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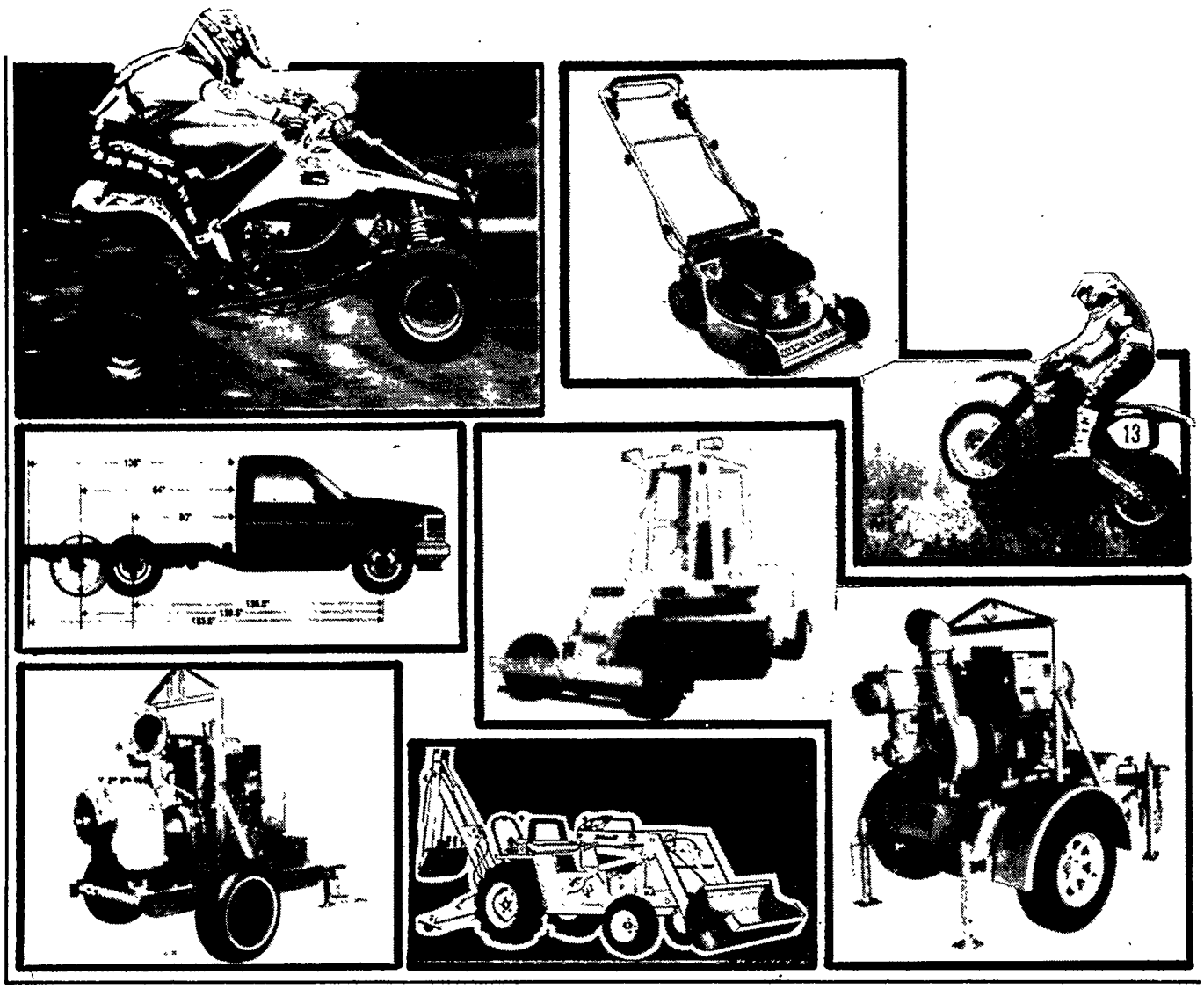
Manufacturer Submission Procedures for Qualification Testing of General Purpose/ Screen and Locomotive Spark Arrester Exhaust Systems



Manufacturer Submission Procedures for Qualification Testing of General Purpose/ Screen and Locomotive Spark Arrester Exhaust Systems

Prepared by:

LOIS P. SICKING
Mechanical Engineer

Reviewed by:

PHILLIP R. SCHULZ
Equipment Specialist

ROGER W. BERGMANN
Mechanical Engineer Technician

Approved by:

PAUL R. HILL
Program Leader - Fire Management

San Dimas Technology & Development Program

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Technical Services, Fire Management

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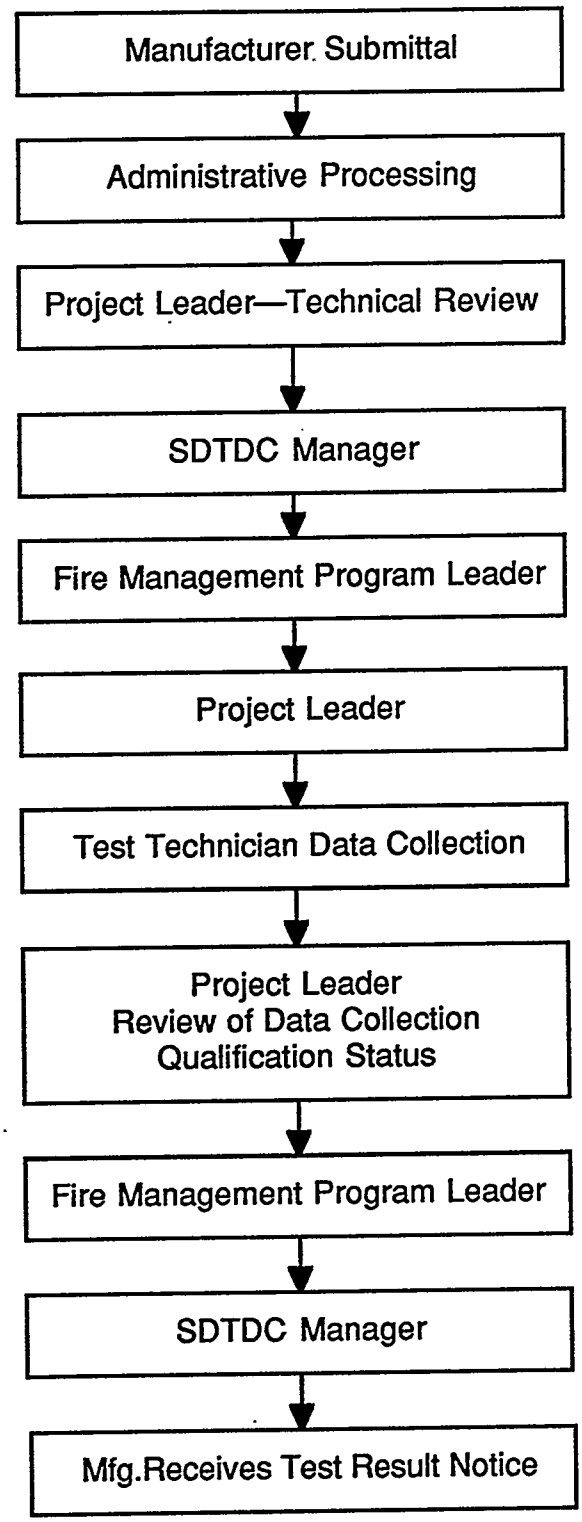


