

the National Office under procedures established by the Assistant Commissioner (Employee Plans and Exempt Organizations). Under this procedure, appeals from adverse key district actions in these cases will be considered by the National Office rather than the Regional Directors of Appeal.

SEC. 8. EFFECTIVE DATE.

In the case of schools adjudicated to be discriminatory, this Revenue Procedure will be effective on final publication for purposes of examinations and applications for exemptions. In the case of reviewable schools, this Revenue Procedure will be effective for purposes of examinations on and after January 1, 1980. For reviewable schools whose applications for exemption are pending on the date of final publication, but which do not meet the provisions of section 6 of this Revenue Procedure, the Service will, if requested by the school, defer any action on the application for exemption until January 1, 1980, to give the school an opportunity to supplement its application to demonstrate compliance with section 6. Otherwise, for purposes of applications for exemption by reviewable schools, this Revenue Procedure will be effective on final publication.

SEC. 9. EFFECT ON OTHER DOCUMENTS.

Revenue Procedure 75-50 is amplified, and continues to be applicable to all private schools, whether or not affected by this Revenue Procedure.

[FR Doc. 79-4801 Filed 2-12-79; 8:45 am]

[8320-01-M]

VETERANS ADMINISTRATION

120-BED NURSING HOME CARE UNIT, CLINICAL FACILITIES, AND AN UNDERGROUND PARKING GARAGE, VETERANS ADMINISTRATION MEDICAL CENTER, WASHINGTON, D.C.

Availability of Final Environmental Impact Statement

Notice is hereby given that a document entitled "Final Environmental Impact Statement for a 120-Bed Nursing Home Care Unit, Clinical Facilities, and an Underground Parking Garage, Veterans Administration Medical Center, Washington, D.C.," dated December 1978, has been prepared as required by the National Environmental Policy Act of 1969.

The proposed project includes new construction and necessitates alterations in the existing hospital building. The new construction will contain (1) a Nursing Home Care Unit of 120 beds (2) Clinical Facilities to include the Dental Service, Audiology and Speech Pathology and (3) an Under-

ground Parking Garage for approximately 650 cars.

This final statement responds to comments received on the draft Environmental Impact Statement. This document and the draft Environmental Impact Statement are placed for public examination in the Veterans Administration office in Washington, D.C.

Persons wishing to examine a copy of the document may do so at the following office: Mr. Willard Sitler, Director, Environmental Affairs Office (66), Room 950, Veterans Administration, 1425 K Street, NW., Washington, DC 20420, Phone 202-389-2526.

Single copies of the Final Statement may be obtained on request to: Director, Environmental Affairs Office (66) Veterans Administration, 810 Vermont Avenue, NW., Washington, DC 20420.

Dated: February 7, 1979.

MAURY S. CRALLE, Jr.,
Assistant Deputy Administrator
for Financial Management and
Construction.

[FR Doc. 79-4693 Filed 2-12-79; 8:45 am]

[7035-01-M]

INTERSTATE COMMERCE COMMISSION

[Docket No. AB-19 (Sub-No. 40F)]

BALTIMORE & OHIO RAILROAD CO. AND BUFFALO, ROCHESTER & PITTSBURGH RAILWAY CO.

Discontinuance of Service—Abandonment at Dock Junction in Rochester, Monroe County, N.Y.; Findings

Notice is hereby given pursuant to Section 10903 of the Interstate Commerce Act (formerly Section 1a) (49 U.S.C. 19093) that by a Certificate and Decision decided January 24, 1979, a finding, which is administratively final, was made by the Commission, Review Board Number 5, stating that, subject to the conditions for the protection of railway employees prescribed by the Commission in *Oregon Short Line R. Co.-Abandonment Goshen*, 354 I.C.C. 584 (1978), and for public use as set forth in said decision, the present and future public convenience and necessity permit the discontinuance of service by the B&O on, and abandonment by the BR&P of, a line of railroad known as the Dock Branch extending from railroad milepost 0.0 at Dock Junction to railroad milepost 1.14 at the end of line, a distance of approximately 1.14 miles, in Rochester, Monroe County, N.Y. A certificate of public convenience and necessity permitting abandonment and discontinuance of service was issued to the Baltimore and Ohio Rail-

road Company and the Buffalo, Rochester and Pittsburgh Railway Company. Since no investigation was instituted, the requirement of § 1121.38(a) of the Regulations that publication of notice of abandonment decisions in the FEDERAL REGISTER be made only after such a decision becomes administratively final was waived.

Upon receipt by the carrier of an actual offer of financial assistance, the carrier shall make available to the offeror the records, accounts, appraisals, working papers, and other documents used in preparing Exhibit I (Section 1121.45 of the Regulations). Such documents shall be made available during regular business hours at a time and place mutually agreeable to the parties.

The offer must be filed and served no later than February 28, 1979. The offer, as filed, shall contain information required pursuant to Section 1121.38(b) (2) and (3) of the Regulations. If no such offer is received, the certificate of public convenience and necessity authorizing abandonment shall become effective March 30, 1979.

H. G. HOMME, Jr.,
Secretary.

[FR Doc. 79-4727 Filed 2-12-79; 8:45 am]

[7035-01-M]

[Docket No. AB-1 (Sub-No. 71F)]

CHICAGO & NORTH WESTERN TRANSPORTATION CO.

Abandonment Near Rochester and Stewartville in Olmsted County, MN; Findings

Notice is hereby given pursuant to Section 10903 of the Interstate Commerce Act (formerly Section 1a) (49 U.S.C. 19093) that by a Certificate and Decision decided January 18, 1979, a finding, which is administratively final, was made by the Commission, Review Board Number 5, stating that, subject to the conditions for the (1) protection of railway employees prescribed by the Commission in *Oregon Short Line R. Co.-Abandonment Goshen*, 354 I.C.C. 584 (1978), and further that North Western shall not sell, lease, exchange, or otherwise dispose of the right-of-way underlying the track, all bridges and all culverts on the line for a period of 120 days from the effective date of this certificate and decision unless this property has first been offered, upon reasonable terms, to public authorities or other responsible persons interested in acquiring the property for public use; and (2) North Western shall work with the Minnesota Department of Natural Resources to assure that the disturbance of prairie grass is kept to a minimum during the salvaging of the line and that salvaging operation occur during the period August 1 through

May 1 in order to mitigate the impact on the wildlife during their nesting season, the present and future public convenience and necessity permit the abandonment by the Chicago and North Western Transportation Company of a line of railroad known as the Stewartville Spur extending from railroad milepost 146.0 near Rochester to railroad milepost 158.6 at the end of the line near Stewartville, a distance of 12.6 miles, in Olmsted County, MN.

A certificate of public convenience and necessity permitting abandonment was issued to the Chicago and North Western Transportation Company. Since no investigation was instituted, the requirement of § 1121.38(a) of the Regulations that publication of notice of abandonment decisions in the Federal Register be made only after such a decision becomes administratively final was waived.

Upon receipt by the carrier of an actual offer of financial assistance, the carrier shall make available to the offeror the records, accounts, appraisals, working papers, and other documents used in preparing Exhibit I (Section 1121.45 of the Regulations). Such documents shall be made available during regular business hours at a time and place mutually agreeable to the parties.

The offer must be filed and served no later than February 28, 1979. The offer, as filed, shall contain information required pursuant to § 1121.38(b) (2) and (3) of the Regulations. If no such offer is received, the certificate of public convenience and necessity authorizing abandonment shall become effective March 30, 1979.

H. G. HOMME, Jr.,
Secretary.

[FR Doc. 79-4724 Filed 2-12-79; 8:45 am]

[7035-01-M]

[Docket No. AB-160 (Sub-No. 2F)]

MONTOUR RAILROAD CO.

