results from the AASHTO Materials Reference Laboratory Proficiency Sample Program, with testing conducted by Test Method C 136 and AASHTO No. T 27. The data are based on the analyses of the test results from 65 to 233 laboratories that tested 18 pairs of coarse aggregate proficiency test samples and test results from 74 to 222 laboratories that tested 17 pairs of fine aggregate proficiency test samples (Samples No. 21 through 90). The values in the table are given for different ranges of total percentage of aggregate passing a sieve.

**TABLE 2 Precision**

| | Total Percentage of Material Passing | | Standard Deviation (1s), %[A] | Acceptable Range of Two Results (d2s), %[A] |
|---|---|---|---|---|
| *Coarse Aggregate:*[B] | | | | |
| Single-operator precision | <100 | ≥95 | 0.32 | 0.9 |
| | <95 | ≥85 | 0.81 | 2.3 |
| | <85 | ≥80 | 1.34 | 3.8 |
| repeatability | <80 | ≥60 | 2.25 | 6.4 |
| | <60 | ≥20 | 1.32 | 3.7 |
| | <20 | ≥15 | 0.96 | 2.7 |
| | <15 | ≥10 | 1.00 | 2.8 |
| | <10 | ≥5 | 0.75 | 2.1 |
| | <5 | ≥2 | 0.53 | 1.5 |
| | <2 | >0 | 0.27 | 0.8 |
| Multilaboratory precision | <100 | ≥95 | 0.35 | 1.0 |
| | <95 | ≥85 | 1.37 | 3.9 |
| | <85 | ≥80 | 1.92 | 5.4 |
| reproducibility | <80 | ≥60 | 2.82 | 8.0 |
| | <60 | ≥20 | 1.97 | 5.6 |
| | <20 | ≥15 | 1.60 | 4.5 |
| | <15 | ≥10 | 1.48 | 4.2 |
| | <10 | ≥5 | 1.22 | 3.4 |
| | <5 | ≥2 | 1.04 | 3.0 |
| | <2 | >0 | 0.45 | 1.3 |
| *Fine Aggregate:* | | | | |
| Single-operator precision | <100 | ≥95 | 0.26 | 0.7 |
| | <95 | ≥60 | 0.55 | 1.6 |
| | <60 | ≥20 | 0.83 | 2.4 |
| | <20 | ≥15 | 0.54 | 1.5 |
| | <15 | ≥10 | 0.36 | 1.0 |
| | <10 | ≥2 | 0.37 | 1.1 |
| | <2 | >0 | 0.14 | 0.4 |
| Multilaboratory precision | <100 | ≥95 | 0.23 | 0.6 |
| | <95 | ≥60 | 0.77 | 2.2 |
| | <60 | ≥20 | 1.41 | 4.0 |
| | <20 | ≥15 | 1.10 | 3.1 |
| | <15 | ≥10 | 0.73 | 2.1 |
| | <10 | ≥2 | 0.65 | 1.8 |
| | <2 | >0 | 0.31 | 0.9 |

[A] These numbers represent, respectively, the (1s) and (d2s) limits described in