MANUFACTURER SUBMISSION PROCEDURE

For Qualification Testing of General Purpose/Screen and Locomotive Spark Arrester Exhaust Systems

INTRODUCTION

This submission procedure booklet is designed specifically for use by a manufacturer in submitting a spark arrester exhaust system for evaluation and qualification testing. When the submittal packet is completed, your product will be placed in chronological order for test scheduling.

The present evaluation program is based on performance requirements for the Society of Automotive Engineers (SAE) Recommended Practice J350, "Spark Arrester Test Procedure for Medium Size Engines" and the USDA Forest Service Standard 5100-01, "Spark Arresters for Internal Combustion Engines" for General Purpose/ Screen spark arrester performance requirements.

The performance requirements for locomotive spark arresters are defined in SAE Recommended Practice J342, "Spark Arrester Test Procedure For Large Size Engines," the Association of American Railroads (AARR) Recommended Practice "Standard For Spark Arresters for Non-Turbocharged Diesel Engines in Railroad Locomotives" and the USDA Forest Service Standard 5100-01.

PURPOSE

The spark arrester qualification test provides a method of testing to evaluate the spark arresting effectiveness of the General Purpose/Screen and Locomotive exhaust systems. This type of equipment may come into close proximity with grass, brush, timber and similar cellulose materials with potential for fire ignition. Qualification for general purpose and locomotive spark arresters require that the exhaust system shall have a minimum 80% spark arresting effectiveness on the laboratory test. Special requirements for the screen-type devices include: (a.) the spark arrester exhaust screens do not contain openings greater than 0.023 inch and (b.) the open effective exhaust area shall not be less than 200 percent of the exhaust port area. The screen material must be heat and corrosion resistant and shall provide a minimum of 100 hours of service life.

REQUEST FOR QUALIFICATION TESTING

A manufacturer makes a request for qualification testing to the USDA Forest Service at the San Dimas Technology and Development Center (SDTDC) in San Dimas, California. Instructions and forms for submitting a spark arrester exhaust system for qualification testing are contained in this procedure booklet and may be copied for submission purposes.

SUBMITTAL PAPERWORK AND HARDWARE FOR GENERAL PURPOSE/ SCREEN QUALIFICATION TESTING

The following are required when submitting a General Purpose/Screen test unit:

1. A completed COLLECTION AGREEMENT, SDTDC 7100-12 (05/91), with an original signature. A separate collection agreement must be sent for each sample test unit and for each position the general purpose sample test unit is to be tested. See the section herein entitled "Spark Arrester Position of Application."

2. A completed General Purpose/Screen Spark Arrester Pretest Information Form for Qualification Testing, SDTDC 7100-35 (01/91) for screen-type spark arresters.

3. A test fee in the form of a check made out to the USDA Forest Service. This test fee will cover direct and indirect costs of conducting the test. If costs exceed the initial estimate, additional funds will be requested. The Collection Agreement fee is placed in the manufacturer's pool account.

4. Spark arrester installation, cleanout, and maintenance instructions as would be provided with the unit to the consumer. The cleanout shall be accomplished readily by the consumer without the removal of the clamping or mounting devices from the stack, pipe, or manifold assembly. Screen-type spark arresters shall provide for the easy removal, cleaning, and replacement of the screen.

5. A quality line drawing to be used in the Spark Arrester Guide (SAG) is required to be submitted by GP/Screen manufacturers after September 1, 1991. See the attached examples in Appendix 3A. A complete set of engineering working drawings are also required with internal and external construction details with dimensions.

6. Include a sample test unit. Qualification testing will be performed on pre-production or full production models only. Testing of a prototype must be followed by a test of the production model before the unit can be listed as a qualified unit. Changes or modifications to a design are not permitted during a qualification test.

Production models must be permanently marked with a manufacturer identification in the form of a trademark or name and a unique spark arrester alphanumeric model identification. The model identification must match exactly the number called

out in the Collection Agreement. In addition, the screen-type spark arresters must have "Screen-Type" clearly imprinted in 1/8-inch or larger letters on the arrester or on a readily visible exterior surface near the exhaust outlet. A temperature resistant decal can be an option to imprinting "Screen-Type".

If a general purpose spark arrester can be disassembled, as in a spark arrester insert in a muffler shell or a unit with an end cap, reassembly must be indexed to one position only. The exhaust system identification shall be visible without removal of the exhaust system from the engine.

7. One hundred hour endurance test data shall be submitted for the screen-type spark arrester qualification test and the screen-type qualification by exam test for screen-type spark arresters with a 50-hp or greater engine application. The 100-hour endurance test shall be performed in accordance with the requirements of FSS 5100-01. See the section herein titled "Endurance Test For the Screen-Type Spark Arrester."

8. Any special tools that may be required to complete testing.

9. A spark arrester chamber mounting adapter must be included, if necessary, for qualification testing.

SUBMITTAL PAPERWORK FOR LOCOMOTIVE QUALIFICATION TESTING

The following are required when submitting a request for locomotive qualification testing:

1. A completed Collection Agreement, 7100-14 (12/90), with an original signature. A separate collection agreement must be sent for each test unit for qualification.