Abandonment in Bethel Park, Allegheny County, Pa.; Findings

Notice is hereby given pursuant to section 10903 of the Interstate Commerce Act (formerly Section 1a) (49 U.S.C. 10903) that by a Certificate and Decision decided January 24, 1979, a finding, which is administratively final, was made by the Commission, Review Board Number 5, stating that, subject to the conditions for the protection of railway employees prescribed by the Commission in *Oregon Short Line R. Co. Abandonment, Goshen*, 354 I.C.C. 584 (1978), and for

public use as set forth in said decision, the present and future public convenience and necessity permit the abandonment by the Montour Railroad Company of a portion of its main line of railroad extending from railroad milepost 39.9 to the end of the line at railroad milepost 41.3, a distance of 1.4 miles, in Bethel Park, Allegheny County, PA. A certificate of public convenience and necessity permitting abandonment was issued to the Montour Railroad Company. Since no investigation was instituted, the requirement of § 1121.38(a) of the Regulations that publication of notice of abandonment decisions in the Federal Register be made only after such a decision becomes administratively final was waived.

Upon receipt by the carrier of an actual offer of financial assistance, the carrier shall make available to the offeror the records, accounts, appraisals, working papers, and other documents used in preparing Exhibit I (§ 1121.45 of the Regulations). Such documents shall be made available during regular business hours at a time and place mutually agreeable to the parties.

The offer must be filed and served no later than February 28, 1979. The offer, as filed, shall contain information required pursuant to Section 1121.38(b) (2) and (3) of the Regulations. If no such offer is received, the certificate of public convenience and necessity authorizing abandonment shall become effective March 30, 1979.

H. G. HOMME, Jr.,
Secretary.

[FR Doc. 79-4726 Filed 2-12-79; 8:45 am]

[7035-01-M]

[Docket No. AB-7 (Sub-No. 77F)]

STANLEY E. G. HILLMAN

Abandonment Near Bervery Junction and Hanford in Kittitas, Yakima and Benton Counties, WA; Findings

Notice is hereby given pursuant to Section 10903 of the Interstate Commerce Act (formerly Section 1a) (49 U.S.C. 10903) that by a Certificate and Decision decided January 18, 1979, a finding, which is administratively final, was made by the Commission, Review Board Number 5, stating that, subject to the conditions for the (1) protection of railway employees prescribed by the Commission in *Oregon Short Line R. Co. Abandonment, Goshen*, 354 I.C.C. 584 (1978), and further that Milwaukee Road shall not sell, lease, exchange, or otherwise dis-

pose of the right-of-way underlying the track, all bridges and all culverts on the line for a period of 120 days from the effective date of this certificate and decision unless this property has first been offered, upon reasonable terms, to public authorities or other responsible persons interested in acquiring the property for public use; (2) Milwaukee Road shall notify the Washington Historical Society 30 days prior to salvaging the track so that a trained archaeologist can be available to monitor salvage operations; and (3) Milwaukee Road shall include in its contract for sale of those portions of the right-of-way within which archaeological sites have been identified, a provision requiring the purchasers to notify the Washington Historical Society of their plans for development of the property, the present and future public convenience and necessity permit the abandonment by Stanley E. G. Hillman, Trustee of the Property of the Chicago, Milwaukee, St. Paul and Pacific Railroad Company, Debtor, of a line of railroad known as the Hanford Branch extending from railroad milepost 0.0 near Beverly Junction to railroad milepost 20.8 near Hanford, a distance of 20.8 miles, in Kittitas, Yakima and Benton Counties, WA. A certificate of public convenience and necessity permitting abandonment was issued to Stanley E. G. Hillman, Trustee of the Property of Chicago, Milwaukee, St. Paul and Pacific Railroad Company, Debtor. Since no investigation was instituted, the requirement of § 1121.38(a) of the Regulations that publication of notice of abandonment decisions in the Federal Register be made only after such a decision becomes administratively final was waived.

Upon receipt by the carrier of an actual offer of financial assistance, the carrier shall make available to the offeror the records, accounts, appraisals, working papers, and other documents used in preparing Exhibit I (§ 1121.45 of the Regulations). Such documents shall be made available during regular business hours at a time and place mutually agreeable to the parties.

The offer must be filed and served no later than February 28, 1979. The offer, as filed, shall contain information required pursuant to Section 1121.38(b) (2) and (3) of the Regulations. If no such offer is received, the certificate of public convenience and necessity authorizing abandonment shall become effective March 30, 1979.

H. G. HOMME, Jr.,
Secretary.

[FR Doc. 79-4725 Filed 2-12-79; 8:45 am]

sunshine act meetings

This section of the FEDERAL REGISTER contains notices of meetings published under the "Government in the Sunshine Act" (Pub. L. 94-409) 5 U.S.C. 552b(e)(3)

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[6320-01-M]

[M-193 Amdt. 4; Feb. 7, 1979]

CIVIL AERONAUTICS BOARD.

Notice of deletion of items from the February 7, 1979 meeting agenda.

TIME AND DATE: 10 a.m., February 7, 1979.

PLACE: Room 1027, 1825 Connecticut Avenue NW., Washington, D.C. 20428.

SUBJECT:

12. Docket 33221, joint application of frontier and Louisville for exemption authority in the Louisville-Kansas City market (memo 8452, BPDA, OGC).

14. Dockets 33824 and 33514. TWA's application for pendente lite exemption to provide immediate air transportation in approximately 70 named city-pair markets; Air Florida's application for pendente lite exemption to operate in the New York-Miami/West Palm Beach market (memo 8435-A, BPDA, OGC).

STATUS: Open.

PERSON TO CONTACT:

Phyllis T. Kaylor, the Secretary, 202-673-5068.

SUPPLEMENTARY INFORMATION:

In light of the age of this application and present availability of dormant authority in the affected market under the new Act, this item (12) is being deleted from the February 7, 1979, agenda in order that a revised recommendation may be submitted by staff. Item 14 is being deleted because it requires additional staff discussion. Accordingly, the following members

have voted that agency business requires deletion of items 12 and 14 from the February 7, 1979, agenda and that no earlier announcement of these deletions was possible:

Chairman Marvin S. Cohen
Member Elizabeth E. Bailey
Member Gloria Schaffer

[S-286-79 Filed 2-9-79; 10:20 am]

[6320-01-M]

2

[M-194; Feb. 8, 1979]

CIVIL AERONAUTICS BOARD.

TIME AND DATE: 9:30 a.m., February 15, 1979.

PLACE: Room 1027, 1825 Connecticut Avenue NW., Washington, D.C. 20428.

SUBJECT:

1. Ratification of items adopted by notation.

2. Docket 32860, elimination of the reporting of user charge data for foreign en route and airport facilities and services (memo 7998-A, OEA, BCAA, BIA, OGC).

3. Docket 34052, final rule to amend section 213.3(d) of the economic regulations to remove the mandatory 30-day waiting period for effectiveness of orders requiring foreign air carriers to discontinue operation of existing schedules (memo 8285-A, BIA, OGC, BPDA).

4. Amendment of Part 302 to set uniform 30-day answer period (memo 8456, OGC).

5. Final rules amending Part 384 statement of organization delegation of authority, and availability of records and information and Part 385 delegations and review of action under delegation; nonhearing matters. These amendments transfer the functions and delegations of the former Bureau of Accounts and Statistics (BAS) to a new Bureau of Carrier Accounts and Audits (BCAA), to the Office of Economic Analysis (OEA) and to the Office of the Comptroller (OC) (BCAA, OEA, OC, OGC).

6. Request for public comments regarding a report that the Board must make to Congress about direct sale of charter (memo 8490, OGC, OI, OEEO, BCAA, BLJ, BIA, BPDA, OEA, BCP).

7. Docket 26509 (EDR-264)—Termination of rulemaking proceeding proposing amendments to Part 212 charter regulations applicable to foreign scheduled carriers (memo 4418-A, OGC, BIA).

8. Docket 32420, Part 223 of the Board's Economic Regulations—Final rule amending Part 223 to permit free or reduced-rate interstate transportation to employees of foreign air carriers not serving U.S. points (memo 8143-A, OGC).

9. Docket 32466, Part 302, expedited procedures for licensing and rates cases: Sup-

plemental notice of rulemaking (OGC, BIA, BPDA, BLJ).