2. A test fee in the form of a check made out to the USDA Forest Service. This test fee will be estimated by the SDTDC General Purpose/Locomotive Spark Arrester Project Leader and will cover direct and indirect costs of conducting the test.

3. Spark arrester installation, cleanout, and maintenance instructions as would be provided with the unit to the consumer. The cleanout shall be accomplished readily by the consumer without the removal of the clamping or mounting devices from the stack, pipe, or manifold assembly. The arrester, if of the retention type, shall have provisions for the easy disposal of accumulated carbon particles.

4. A quality line drawing to be used in the Spark Arrester Guide (SAG) is required. See attached examples in Appendix 3B. A complete set of engineering working drawings are also required with internal and external construction details with dimensions.

5. Include hardware to be tested. Qualification testing will be performed on pre-production or full production models only. Testing of a prototype must be followed by a test of the production model before the unit can be listed as a qualified unit. Changes or modifications to a design are not permitted during a qualification test. The external locomotive spark arrester is usually mounted on the exhaust stack with the requirement that the body of the spark arrester be permanently marked with the manufacturer identification and a unique spark arrester alphanumeric model identification by stamping the metal surface or by attaching a metal plate.

For the manifold-type internal spark arrester, the above identification must be stamped in the metal body or on an attached plate affixed to the manifold. The model identification must match exactly the number called out in the Collection Agreement.

6. Qualification testing will be arranged with the manufacturer at a mutually agreeable time and location. The manufacturer will be responsible for expenses associated with testing.

DOCUMENTS

The following are brief narratives that describe each form to be completed as part of the submittal packet.

SDTDC 7100-12 (05/91), Collection Agreement For Qualification Testing of Spark Arresters. This form is used by a manufacturer to enter into an agreement with SDTDC to perform qualification testing in accordance with SAE Recommended Practice J350, "Spark Arrester Test Procedure For Medium Size Engines" and the Forest Service Standard 5100-01, "Spark Arresters For Internal Combustion Engines."

The General Purpose/Screen-Type spark arrester exhaust system must have a unique alphanumeric model identification separate from any General Purpose/Screen-Type spark arrester alphanumeric model identification.

SDTDC 7100-14 (12/90), Collection Agreement For Qualification Testing of Locomotive Spark Arresters. This form is used by a manufacturer to enter into an agreement with SDTDC to perform qualification testing in accordance with the requirements of the Association of American Railroads (AARR) Recommended Practice "Standard For Spark Arresters for Non-Turbocharged Diesel Engines In Railroad Locomotives," SAE Recommended Practice J342, "Spark Arresters for Large Size

Engines" and the USDA Forest Service Standard 5100-01.

SDTDC 7100-35 (01/91), General Purpose/Screen-Type Spark Arrester Pretest Information Form. This form is necessary for test and qualification parameters to be set for the screen-type spark arrester.

SDTDC 7100-34 (06/90), Waiver Request Information Form For General Purpose/Screen Spark Arrester. This form is necessary for documentation of waiver purposes.

SPARK ARRESTER POSITION OF APPLICATION

Spark arrester positions are classified as vertical, horizontal, multipositional, and inverted. The direction the inlet enters the spark arrester determines the position of application. If the spark arrester inlet is horizontal and the body is vertical, the position of application is horizontal. If the inlet is vertical upward, the position of application is vertical regardless of the position of the spark arrester body. If the inlet is vertical downward, it is classified as inverted and the inlet or outlet shall be identified. Screen-type spark arresters are considered multipositional. See Appendix 2.

ENDURANCE TEST FOR THE SCREEN-TYPE SPARK ARRESTER

A test data package of a 100-hour endurance test as performed in accordance with the FSS 5100-01 shall be submitted for the screen-type spark arrester qualification test and the screen exam for the screen-type spark arrester with a 50-hp or greater engine application. The 100-hour endurance test shall be performed in accordance with the requirements of FSS 5100-01. See the section herein titled "Endurance Test For the Screen-Type Spark Arrester."

Information required consists of the specifications for the engine utilized in the 100-hour endurance test. These specifications shall include the engine manufacturer identification, the alphanumeric model designation, maximum governed rpm, 2 or 4 stroke cycle, engine displacement, and engine horsepower.

Also, include the type of fuel used, screen material alloy designation, mesh, wire diameter, screen opening size, a description of the test setup with photographs, and a complete set of working drawings with the dimension of the smallest restriction of the exhaust port diameter identified. The hardware to be submitted consists of the screen-type spark arrester with the screen installed, a new screen, and any parts that may have failed during the 100-hour endurance test.

It is important that the screen and exhaust assembly not be cleaned or altered in any way the last 25 hours of the endurance test and also following the completion of the endurance test.

MODIFICATIONS TO THE SPARK ARRESTER

Any modification or damage to any part of the spark arrester or spark arrester exhaust system as it was originally submitted to SDTDC for qualification testing voids the qualification of the spark arrester. Examples of modifications include removal of or damage to the spark arrester or body parts, a change in the exhaust outlet, improper mounting, exhaust bypasses, and replacing fiberglass packing with steel wool.

GENERAL PURPOSE/SCREEN WAIVER REQUEST PROCEDURE FOR MODELS UNDER A PREVIOUSLY QUALIFIED SPARK ARRESTER EXHAUST SYSTEM

Most General Purpose/Screen spark arrester manufacturers develop several lines of spark arresters to meet widely differing applications. With each line there may be several models, which differ only slightly from each other and employ the same exhaust system. These differences may have little or no effect on the spark arresting effectiveness. Where such a condition exists, it may only be necessary for full qualification testing on the initial spark arrester and allow waiver with a spot check, as deemed necessary, for use on all or part of all of the models in that line. The unit selected for test should be the one representing the most severe application for the group of applications being considered. Qualification by waiver is determined by the USDA Forest Service at the SDTDC.

Listed below are some of the reasons for waiving of test requirements for additional models:

A. The General Purpose/Screen spark arrester model is identical to the test unit except the support bracket location has been changed.