10. Dockets 33112 and 33283. Texas International—National acquisition case and Pan American—National acquisition case. National Airlines application to take the testimony of Dr. Robert H. Frank (OGC).

11. Docket 32872, Braniff Airways, Inc. v. Texas International Airlines, Inc. Section 411 enforcement proceeding (OGC) (memo 8504).

12. Dockets 28213 et al. Applications of seven Japanese air freight forwarders—Final order (memo 8492, OGC).

13. Docket 30055, Phoenix-Las Vegas-Reno nonstop service investigation—Draft order (memo 8403-J, OGC).

14. Docket 30635, Arizona service investigation (memo 8158-E, OGC).

15. Docket 34258, application of Continental Air Lines for Denver-Reno exemption authority (memo 8495, OGC).

16. Dockets 33363, 32504, 32505, 32506, 32507, 32508, 32509, 32510, 32511, 32514, 32515, and 32580; former large irregular air service investigation (memo 7690-M, OGC).

17. Dockets 32327, 33361, 33362, 33363, 33941, 34292, 34293, 34241, 34107, 34108, 34476, 34477, 34281, and 34282; former large irregular air carrier investigation—Order granting six motions to consolidate and delegating authority to the presiding administrative law judges to grant or dismiss future motions to consolidate (memo 7690-N, OGC).

18. Docket 31013; petition for reconsideration of order 78-3-63, which approved an air traffic conference of America resolution allowing intrastate carriers to participate in the area settlement plan, provided that certain practices are optional, rather than specific (memo 7750-D, BPDA, BCP, OEA, OGC).

19. Docket 32881, Petition of General Mills, Inc., and Trans-Mark Services, Inc., for the Board to reexamine the Air Traffic Conference of America's resolution governing establishment of travel agent offices on customer premises (in-plant agency resolution) under section 403 of the Act (memo 8496, BPDA, BCP, OGC).

20. Docket 26951; Motion by Trans International Airlines for modification of arbitrator's award and other relief (memo 8494, BPDA).

21. Docket 31298, Sky West's application and motion to show cause for certification of those points on their system which were not certificated in the Arizona service investigation, Docket 30635 (BPDA).

22. Dockets 32873, 33490, 33505, 33535, 33585, 33730, and 33738; Applications of American, Allegheny, TWA, Braniff, Northwest, Ozark, and Continental for Reno-Chicago authority (memo 8179-A, BPDA, OGC, BLJ).

23. Dockets 32573, 32628, 32756, 33606, 34079, 32725, and 32758; application of the city of Birmingham for institution of route proceeding for new nonstop authority in the Birmingham - Cleveland / Dallas / Houston / Philadelphia/Pittsburgh/St. Louis/Tampa/

Washington markets; Braniff's Southern's Frontier's, and Ozark's applications, respectively, requesting the authority sought by Birmingham in whole or in part, and motions to consolidate; as amended certificate application of Allegheny Airlines for Birmingham-Bristol/Kingsport/Johnson City/Dallas / Houston / Philadelphia / Pittsburgh / Tampa/Washington nonstop authority; certificate application of Piedmont Aviation for Birmingham-Charlotte/Dallas/Greensboro / Houston / Richmond / Roanoke / Washington nonstop authority (memo 8497, BPDA).

24. Docket 33754, application of TWA for amendment of its certificate of public convenience and necessity for route 2 for authority in 72 new city-pair markets (memo 8499, BPDA, OGC).

25. Dockets 33824 and 33514; TWA's application for pendent lite exemption to provide immediate air transportation in approximately 70 named city-pair markets; Air Florida's application for exemption to operate in the New York-Miami/West Palm Beach market (memo 8435-A, BPDA, OGC).

26. Dockets 33747, 33920, and 34173, Eastern's application and petition for an order to show cause requesting Albuquerque-St. Louis/Atlanta authority (BPDA).

27. Docket 34370, Ozark's 60-day notice to suspend nonstop and/or single-plane service in several markets (memo 8488, BPDA, OCCR).

28. Docket 34473—Airwest's 401(j)(2) notice of intent to suspend service in 85 markets in 60 days (BPDA, OCCR) (memo 8505).

29. Docket 34148, petition of the County of Kern for reconsideration of the Board's notice of intent not to prohibit Hughes Airwest from suspending service at Bakersfield (BPDA) (memo 8415-A).

30. Dockets 26681, 34565, and 34513; Hughes Airwest petition for modification of orders granting temporary suspension authority and notice of intent to terminate service at Astoria/Seaside, Oregon; petition of the Port of Astoria requesting the Board to determine the essential air transportation of Astoria/Seaside and name a replacement carrier (BPDA, OCCR) (memo 4737-E).

31. Docket 33752, notice of Airwest to terminate service at Santa Maria, Calif. (BPDA).

32. Docket 34296, application of Air New England for removal of its one-stop restriction in the Burlington-New York market and motion to consolidate in Docket 33658 (memo 8326-B, BPDA, OGC, BLJ).

33. Docket 34544, notice of Frontier Airlines, Inc., of intent to terminate service at Enid, Ponca City, and McAlester, Okla. (memo 8060-B, BPDA, OCCR, OGC, BCP).

34. Dockets 32773, 33026, 33508, and 23888; Allegheny replacement service agreements; Altair petition (memo 8502, BPDA).

35. Docket 25476, agreement CAB 23157, organizational documents of Airline Tariff Publishing Co., Inc., (ATPCO) (BPDA, BCP, OGC) (memo 8506).

36. Docket 33218, boarding priority rules of the U.S. certificated carriers (BPDA) (memo 8165-A).

37. Tariff rule governing acceptance of stretcher patients proposed by United (memo 8493, BPDA).

38. Air carrier rules governing the application of tariffs (memo 8503, BPDA, BCP).

STATUS: Open.

PERSON TO CONTACT:

Phyllis T. Kaylor, the Secretary, 202-673-5068.

(S-300-79 Filed 2-9-79; 2:42 pm)

[6712-01-M]

3

FEDERAL COMMUNICATIONS COMMISSION.

TIME AND DATE: 9:30 a.m., Thursday, February 8, 1979.

PLACE: Room 856, 1919 M Street NW., Washington, D.C.

STATUS: Special closed commission meeting.

CHANGES IN THE MEETING: The following item has been deleted:

AGENDA, ITEM NUMBER, AND SUBJECT

Hearing—6—Applications for review of Review Board decision and related interlocutory requests in the Gainesville, Fla., new FM station proceeding (Docket Nos. 20622-4).

Additional information concerning this meeting may be obtained from the FCC Public Information Office, telephone number (202) 632-7260.

Issued: February 7, 1979.

(S-287-79 Filed 2-9-79; 10:20 am)

[6712-01-M]

4

FEDERAL COMMUNICATIONS COMMISSION.

TIME AND DATE: 9:30 a.m., Wednesday, February 14, 1979.

PLACE: Room 856, 1919 M Street NW., Washington, D.C.

STATUS: Closed Commission meeting following the open meeting.

MATTERS TO BE CONSIDERED:

AGENDA, ITEM NUMBER, AND SUBJECT

General—1—McGraw-Hill Broadcasting Co., Inc. v. FCC, No. 78-1895 and 78-2225.

Complaints and Compliance—1—Field investigation into the operation of radio stations WDAS and WDAS-FM, Philadelphia, Pa.

This meeting may be continued the following work day to allow the Commission to complete appropriate action.

Additional information concerning this meeting may be obtained from the FCC Public Information Office, telephone number (202) 632-7260.

Issued: February 7, 1979

(S-288-79 Filed 2-9-79; 10:20 am)

[6712-01-M]

5

FEDERAL COMMUNICATIONS COMMISSION.

TIME AND DATE: 9:30 a.m., Wednesday, February 14, 1979.

PLACE: Room 856, 1919 M Street NW., Washington, D.C.

STATUS: Open Commission meeting.

MATTERS TO BE CONSIDERED:

AGENDA, ITEM NUMBER, AND SUBJECT

General—1—Use of radio for the remote reading of utility meters (Docket No. 20005) and for automated utility distribution systems (RM-2824).

General—2—Authority of the Executive Director to act on requests by other Federal agencies for disclosure of information submitted to the Commission in confidence.

General—3—Reinstatement of radiotelephone second class operator license issued to Arthur W. Brothers.

Safety and Special Radio Services—1—Credit for the telegraphy portion of the amateur extra class examination to applicants who hold the amateur extra first class license.

Common Carrier—1—Notice of inquiry on treatment of litigation expenses for rate making purposes.

Common Carrier—2—Provision of domestic facilities to International Record Carriers by A.T. & T. (CC Docket No. 21499).

Cable Television—1—Applications for certificates of compliance to carry WVIA-TV (Educ), Scranton, Pa., filed by Cablevision Systems, et al.

Cable Television—2—Petition for waiver filed by Warner Cable Corp.

Cable Television—3—Petition for waiver filed by Midwest Video Corp.

Assignment and Transfer—1—Assignment of KFMK, Houston, Tex., from Liberty Communications Corp. to First Media Corp. (BALH-2731, BASCA-909).

Renewal—1—Petition to deny the renewals of all five Washington, D.C. TV stations.

Renewal—2—Imposing EEO sanctions on certain broadcast stations.

Renewal—3—Petition to deny renewal of KSBW-TV, Salinas, Calif.

Aural—1—Application for modification of facilities filed by Hall Broadcasting Co., Inc., WIYD-FM, Palatka, Fla., and petition for reconsideration of the Commission's memorandum opinion and order, FCC 78-721 granting the application filed by Rounsaville of Jacksonville, Inc. et al.

Television—1—Applications of KLOC Broadcasting (BPCT-4982) and Leejon Broadcasting (BPCT-5021) for a television station on channel 35, Salinas, Calif.

Broadcast—1—Petition for rulemaking (RM-2830), filed by the National Association of Broadcasters, to permit rebroadcast of CB and Amateur transmissions of emergency information.

Broadcast—2—Waiver of the "off-network" restriction of the prime time access rule, filed by WBRE-TV, Wilkes-Barre, Pa.

Broadcast—3—Reconsideration of the assignments of FM channel 243 to Fort Walton Beach, Fla. and of FM channel 221A to Destin, Fla.

Complaints and Compliance—1—Fairness doctrine complaint of the Committee for

the Scientific Investigation of Claims of the Paranormal Against NBC.
Complaints and Compliance—2—Complaint regarding the program "Youth Terror: The View From Behind the Gun."
Complaints and Compliance—3—Response of KIFW (AM & TV), Sitka, Alaska, to a notice of apparent liability.

This meeting may be continued the following work day to allow the Commission to complete appropriate action.

Additional information concerning this meeting may be obtained from the FCC Public Information Office, telephone number (202) 632-7260.

Issued: February 7, 1979.

[S-289-79 Filed 2-9-79; 10:20 am]

[6450-01-M]

6

FEBRUARY 8, 1979.

FEDERAL ENERGY REGULATORY COMMISSION.

TIME AND DATE: 3:30 p.m., February 8, 1979.

PLACE: Room 9306, 825 North Capitol Street NE., Washington, D.C.

STATUS: Closed.

MATTERS TO BE CONSIDERED: An additional item is added to this previously announced closed meeting relating to pending civil litigation.

CONTACT PERSON FOR FURTHER INFORMATION:

Kenneth F. Plumb, Secretary, 202-275-4166.

[S-294-79 Filed 2-9-79; 11:17 am]

[6730-01-M]

7

FEDERAL MARITIME COMMISSION.

"FEDERAL REGISTER" CITATION OF PREVIOUS ANNOUNCEMENT: February 8, 1979, 44 FR 8099.

PREVIOUSLY ANNOUNCED TIME AND DATE OF THE MEETING: February 14, 1979, 10 a.m.

CHANGE IN THE MEETING: Addition of the following item to the open session:

4. Rates on Neptune Orient Line and Far Eastern Shipping Co.

[S-302-79 Filed 2-9-79; 3:48 pm]

[6735-01-M]

8

FEBRUARY 7, 1979.

FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION.

TIME AND DATE: 10 a.m., February 7, 1979.

PLACE: Room 600, 1730 K Street NW., Washington, D.C.

STATUS: Closed (pursuant to 5 U.S.C. 552b(c)(10)).

MATTERS CONSIDERED: Disposition on the merits:

Secretary of Labor v. Peter White Coal Mining Corp. HOPE 78-374, etc., 78-344, etc., 78-509, 78-535, etc.; Peabody Coal Co., VINC 78-386; United States Steel Corp., PITT 78-335; Monterey Coal Co., VINC 78-416; Rochester & Pittsburgh Coal Co., PITT 78-323; Helvetia Coal Co., PITT 78-322; Iselin Preparation Co., PITT 78-344; and Energy Fuels Corp., DENV 78-410.

Eastern Associated Coal Corp. v. Secretary of Labor, PITT 76X203; Florence Mining Co., Helen Mining Co., Oneida Mining Co., North American Coal Corp. v. Secretary of Labor, PITT 77-15, 77-16, 77-17, 77-18, 77-19, 77-23; Alabama By-Products Corp. v. Secretary of Labor, BARB 76-153; Inland Steel Coal Co. v. Secretary of Labor, VINC 77-164.

Vote: Voting to close the meeting: Commissioners Waldie (Chairman), Lawson, Nease, and Jestrab. It was determined by this vote that Commission business required that this meeting be closed. Further, the Commission members voted to hold the meeting immediately on the basis that agency business so required and to issue public notice as soon as practicable.

Attendance: Those present at that closed meeting were: Commissioners Waldie (Chairman), Lawson, Nease, and Jestrab; Al Treherne; Robert Phares, Mary Masulla; Arthur Sapper; Dan Delacey; General Robert Pleasure; Joanne Kelley, Carolyn Crittenden; Cris Gilbert and Joan Haugen.

CONTACT FOR MORE INFORMATION:

Joanne Kelley, 202-653-5632.

[S-296-79 Filed 2-9-79; 12:07 pm]

[6735-01-M]

9

FEBRUARY 8, 1979.

FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION.

TIME AND DATE: 8:30 p.m., February 8, 1979.

PLACE: Room 600, 1730 K Street NW., Washington, D.C.

STATUS: Closed (pursuant to 5 U.S.C. 552b(c)(10)).

MATTERS CONSIDERED:

Secretary of Labor v. Republic Steel Corp., IBMA 76-28, MORG 76-21.

Secretary of Labor v. Republic Steel Corp., IBMA 77-39, MORG 76X95-P.

Secretary of Labor v. Kaiser Steel Corp., DENV 77-13-P.

Vote: Voting to close the meeting: Commissioners Waldie (Chairman), Lawson, Nease, Jestrab, and Backley. It was determined by this vote that Commission business required that the meeting be closed. Further the Commission members voted to

hold the meeting immediately on the basis that agency business so required and to issue public notice as soon as practicable.

Attendance: Those present at that closed meeting were: Commissioners Waldie (Chairman), Lawson, Nease, Backley, and Jestrab; Al Treherne; Robert Phares, Mary Masulla; Arthur Sapper; Dan Delacey; Howard Schellenberg; Jim Lastowka; Phil Paschall; General Counsel Robert Pleasure; Joanne Kelley; Carolyn Crittenden and Cris Gilbert.

CONTACT FOR MORE INFORMATION:

Joanne Kelley 202-653-5632.

[S-297-79 Filed 2-9-79; 12:07 pm]

[6735-01-M]

10

FEBRUARY 9, 1979.

FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION.

TIME AND DATE: 10 a.m., February 12, 1979.

PLACE: Room 600, 1730 K Street, NW., Washington, D.C.

STATUS: This meeting may be closed.

MATTERS TO BE CONSIDERED:

The Commission will consider and act upon the following:

Secretary of Labor v. Peter White Coal Mining Corp. HOPE 78-374 etc., 78-444 etc., 78-509, 78-535 etc.; Peabody Coal Co., VINC 78-386; United States Steel Corp., PITT 78-335; Monterey Coal Co., VINC 78-416; Rochester & Pittsburgh Coal Co., PITT 78-323; Helvetia Coal Co., PITT 78-322; Iselin Preparation Co., PITT 78-343, 78-344; and Energy Fuels Corp. DENV 78-410, (disposition on the merits).