B. Variations in design do not affect the exhaust system, exhaust flow pattern, and do not change the spark arresting effectiveness.

C. The model is identical to the test unit except for color and/or label or miscellaneous appearance changes.

Request Waiver Process

1. The request for waiver for a model under a previously qualified exhaust system is initiated with a formal letter request to the General Purpose Project Leader by the manufacturer with all necessary supporting documentation enclosed.

2. The manufacturer is to request waiver on an originally tested spark arrester exhaust system only. No waiver will be processed based on a previous waiver.

3. A model involved in a waiver request may not have the same alphanumeric model number designation as the previously qualified exhaust system.

4. The manufacturer must submit a fee in the form of a check, pay to the order of USDA Forest Service. This fee will cover estimated direct and indirect costs of conducting the qualification by waiver exam.

5. Requests for waiver of previously qualified models are considered in the order received, only after all the supporting documentation and submittal paperwork has been received and approved by the General Purpose/Locomotive Spark Arrester Project Leader.

6. The SDTC will issue a Qualification Notice with a summary of test results if a comparison of the submitted material for waiver documentation, the original SDTDC test file, and a spot check do support the criteria for physical testing waiver.

Waiver Submittal Documentation

The following are required when requesting waiver for a General Purpose/Screen spark arrester model under a previously qualified spark arrester:

A. A signed Collection Agreement Form SDTDC 7100-12 (05/91) must accompany each request for qualification by waiver exam.

B. A completed Waiver Request Information Form SDTDC 7100-34 (06/90).

C. Qualification by Waiver Exam Fee in the form of a check, pay to the order of USDA Forest Service.

D. The 100-hour endurance test data as performed in accordance with the requirements of FSS 5100-01 will be submitted for the screen-type spark arrester for an engine application of 50-hp or greater.

E. A complete set of engineering drawings and a SAG quality drawing indicating internal and external construction details with dimensions of the previously qualified exhaust system.

F. A complete set of engineering drawings and a SAG quality drawing indicating internal and external construction details with dimensions of the waiver unit under consideration.

G. Detailed engineering working drawings of waiver unit and the previously qualified unit.

H. Photos of the previously qualified exhaust system and the waiver unit under consideration.

TEST FEES

Test fees are collected to cover the estimated direct and indirect costs of testing. The Collection Agreement provides for refunds.

A. Full Qualification Test.....$1,400

The Full Qualification Test is the standard quaification test to determine if the General Purpose spark arrester exhaust system meets the requirements of the USDA Forest Service Standard 5100-01.

B. Screen-Type Spark Arrester Qualification Test.....$1,100

The Screen Qualification Test is the standard qualification test for the Screen-Type General Purpose spark arresters to determine compliance with the Endurance Test for ScreenType arresters qualified under USDA Forest Service Standard 5100-01.

C. Qualification By Examination Test $1,000

When a manufacturer has made certain limited modifications to a General Purpose spark arrester, or if a new model has an arresting section identical to an already qualified model, an examination of appropriate drawings and a spot check of efficiency may be necessary, as determined by the SDTDC, to qualify this unit without the full standard qualification test. A decision as to qualification status of any modification is made by SDTDC.

General Purpose spark arresters may be submitted for qualification by examination if the modifications are limited to moderate changes in the inlet size, moderate changes in the outlet size if it is downstream of the carbon separation point, and minor changes in the carbon trap capacity provided this capacity remains adequate. Any additional internal changes to the spark arresting section must be evaluated with a Full Qualification Test.

D. General Purpose QuickTest.....$1,000

The General Purpose Quick Test provides a limited test of arrester performance to give the manufacturer an indication of the effectiveness of his product prototype at a limited number of

points along the presumed operating flow range. An arrester cannot be qualified under this test.

This test is provided as a service to the manufacturer in the product development phase to assist the manufacturer in determining if the unit should be considered for submission for the Full QualificationTest.

SCHEDULING OF TESTING

Testing will be scheduled after all submittal paperwork and hardware has been received and approved by the General Purpose/Locomotive Spark Arrester Project Leader.

QUALIFICATION

A Qualification Notice will be issued to the manufacturer when it has been determined that the submitted General Purpose/Screen spark arrester exhaust system has met all the performance requirements for:

1. The SAE Recommended Practice J350, "Spark Arrester Test Procedure For Medium Size Engines."

2. The USDA Forest Service Standard 5100-01, "Spark Arresters For Internal Combustion Engines."

Or, when the locomotive spark arrester has met all the performance requirements defined in:

1. The SAE Recommended Practice J342, "Spark Arrester Test Procedure For Large Size Engines."

2. The Association of American Railroads (AARR) Recommended Practice "Standard For Spark Arresters for Non-Turbocharged Diesel Engines in Railroad Locomotives."

3. The USDA Forest Service Standard 5100-01.

A summary of test results will be included in the Qualification Notice.

The General Purpose spark arrester will be qualified for a specific position of application. The general purpose spark arresters on mobile equipment shall not be mounted more than 45 degrees from the qualified position.

The Screen-Type spark arrester will be qualified for a specific engine, stroke cycle, maximum governed rpm, and at the manufacturer's rated engine horsepower.

The locomotive spark arrester will be qualified for a specific body type and leg configuration.

See Appendix 4A for data on body types and 4B for leg configutrations.

FAILURE TO QUALIFY

A Failure To Qualify Notice will be issued to the manufacturer when it has been determined that the submitted General Purpose/Screen spark arrester exhaust system has not met all the performance requirements for:

1. The SAE Recommended Practice J350, "Spark Arrester Test Procedure For Medium Size Engines."

2. The USDA Forest Service Standard 5100-01, "Spark Arresters For Internal Combustion Engines."

Or, when the locomotive spark arrester has not met all the performance requirements defined in:

1. The SAE Recommended Practice J342, "Spark Arrester Test Procedure For Large Size Engines."

2. The Association of American Railroads (AARR) Recommended Practice "Standard For Spark Arresters for Non-Turbocharged Diesel Engines in Railroad Locomotives."

3. USDA Forest Service Standard 5100-01.

A summary of test results will be included in the Failure to Qualify Notice.

A failed spark arrester or spark arrester exhaust system cannot be resubmitted for testing under the same model designation or under the same collection agreement. A resubmission must meet all the requirements for a new submission.