Eastern Associated Coal Corp. v. Secretary of Labor, PITT 76X203; Florence Mining Co., Helen Mining Co., Oneida Mining Co., North American Coal Corp. v. Secretary of Labor, PITT 77-15, 77-16, 77-17, 77-18, 77-19, 77-23; Alabama By-Products Corp. v. Secretary of Labor, BARB 76-153; Inland Steel Coal Co. v. Secretary of Labor, VINC 77-164 (disposition on the merits).

It was determined by unanimous vote of the Commissioners that Commission business required that these matters be scheduled for Commission action as soon as possible and that no earlier announcement of this action was possible.

CONTACT PERSON FOR MORE INFORMATION:

Joanne Kelly, 202-653-5632.

[S-298-79 Filed 2-9-79; 12:07 pm]

[6735-01-M]

11

FEBRUARY 8, 1979.

FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION.

TIME AND DATE: 10:00 a.m., February 14, 1979.

PLACE: Room 600, 1730 K Street NW., Washington, D.C.

STATUS: Open.

MATTER TO BE CONSIDERED:

It was determined by unanimous vote of all Commissioners that Commission business required that a meeting be held on this matter and that no earlier announcement of the meeting was possible.

CONTACT PERSON FOR MORE INFORMATION:

Joanne Kelley, 202-653-5632.

[S-299-79 Filed 2-9-79; 12:07 pm]

[6210-01-M]

12

FEDERAL RESERVE SYSTEM (Board of Governors).

"FEDERAL REGISTER" CITATION OF PREVIOUS ANNOUNCEMENT: Forwarded to the Federal Register on February 6, 1979.

PREVIOUSLY ANNOUNCED TIME AND DATE OF THE MEETING: 10 a.m., Wednesday, February 14, 1979.

CHANGES IN THE MEETING: Deletion of the following open item from the agenda:

Proposals to implement Titles VIII and IX of the Financial Institutions Regulatory and Interest Rate Control Act.

This item will be rescheduled at a later time.

CONTACT PERSON FOR MORE INFORMATION:

Mr. Joseph R. Coyne, Assistant to the Board: (202) 452-3204.

Dated: February 9, 1979.

THEODORE E. ALLISON,
Secretary of the Board.

[S-295-79 Filed 2-9-79; 11:42 am]

[7020-02-M]

13

[USITC SE-79-8B]

INTERNATIONAL TRADE COMMISSION.

"FEDERAL REGISTER" CITATION OF PREVIOUS ANNOUNCEMENT: 44 FR 6838-9, February 2, 1979.

PREVIOUSLY ANNOUNCED TIME AND DATE OF THE MEETING: 11 a.m., Tuesday, February 13, 1979.

CHANGES IN THE MEETING: Change of time and date.

The meeting originally scheduled to be held on Tuesday, February 13, 1979, has been rescheduled to begin at 10 a.m., on

Wednesday, February 14, 1979. There are no other changes to the agenda for that date.

CONTACT PERSON FOR MORE INFORMATION:

Kenneth R. Mason, Secretary, 202-523-0161.

[S-284-79 Filed 2-9-79; 10:20 am]

[7020-02-M]

14

[USITC SE-79-9]

INTERNATIONAL TRADE COMMISSION.

TIME AND DATE: 10 a.m., Thursday, February 22, 1979.

PLACE: Room 117, 701 E Street NW., Washington, D.C. 20436.

STATUS: Parts of this meeting will be open to the public. The rest of the meeting will be closed to the public.

MATTERS TO BE CONSIDERED:

Portions open to the public:

1. Agenda
2. Minutes.
3. Ratifications.
4. Petitions and complaints, if necessary: (a) Spindle adapters from the United Kingdom (Docket No. 555); and (b) Perchloroethylene from Belgium, France, and Italy (Docket Nos. 556, 557, and 558).
5. Any items left over from previous agenda.

Portions closed to the public:

6. Status report on Investigation 332-101 (MTN Study), if necessary.

CONTACT PERSON FOR MORE INFORMATION:

Kenneth R. Mason, Secretary, 202-523-0161.

[S-293-79 Filed 2-9-79; 10:55 am]

[6820-35-M]

15

LEGAL SERVICES CORPORATION.

Legal Services Corporation—Meeting of the committee on Provision of Legal Services.

TIME AND DATE: 10 a.m., Friday, February 16, and Saturday, February 17, 1979.

PLACE: Marvin Center, George Washington University, room 405, 800 21st Street NW., Washington, D.C.

STATUS: Open meeting.

MATTERS TO BE CONSIDERED:

1. Adoption of agenda.
2. Approval of minutes of the meeting of November 13, 1978.
3. Discussion of the Reginald Heber Smith Community Lawyer Fellowship Program.
4. Report in accordance with section 1007(h) of the LSC Act.
5. Other business.

CONTACT PERSON FOR MORE INFORMATION:

Dellano Young, Office of the President, 202-376-5100.

Issued: February 7, 1979.

THOMAS EHRLICH,
President.

[S-301-79 Filed 2-9-79; 3:48 pm]

[7590-01-M]

16

NUCLEAR REGULATORY COMMISSION.

TIME AND DATE: Week of February 12, 1979.

PLACE: Commissioners conference room, 1717 H Street NW., Washington, D.C.

STATUS: Open and closed.

MATTERS TO BE CONSIDERED:

Wednesday, February 14 1:30 p.m.

1. Discussion of decision in S-3 rulemaking (approximately 1 hour, public meeting).
2. Briefing on NRC legislative proposals including siting and licensing and omnibus legislation (approximately 2 hours, public meeting).
3. Affirmation session (approximately 10 minutes, public meeting): (a) Amendment to 10 CFR 50, appendices G & H; and (b) Cochran FOIA appeal (78-A-6) (partial); postponed from February 8, 1979.

Thursday, February 15 9:30 a.m.

1. Initial briefing on draft report "Regulation of Federal Radioactive Waste Activities" (tentative) (approximately 1½ hours public meeting).
2. Briefing on use of WASH-1400 in licensing actions (Approximately 1 hour, public meeting).

1:30 p.m.

1. Tarapur discussion (approximately 1½ hours, closed—exemption 1) (continued from February 6).

2. Discussion of personnel matter (approximately 1½ hours, Chairman's conference room, closed—exemption 6).

Friday, February 16 9:30 a.m.

1. Time reserved for continuation of legislative proposals (if necessary) (approximately 2½ hours, public meeting).

ADDITIONAL INFORMATION: The following changes were made to items announced for the Week of February 5:

- (a) Discussion of personnel matter—continued at 3 p.m. on February 7.
- (b) Discussion of amendment to 10 CFR 73.55—postponed to February 8 at 3 p.m.
- (c) Continuation of NRC legislative proposals—postponed to February 7 at 1:30 p.m.
- (d) Discussion of testimony before the House Foreign Affairs Committee—added on February 7 at 2:45 p.m. (closed—exemption 9).

CONTACT PERSON FOR MORE INFORMATION:

Walter Magee, 202-634-1410.

WALTER MAGEE,
Office of the Secretary.

FEBRUARY 7, 1979.

[S-290-79 Filed 2-9-79; 10:20 am]

[4410-01-M]

17

PAROLE COMMISSION.

TIME AND DATE: 9 a.m., Thursday,
February 15, 1979.

PLACE: Room 831, 320 First Street
NW., Washington, D.C. 20537.

STATUS: Closed, pursuant to a vote
to be taken at the beginning of the
meeting.

MATTER TO BE CONSIDERED: Re-
ferrals from Regional Commissioners
of approximately 15 cases in which in-
mates of Federal prisons have applied
for parole or are contesting revocation
of parole or mandatory release.

CONTACT PERSON FOR MORE IN-
FORMATION:

A. Ronald Peterson, Analyst, 202-
724-3094.

[S-292-79 Filed 2-9-79; 10:53 am]

[7715-01-M]

18

POSTAL RATE COMMISSION.

TIME AND DATE: 9 a.m., February
14, 1979.

PLACE: Conference room, room 500,
2000 L Street NW., Washington, D.C.

STATUS: Closed.

MATTERS TO BE CONSIDERED:
Office reorganization and personnel
matters.

Closed pursuant to 5 U.S.C. 552b(c)(2)(6).

CONTACT PERSON FOR MORE IN-
FORMATION:

Ned Callan, Information Officer,
Postal Rate Commission, room 500,
2000 L Street NW., Washington,
D.C. 20268, 202-254-5614.

[S-285-79 Filed 2-9-79; 10:20 am]

[7910-01-M]

19

RENEGOTIATION BOARD.

"FEDERAL REGISTER" CITATION
OF PREVIOUS ANNOUNCEMENT:
44 FR 4095, January 19, 1979.

PREVIOUSLY ANNOUNCED DATE
AND TIME OF MEETING: Tuesday,
January 30, 1979; 10 a.m.

CHANGE IN MEETING: Matters five
and six are added to the previously an-
nounced agenda.

MATTERS TO BE CONSIDERED:
Board meeting concerning:

5. Recommendation for finding of exces-
sive profits: Stelma Inc., successor-in-inter-
est to a 1960 Delaware corporation of the
same name, fiscal years ended March 31,
1968 and 1969 and May 8, 1969.

6. Recommendation for denial of contrac-
tor's request for special accounting agree-
ment: National Steel and Shipbuilding Co.,
fiscal year ended December 31, 1974.

STATUS: Closed to public observa-
tion.

CONTACT PERSON FOR MORE IN-
FORMATION:

Kelvin H. Dickinson, Assistant Gen-
eral Counsel-Secretary, 2000 M
Street NW., Washington, D.C., 202-
254-8277.

Dated: February 5, 1979.

HARRY R. VAN CLEVE,
Acting Chairman.

[S-291-79 Filed 2-9-79; 10:53 am]

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TUESDAY, FEBRUARY 13, 1979

PART II



**ENVIRONMENTAL
PROTECTION
AGENCY**



**1983 AND LATER MODEL
YEAR HEAVY-DUTY
ENGINES**

**Proposed Gaseous Emission
Regulations**

[6560-01-M]

ENVIRONMENTAL PROTECTION
AGENCY

[40 CFR Part 86]

[FRL 1024-4]

CONTROL OF AIR POLLUTION FROM NEW
MOTOR VEHICLES AND MOTOR VEHICLE
ENGINESGaseous Emission Regulations for 1983 and
Later Model Year Heavy-Duty EnginesAGENCY: Environmental Protection
Agency.

ACTION: Proposed rule.

SUMMARY: This proposed rule prescribes more stringent hydrocarbon and carbon monoxide emission standards, and establishes an assembly line testing program and nonconformance penalty system for 1983 and later model year heavy-duty (HD) gasoline-fueled and diesel engines as mandated by the Clean Air Act Amendments of 1977. Substantial changes are also being proposed to the emission test procedures, the definition of useful life, and the procedures used to verify the durability of emission control systems over their useful life.

Although there have been gains in control of air pollution, many air quality control regions still fail to meet the ambient air quality standards. Heavy-duty vehicles contribute a significant percentage of the total hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx). For this reason the Clean Air Act Amendments of 1977 have mandated a 90% reduction from 1969 baseline gasoline levels of HC and CO pollutants. The amended Clean Air Act also requires a more stringent NOx standard for 1985, which will be proposed at a later date.

This proposed regulatory action will result in significant reductions in gaseous emissions from heavy-duty vehicles, particularly from gasoline-fueled vehicles. If promulgated as final rule, this action is anticipated to reduce HC emissions up to 2 tons per vehicle and CO emissions up to 39 tons per vehicle for HD gasoline-fueled vehicles. HD diesel vehicles will also experience up to one ton per vehicle reduction in HC. In the major urban regions evaluated (48 for HC and 26 for CO), reductions of up to 11% for mobile source HC emissions and up to 21% for mobile source CO emissions will be realized. These reductions correspond to urban air quality improvements of 2% for oxidants and 6% for carbon monoxide.

DATES: Proposed effective date is Dec. 1979. Comments received on or before the first normal business day, June 13, 1979, will be considered.

PUBLIC HEARING: A public hearing on the provisions of the proposed reg-

ulations will be convened approximately May 14, 1979. The time and place of the public hearing will be announced later in the FEDERAL REGISTER. Pursuant to Section 307 of the Clean Air Act, the record of the public hearing will be kept open for 30 days following the close of the hearing.

ADDRESS—PUBLIC COMMENT: Interested persons may submit written comments to the: Administrator, Environmental Protection Agency, Attention: Director, Emission Control Technology Division, 2565 Plymouth Rd., Ann Arbor, MI 48105. Four copies of the comments are requested but not required.

FOR FURTHER INFORMATION
CONTACT:

Mr. Chester J. France, Emission Control Technology Division, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, Telephone: (313) 668-4338.

SUPPLEMENTARY INFORMATION:

BACKGROUND

Heavy-duty (HD) engine exhaust emissions (gasoline-fueled vehicles only) were first regulated by the State of California in 1969. A year later, EPA adopted the California emission standards and test procedures and added exhaust and smoke emission standards for diesel engines. The emission standards for HC and CO were lowered by California in 1972. California further modified their HD emission regulations in 1973 by changing the gasoline test procedure to a mass measurement basis, adding a standard for oxides of nitrogen emissions, and establishing diesel test procedures and standards. EPA adopted the 1973 California regulations for the 1974 model year. EPA also included a peak smoke level standard for diesel engines. California has since lowered the standards once in 1975 and once in 1977.

In 1977, EPA promulgated more stringent HD emission standards and also adopted a number of test procedure refinements to improve the test procedure's measurement accuracy and test repeatability. These new standards and modified test procedures apply to 1979 and later model year HD vehicles (gasoline and diesel) and are currently in effect.

Section 202(a)(3)(A) of the amended Clean Air Act (42 U.S.C. 7521(a)(3)(A)) now requires a 90% reduction from 1969 gasoline baseline levels in HC and CO emissions effective in the 1983 model year. The Clean Air Act, as amended in August 1977, also requires a 75% reduction (from 1973 gasoline baseline levels) in NOx effective in 1985, but this new standard will be promulgated at a later date.

For the past several years, EPA has been developing transient test procedures that are reliable to actual in-use emissions. Based on analysis of the current steady-state procedures (9-mode for gasoline and 13-mode for diesel) EPA has determined that the current emission test procedures are incapable of insuring that the reductions mandated by the Clean Air Act are achieved in actual use. This action proposes standards that represent 90% reductions (from baseline levels) in HC and CO emissions. It is proposed to measure emissions using EPA's newly developed transient engine test procedure.

In conjunction with these changes EPA is proposing assembly-line testing and non-conformance penalty regulations as required by the Act. Other significant changes which include redefinition of useful life, revised durability requirements, parameter adjustment, and allowable maintenance are also being proposed.

An attempt has been made in this rulemaking action to consolidate several significant regulations (e.g., test cycles, parameter adjustment, durability procedures, and Selective Enforcement Auditing (SEA)). The package represents what EPA feels is a comprehensive "compliance strategy" necessary to achieve the emission reductions mandated by the Clean Air Act. In the past, EPA has implemented similar regulations, for light-duty vehicles, however, it was done with numerous rulemaking actions. Not only has this approach been wasteful of resources, but has at times confused the manufacturers. With respect to this rulemaking action, the manufacturers will know from one rulemaking action what EPA's long-term requirements will be. Moreover, they will have an opportunity to provide meaningful comments on the interdependence of the various elements of the package as they relate to the complete compliance strategy.