DISPOSAL OF HARDWARE

All hardware will be returned to the manufacturer including the spark arrester exhaust system, adapter, and any special tools sent by the manufacturer to complete testing.

TEST FACILITY LIMITATION

Physical limitations of the SDTDC test facilities preclude testing a general purpose spark arrester with an inlet size greater than 6 inches. In this situation, Qualification Testing will be arranged with the manufacturer. Testing outside of routine will require special arrangements, and may require an adjustment of fees submitted and time required for testing. For further information contact:

USDA Forest Service
Technology and Development Center
Attention: *MSE/GP/LOCO*
Spark Arrester Project Leader
444 East Bonita Avenue
San Dimas, California 91773

Telephone: 714/599-1267

Appendix 1A

COLLECTION AGREEMENT
FOR QUALIFICATION TESTING OF
GENERAL PURPOSE AND SCREEN TYPE SPARK ARRESTERS

THIS AGREEMENT, is between _____hereinafter referred to as Company; and USDA Forest Service, San Dimas Technology & Development Center, hereinafter referred to as the Forest Service, and is made under provisions of the Cooperative Funds Act of June 30, 1914 (16 USC 498).

WHEREAS, the Company desires to have the Forest Service conduct a_____ type test on its model _____spark arrester in the _____ position to determine whether it meets requirements of Forest Service Standard 5100-01, "Spark Arresters For Internal Combustion Engines".

WHEREAS, the Forest Service is willing to perform the _____type test on the model _____ spark arrester in order to increase the number of qualified products that meet Forest Service Standard 5100-01, and

WHEREAS, Company is willing to advance funds to defray the costs to the Forest Service to perform such tests of Company's product, and

WHEREAS, it is mutually advantageous at this time to both parties to have tests and evaluations performed.

NOW, THEREFORE:

A. The Company Agrees:

1. To deliver its product to the San Dimas Technology & Development Center, 444 East Bonita Avenue, San Dimas, California 91773.

2. To make advance payments at such time as requested by the Forest Service by check payable to USDA Forest Service, addressed to 444 East Bonita Avenue, San Dimas, California 91773, for deposit. Such funds will be used to pay all direct and indirect costs of performing the test currently are estimated to be $_____. If costs exceed the amount of the initial estimate; work will be stopped and an additional advance requested.

3. Upon completion of work, make necessary arrangements for the return of the product.

B. Forest Service agrees:

1. To perform necessary tests on the model_____spark arrester.

2. To keep Company currently informed as work progresses and furnish Company final report within one month of completion of tests and evaluations. Such reports to state whether or not the model _____spark arrester meets Forest Service Standard 5100-1.

3. To annually refund to the Company any amounts in excess of the cost of doing said work, or at the request of the Company, apply such excess to subsequent agreements.

C. It is Mutually agreed:

1. The results of the tests may be published by the Forest Service at its discretion. The Company may publish or distribute its own publication of the test results outside its organization with the consent of the Forest Service through the Manager of the San Dimas Technology & Development Center. Publication or use of reports or results by the Company through advertising or other media will not be made in any way that implies the endorsement of the Forest Service of the product tested, or which broadens or distorts the factual findings of the tests. Any publication of these results will give appropriate recognition to both parties.

2. The United States of America shall not be liable for any damage incident to the performance of work under this agreement to the Company, who is party to this agreement, and such Company hereby expressly waives any and all claims against the United States of America for compensation for any loss, damage, personal injury or death occurring in consequence of the performance of this agreement.

3. No Member of, or delegate to, Congress or Resident Commissioner shall be admitted to share any part of this agreement or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

4. Either party may terminate this agreement by providing written notice prior to commencement of scheduled work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the last date written below.

Date	Signature and Title
Date	*Manager,* Technology & Development Center USDA Forest Service

SDTDC 7100-12 (05/91)

Appendix 1B

COLLECTION AGREEMENT
FOR QUALIFICATION OF LOCOMOTIVE SPARK ARRESTERS

THIS AGREEMENT, is between _____ hereinafter referred to as Company; and USDA Forest Service, Technology & Development Center, hereinafter referred to as Forest Service, and is made under provisions of the Cooperative Funds Act of June 30, 1914 (16 USC 498).

WHEREAS, the Company desires to have the Forest Service conduct a Qualification Test on its model _____ locomotive spark arrester to determine whether it meets the requirements of the latest revision of the Association of American Railroads (AAR) Recommended Practice "Standard for Spark Arresters for Non-Turbocharged Diesel Engines Used in Railroad Locomotives", Society of Automotive Engineers (SAE) Recommended Practice J342, "Spark Arrester Test Procedure for Large Size Engines", and USDA Forest Service Standard 5100-1a, "Spark Arresters for Internal Combustion Engines."

WHEREAS, the Forest Service is willing to perform the Qualification by Examination of the locomotive spark arrester in order to increase the number of qualified products that meet the requirements of the AAR Recommended Practice, SAE J342, and USDA Forest Service Standard 5100-1a.

WHEREAS, Company is willing to advance funds to defray the costs to the Forest Service to perform such tests on the Company's product, and

WHEREAS, it is mutually advantageous at this time to both parties to have tests and evaluations performed.

NOW, THEREFORE:

A. The Company Agrees:

1. To deliver the test results and related documents to San Dimas Technology & Development Center, 444 East Bonita Avenue, San Dimas, California 91773.

2. To make advance payments at such time as requested by the Forest Service by check payable to the USDA Forest Service, addressed to 444 East Bonita Avenue, San Dimas, California 91773, for deposit. Such funds will be used to pay all direct and indirect costs of performing the test currently estimated at $_____. If costs exceed the amount of the initial estimate, work will be stopped and an additional advance requested. Any funds remaining at completion of the work will be refunded to Company.

B. Forest Service agrees:

1. To perform necessary tests on the_____ model spark arrester.

2. To keep Company currently informed as work progresses and furnish Company final report within one month of completion of tests and examinations. Such reports to state whether or not the locomotive spark arrester meets the requirements of the AAR Recommended Practice, SAE J342, and USDA Forest Service Standard 5100-1a.