PROPOSED CHANGES

1. EMISSION STANDARDS

Standards which represent a 90% reduction from 1969 baseline levels are proposed for both hydrocarbon (HC) and carbon monoxide (CO) emissions. These standards will apply to 1983 and later model year heavy-duty gasoline-fueled and diesel engines over their full useful life. Exact numerical standards are not specified in the proposed regulations, but will be in the final action. EPA has not completed its baseline testing of 1969 gasoline engines and can only quote approximate standards at this time. The approximate HC and CO standards for 1983, derived from a sales weighted average of the baseline engines tested to date, are 1.4 grams per brake horsepower-

hour (g/BHP-hr) HC and 14.7 g/BHP-hr CO. Based on a statistical analysis of the baseline data gathered to date, EPA has determined, with reasonable confidence, that the final standards will not be less than .76 g/BHP-hr for HC and 11.4 g/BHP-hr for CO. EPA will not finalize standards below these lower limits without repropounding. Although the approximate standards may change pending completion of baseline testing, EPA does not expect substantial changes to occur.

The above approximate standards were developed from baseline testing of 12 1969 HD gasoline engines. The 12 engines tested so far, represent approximately 58 percent of the gasoline engine sales for 1969. Individual test results for each baseline engine can be found in Appendix A of the Regulatory Analysis. The 1969 baseline testing is expected to be finished by May 1979. The goal is to test enough engines to represent at about 80 percent of 1969 sales. This goal can be achieved by testing 20 to 30 engines. Additional engines will be tested as time permits in order to obtain data from several engines of the same type in the case of the most popular engine models. EPA will continue to update the regulated industry concerning results of its baseline testing.

It is not EPA's intent to substantially increase the stringency of the NOx standard for 1983. EPA will derive the NOx standard from transient test results of 1979 and later model year HD gasoline engines. EPA plans to base such a standard on the sales weighted average of a representative 1979 gasoline engine sample. Manufacturers are invited to submit their ideas on how to derive such a standard. A NOx standard that will achieve at least a 75 percent reduction will be proposed for 1985 in a later Notice of Proposed Rulemaking (NPRM).

Separate HC and CO idle standards representing 90% reductions from 1969 gasoline levels are also being proposed under the authority granted EPA in Section 202(a) of the Clean Air Act (as amended August 1977). Specific values for the idle standards are not contained in the proposed rule itself, but will be in the final rule. The approximate standards, based on the engines tested to date, are 1400 ppmC for HC and .55 percent for CO. These standards are in terms of raw exhaust gas concentrations. As mentioned before EPA will update the manufacturers as further results from the 1969 baseline testing are obtained.

EPA has determined statistically that it is unlikely that the additional baseline testing will result in idle standards less than 530 ppmC for HC and .30 percent for CO. The final idle standards are not expected to change substantially from the approximate

idle standards given above. EPA will not finalize idle standards below these lower limits without repropounding.

The chief reason EPA is proposing HC and CO idle standards is that the idle mode has been identified as the largest single mode of heavy-duty operation. Based on heavy-duty truck operational data collected in Los Angeles and New York City, idle conditions constitute approximately 25% of a truck's operation (32% in New York City and 17% in Los Angeles). In addition to being such a significant portion of overall heavy-duty truck operation, it is important to control idle CO emissions since idle operation will occur in situations that involve fairly direct exposure of people, i.e., local "hot spots". Examples of such situations include crosswalks at intersections, loading dock areas, and bus stops in congested traffic.

EPA has determined from light-duty emission test results that idle HC and CO levels are related to engine displacement and idle speed. The need for expressing the idle standards for heavy-duty engines as a function of engine displacement and idle speed is being evaluated at this time. If a need is identified for expressing the standards in this manner, EPA will act accordingly in the final rule.

Finally, EPA proposes to control HD diesel crankcase emissions. Statutory authority for proposing such controls is provided under Section 202(a) of the Clean Air Act. The current HC emission regulations place controls on crankcase emissions from gasoline-fueled engines, but not from diesel engines. It's inappropriate that diesel engines continue to be excluded from regulations which apply to a competing engine. In addition to being a source of HC and CO emissions, recent testing indicates the possible presence of various nitrosamines in diesel crankcase gaseous flow (refer to EPA report titled "Diesel Crankcase Emissions characterization, Final Report of Task No. 4, Contract 68-03-2196," May 1977 for description and summary of test results). Nitrosamines are a very strong carcinogen in animals and strongly suspected to be carcinogenic in humans.

The same testing also indicated that the particulate emissions from diesel crankcase flow consisted mostly of lubricating oil. Recent work by other researchers has indicated that whereas fresh lubricating oil appears to be non-mutagenic, it quickly becomes mutagenic with use. Therefore, it is very likely that diesel crankcase emissions could be mutagenic (as measured by Ames testing) soon after each oil change. (For further information on "Ames testing" refer to the article titled "Methods for Detecting Carcinogens and Mutagens with the Salmonel-

la/Mammalian—Microsome Mutagenicity Test," by B. N. Ames, J. McCann, and E. Yamasaki, *Mutation Research*, 31 (1975), pgs. 347-364.)

EPA estimates at this time that crankcase emissions can be controlled at minimal cost and within the available lead time. However, EPA is soliciting comments from the manufacturers concerning the costs and feasibility of controlling diesel crankcase emissions beginning with the 1983 model year. If it is determined from the comments to this NPRM that control of crankcase emissions is not practical for 1983, then EPA will propose this requirement together with the Clean Air Act mandated NOx emission reductions (applicable for 1985 and later model years).

2. TEST PROCEDURES

EPA is proposing new test procedures for determining gaseous exhaust emissions from heavy-duty engines (gasoline-fueled and diesel). The major change being proposed is that the current steady-state test cycles (9-mode for gasoline and 13-mode for diesel) are being replaced by transient test cycles. Significant modifications are also being proposed for the emission sampling techniques. The current optional use of the 1974-1978 test procedures by low volume manufacturers will be disallowed after 1982. EPA proposes that the current smoke measurement procedure and standards be retained intact.

The need for the new transient test procedures is thoroughly discussed in Chapter VI, Alternate Actions, of the Regulatory Analysis. Fundamentally, EPA considers the existing steady-state test procedures inadequate for assuring that heavy-duty vehicles achieve the same reductions in on-road emissions as they do in the laboratory. As the emission standards become more stringent the motivation to design around the test procedures will be increased. The emission control techniques used to obtain low emission levels on the steady-state procedures may not achieve the same degree of control on the transient test procedure, nor in actual on-road use. In fact, even at current levels, the steady-state procedures do not provide an accurate assessment of true, real world reductions. For these reasons and others discussed in the Regulatory Analysis, EPA is proposing the numerous test procedure changes.

The need for the transient test has been clearly demonstrated for gasoline-fueled engines, however for diesel engines the need is not as obvious. EPA recognizes that diesel HC and CO levels are already quite low, and in most cases they are already close to the proposed 90% reduction levels. This fact raises a question concerning

the need for the transient procedure for diesel engines. However, under another program, EPA is developing regulations for the control of heavy-duty particulate emissions (required by Section 202(a)(3)(A)(iii) of the Clean Air Act as amended in 1977). These procedures are planned to be implemented in 1983 and will require a transient test. Since acquisition of transient test facilities are a long lead time item, it is imperative that the transient procedure be proposed in this action. Otherwise, the implementation of the heavy-duty diesel particulate regulations in 1983 will be seriously jeopardized. Finally, the required 75 percent reduction in NO_x for 1985 will be difficult for diesel engines to meet. It is anticipated that at such low NO_x levels, a transient test will be necessary to insure that engines achieve 75% reductions in on-road emissions; it is also imperative that the manufacturers have the test procedure finalized at the earliest possible time so as to allow them to proceed with the development of control technology necessary for compliance with the 75% NO_x reduction requirements.

The proposed transient test cycles were developed by EPA from actual in-use truck operational data collected in New York City and Los Angeles. A different cycle for both gasoline-fueled and diesel engines is included in the proposed rule. Each transient cycle is specified by a second-by-second listing of pairs of normalized engine speed and horsepower values. The listings for the cycles can be found in Appendix I of the regulations.