SDTDC 7100-14 (12/90)

C. It is Mutually agreed:

1. The results of the tests may be published by the Forest Service at its discretion. The Company may publish or distribute its own publication of the test results outside its organization with the consent of the Forest Service through the Manager of the Technology & Development Center. Publication or use of reports or results by the Company through advertising or other media will not be made in any way that implies the endorsement of the Forest Service of the product tested, or which broadens or distorts the factual findings of the tests. Any publication of these results will give appropriate recognition to both parties.

2. The United States of America shall not be liable for any damage incident to the performance of work under this agreement to the Company, who is party to this agreement, and such Company hereby expressly waives any and all claims against the United States of America for compensation for any loss, damage, personal injury or death occurring in consequence of the performance of this agreement.

3. No member of, or delegate to, Congress or Resident Commissioner shall be admitted to share any part of this agreement or to any benefit that may arise therefrom; but this provision shall not be construed to this agreement if made with a corporation for its general benefit.

4. Either party may terminate this agreement by providing written notice prior to commencement of scheduled work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the last date written below.

Date	Signature and Title
Date	*Manager,* Technology & Development Center USDA Forest Service

SDTDC 7100-14 (12/90)

Appendix 1C

GENERAL PURPOSE/SCREEN SPARK ARRESTER

Pretest Information Form for Qualification Testing

1. Spark Arrester manufacturer and model: _____

2. 100 hour endurance test engine specifications for the screen type qualification test for engine applications of 50 hp or greater: _____

   A. Engine manufacturer identification: _____

   B. Engine alphanumeric model designation: _____

   C. 2 or 4 stroke cycle: _____

   D. Engine displacement (cc): _____

   E. Engine horsepower: _____

   F. Engine Maximum governed rpm: _____

   G. Type of fuel used: _____

   H. Include a description of the test setup with photographs.

   I. Include a complete set of working drawings with the dimension of the smallest restriction of the exhaust port diameter identified.

   J. Include the screen material alloy designation, mesh size, screen wire diameter, and opening size on the working drawings.

   K. The hardware to be submitted consists of the screen type spark arrester with the screen installed, a new screen and any parts that may have failed during the 100 hour endurance test.

   L. It is important that the screen and exhaust assembly not be cleaned or altered in any way following the completion of the endurance test.

3. Waiver of the Screen Type Spark Arrester is permitted only to an engine of equal or less than engine displacement and horsepower with the percent effective open screen area not less than 200 percent of the exhaust port area. If the screen type unit under waiver consideration does not meet this criteria, it must undergo the Full Screen Type Spark Arrester Qualification Test.

SDTDC 7100-35 (1/91)

Appendix 1D

GENERAL PURPOSE/SCREEN SPARK ARRESTER

WAIVER REQUEST INFORMATION FORM
For Models Under a Previously Qualified Exhaust System

1. Original Collection Agreement Number(if known): _____

2. Date of Original Qualification(if known): _____

3. Make and Model No. of the previously qualified spark arrester exhaust system:

   _____

4. Make and Model No. of the spark arrester exhaust system under waiver consideration:

   _____

5. Give a description of the differences between the two models including any modifications in design, change in the inlet or outlet size or carbon trap capacity: _____

   _____

   _____

6. Waiver of the Screen Type Spark Arrester is permitted only to an engine of equal or less than engine displacement and horsepower with the percent effective open screen area not less than 200 percent of the exhaust port area. If the screen type unit under waiver consideration does not meet this criteria, it must undergo the Full Screen Type Spark Arrester Qualification Test.

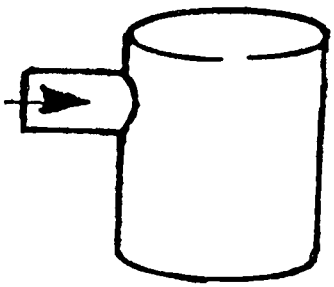
7. 100 hour endurance test engine specifications for the screen type waiver for engines with a 50 hp or greater engine application:

   A. Engine manufacturer identification: _____
   B. Alphanumeric model designation: _____
   C. 2 or 4 stroke cycle: _____
   D. Engine displacement (cc): _____
   E. Engine horsepower: _____
   F. Type of fuel used: _____
   G. Include a description of the test setup with photographs.
   H. Include a complete set of working drawings with the dimension of the smallest restriction of the exhaust port diameter identified.
   I. Include the screen material alloy designation, mesh size, screen wire diameter, and opening size on the working drawings.
   J. The hardware to be submitted consists of the screen type spark arrester with the screen installed, a new screen and any parts that may have failed during the 100 hour endurance test.
   K. It is important that the screen and exhaust assembly not be cleaned or altered in any way following the completion of the endurance test.

SDTDC 7100-34 (6/90)

Appendix 2

Spark Arrester Position of Application



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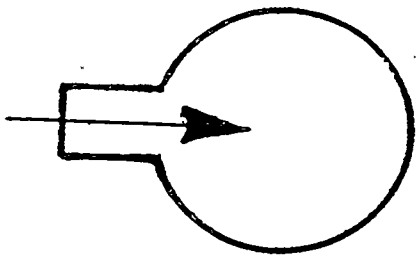

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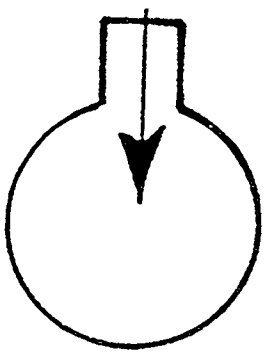
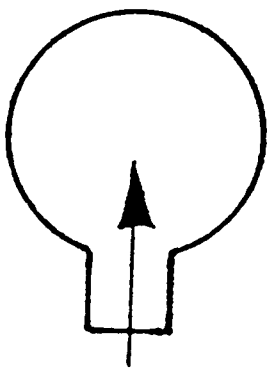
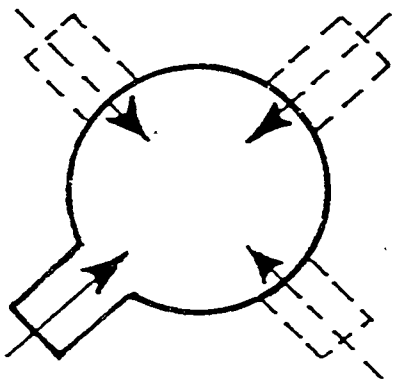


Inverted



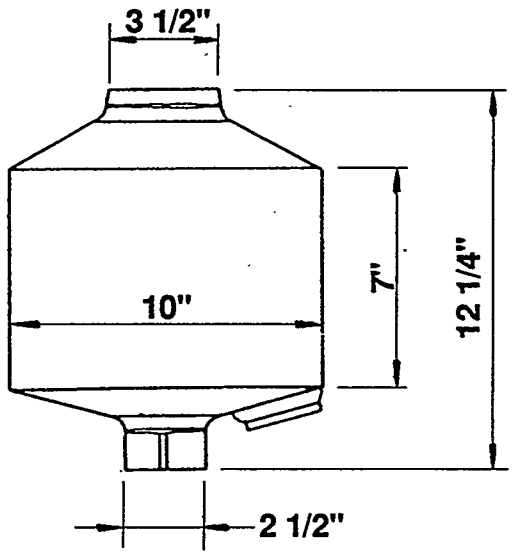
Vertical

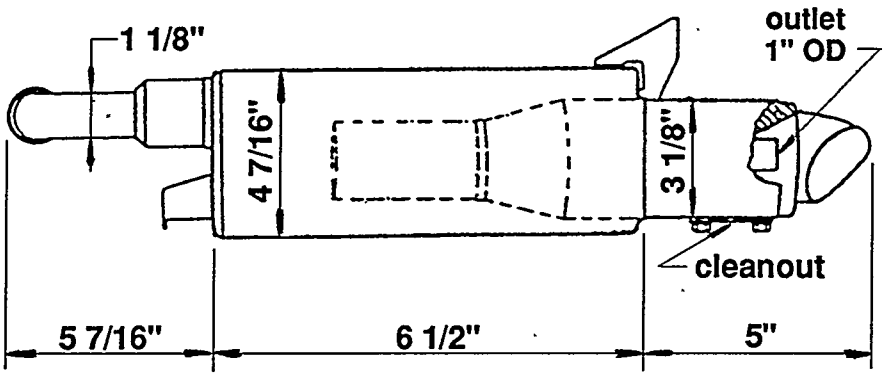


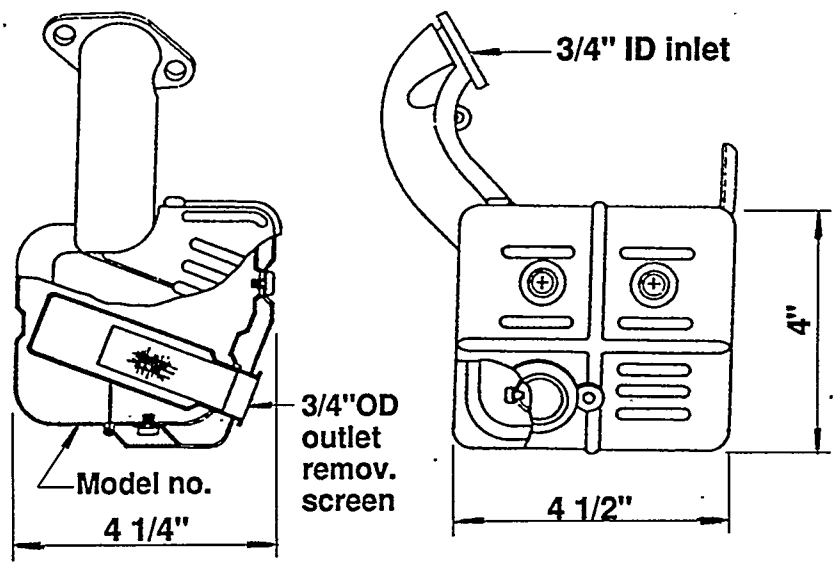
Multi-

Appendix 3A

General Purpose/Screen Type Spark Arrester Drawings

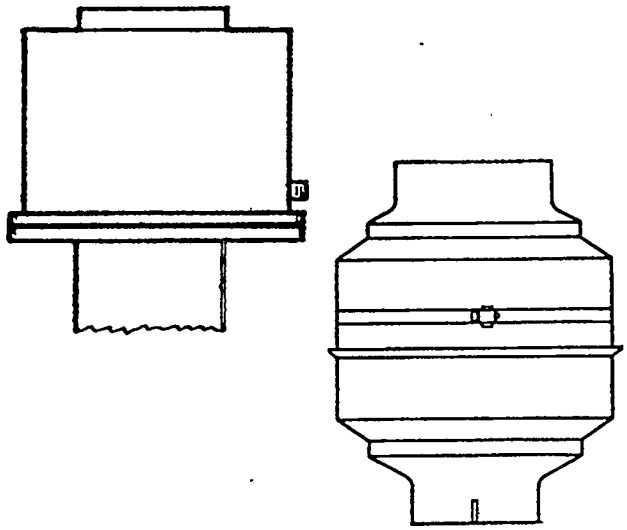




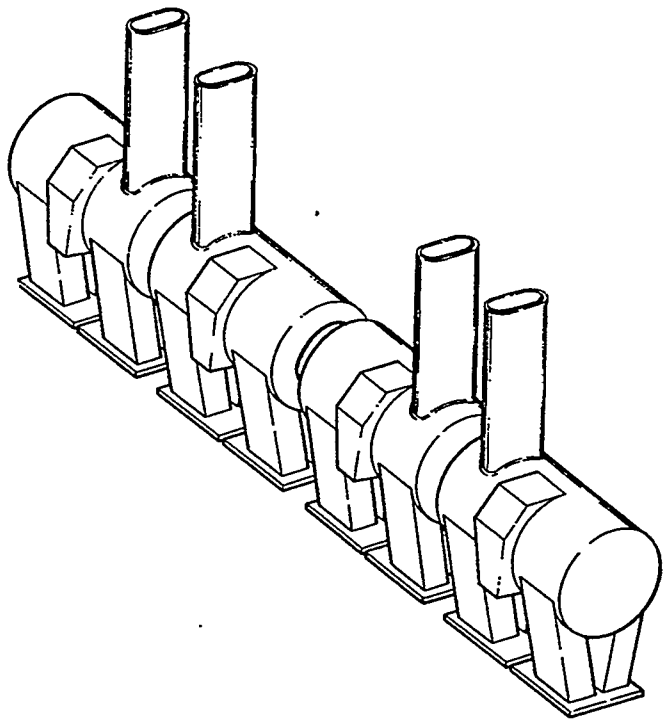


Appendix 3B
Locomotive Spark Arresters

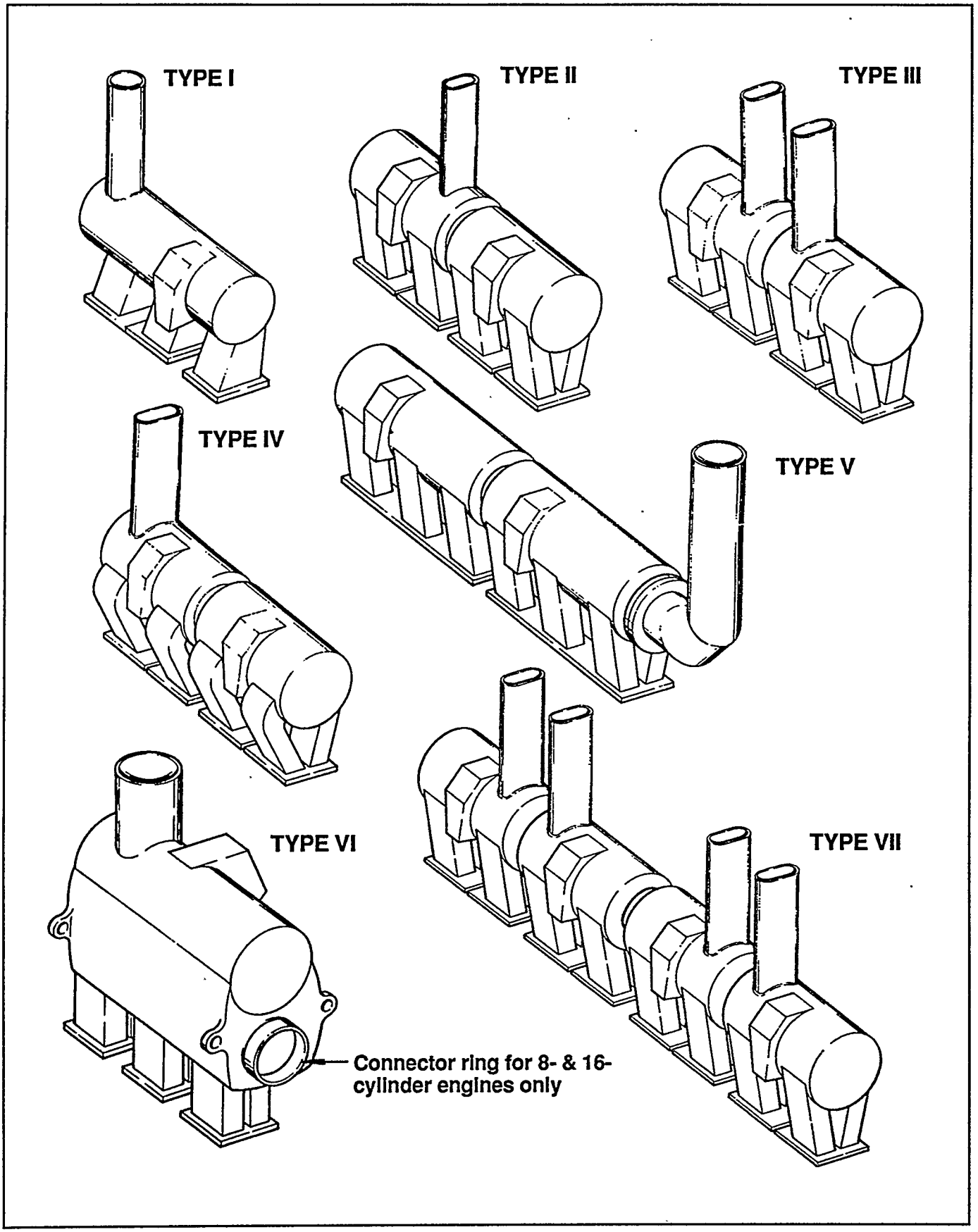
EXTERNAL



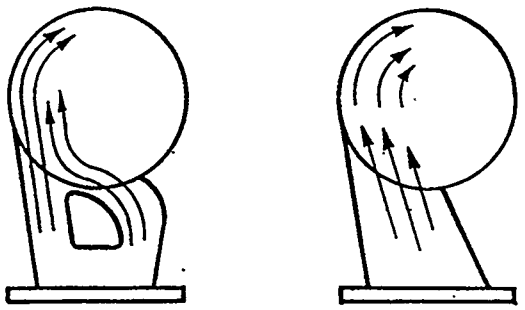
INTERNAL



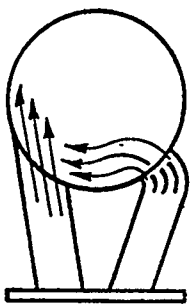
Appendix 4A
Locomotive Spark Arrester—Body Types



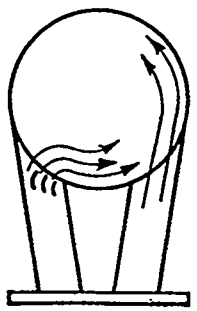
Appendix 4B
Locomotive Spark Arrester—Leg Configurations



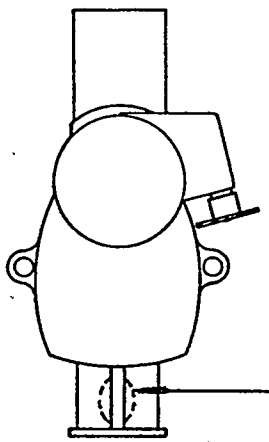
TYPE A—SWIRL



TYPE B—BENT



TYPE C—STRAIGHT



TYPE D—SHORT STRAIGHT

*U.S. GOVERNMENT PRINTING OFFICE 1993-0-784-090/61024