The first step in the test sequence is the generation of the maximum torque curve. The experimentally derived maximum torque curve is then used to unnormalize the test cycle into an actual speed-power cycle. After the maximum torque curve generation the engine is allowed to soak a minimum of 12 hours and a maximum of 36 hours. The engine is then started cold, operated over the test cycle, shut-off for a 20 minute hot soak, restarted again, and operated over the test cycle. The idle emission test procedure (Subpart P) can be conducted at the conclusion of the transient test, if desired. Cycle run validation requirements and tolerances are specified in the procedures.

Under the current test procedures mass emissions are determined from raw exhaust gas analysis. This sampling technique is used because the emissions are measured during periods when exhaust gas composition and flow are not changing. However, during the transient test cycle exhaust gas composition and flow is changing continuously. To measure mass emissions under these conditions it is proposed to dilute the exhaust emissions

with ambient air and collect a continuous proportional sample for both the cold and hot start tests. A constant volume sampler (CVS) is required to obtain a continuous proportional emission sample. Emissions are required to be bagged separately over the cold start test and hot start tests. HC emissions from diesel engines, though, are not bagged, but are continuously sampled and analyzed during the sample periods using heated sample lines and a heated flame ionization detector. The dilute samples collected in the bags are analyzed using a flame ionization detector for HC, a non-dispersive infrared analyzer for CO and CO₂, and a chemiluminescence analyzer for NO_x.

The total volume of dilute sample is measured during the test, and is used to calculate the mass of each pollutant emitted during the sample period. To enable a determination of brake-specific emissions (i.e., g/BHP-hr), the useful work output during both test phases (cold start and hot start test) is measured. The mass emissions for each pollutant is weighted appropriately for the number of cold and hot start trips in a day and is divided by the similarly weighted work output (brake horsepower-hour). The resultant g/BHP-hr pollutant value represents the brake-specific emissions from an average urban trip for a HD truck.

The proposed idle test procedure (Subpart P) includes very general analytical and sampling system requirements which are different from the transient test requirements since the measurements can be made directly from the exhaust without dilution. These requirements of course allow the use of those systems described in Subparts D and N. If the Subpart N analytical system is used, an additional CO₂ analyzer is required to measure CO₂ concentrations in the raw exhaust. This CO₂ measurement is necessary to accurately determine the dilution factor during the idle mode. Additional flexibility is also allowed in running the idle test itself since it is conducted after the engine is at normal operating temperature and therefore would be less sensitive to preconditioning than the cold start, transient test. In addition, the flexible preconditioning procedure and less restrictive instrumentation specifications for the idle procedure permit the straightforward adoption of regulations under section 207(b) of the Act, if such regulations become necessary. For example, wide ambient temperature ranges and simple engine warm-up procedures are specified.

The HC and CO emissions measured during the idle test are not expressed in the units used for the transient emission test results (i.e., g/BHP-hr). Instead, hydrocarbon emissions are ex-

pressed in parts per million (ppm) and carbon monoxide emissions are expressed in percent.

Organizationally, the proposed test procedures (Subpart N) are arranged in a format similar to the light-duty vehicle (LDV) emission regulations. In fact, the following sections are in common with the LDV emission regulations § 86.1309, § 86.1311, § 86.1313, § 86.1314, § 86.1319, § 86.1321, § 86.1322, § 86.1323, § 86.1324, and § 86.1340.

3. REDEFINITION OF "USEFUL LIFE"

EPA is proposing to amend the current definition of "useful life" for heavy-duty engines under the authority given EPA in Section 202(d) of the Clean Air Act. For gasoline-fueled HD engines the useful life is presently defined as a period of use of 5 years or 50,000 miles of vehicle operation or 1,500 hours of engine operation (or 1,500 hours of engine dynamometer operation), whichever occurs first. For diesel HD engines, useful life is presently defined as a period of use of 5 years or 100,000 miles of vehicle operation or 3,000 hours of engine operation (or an equivalent period of 1,000 hours of engine dynamometer operation), whichever occurs first. Both of these definitions are unrealistically short. The amendment would bring the definition of useful life into closer agreement with the periods of use actually seen by heavy-duty engines. Specifically, the useful life for heavy-duty engines would be defined as the average period of use up to engine retirement or rebuild, whichever occurs first. The manufacturer would be responsible for making the useful life determination(s) for its engines.

It is further proposed that the manufacturer make two useful life related statements on the engine label and, with more detail, in the owner's manual. The average useful life (in hours or miles) as determined by the manufacturer shall be stated, as well as a statement of compliance with the emission regulations for the useful life of the engine.

4. REVISED DURABILITY TESTING REQUIREMENTS

EPA proposes to allow each manufacturer to design the test procedure used to determine emission deterioration factors (DFs) for its engines. Manufacturers would be required to state that their procedures are designed and conducted in accordance with good engineering practice and that the procedures account for representative emission deterioration processes. Manufacturers would submit descriptions of the test procedures used, the data collected and the resultant deterioration factors for each engine family control system combination.

The above proposal would apply only to engine family-control system combinations seeking initial certification. For a family-system combination eligible for carry-over under current regulations (i.e., one which has not been significantly redesigned from the previous model year(s)), EPA proposes that manufacturers be required to derive deterioration factors from engines tested via in-chassis, on-the-road service accumulation. The manufacturers would be required to initiate in-chassis service accumulation within three months after the engine(s) in question go into production. The certificate of conformity would become invalid if the manufacturer fails to meet this requirement. EPA will retain the authority to make engine family determinations to discourage the manufacturers from creating "new" engine families each year by making minor engine modifications. By creating new families each year the manufacturers could conceivably avoid use of deterioration factors based upon the in-chassis service accumulation requirements.

EPA will waive the requirement for in-chassis service accumulation for 1983 and 1984 if the manufacturer states in its application for certification that an engine family-control system combination (for which it seeks an initial certificate of conformity for 1983 or 1984) will not be produced past the 1984 model year. EPA is allowing this waiver because it is likely that the manufacturers will be employing different or modified emission control systems on their engines in 1985 to meet the mandated reductions in NOx emissions. This waiver provision will not be available after 1985.

A minimum of three engines per family would be required to undergo in-chassis service accumulation testing. The service application of the vehicle shall be typical of commercial or consumer applications for the engine/vehicle combination. The minimum guidelines the manufacturer is required to follow are:

(1) a minimum annual mileage of at least 15,000 miles or 10 percent of the useful life mileage, whichever is greater, must be accumulated, and

(2) no more than 40,000 miles or 40 percent of the useful life mileage, whichever is greater, can be accumulated in any one year.

After 30,000 miles are accumulated, the engine would be emission tested and an in-chassis deterioration factor would be derived by linear extrapolation over the full useful life. This newly derived deterioration factor would then supersede the initial year's deterioration factor. As more miles are accumulated and until the useful life is reached, the manufacturer would perform emission tests in sufficient number to insure accurate assessment

of the deterioration. The additional emission results are then used to update the in-chassis DF on a yearly basis.

EPA is proposing that the deterioration factors be employed as multiplicative factors, rather than as additive factors (being used in current procedures) to account for deterioration in emission control performance with use and time. Theoretical considerations and empirical studies do not unequivocally support use of multiplicative over additive deterioration factors, or vice versa. However, EPA's position is that for catalyst-equipped engines there is more technical justification for preferring the use of multiplicative factors over additive factors than for the reverse since catalyst systems reduce emissions by a given percentage regardless of input levels. Multiplicative factors are presently used for light-duty vehicles and light-duty trucks for this reason. Since gasoline-fueled engines capable of meeting the proposed standards will include catalysts, EPA is proposing the use of multiplicative factors for all heavy-duty engines beginning in 1983.

5. PARAMETER ADJUSTMENT

EPA proposes to amend the certification procedures to permit the Administrator to adjust or require manufacturers to adjust certain previously identified engine parameters to settings anywhere within the physical limits of adjustment for the parameter(s) in question. This provision is also included in the proposed Selective Enforcement Auditing (SEA) and Production Compliance Auditing (PCA) regulations. The authority to establish such regulations is granted to EPA in Sections 202, 206, and 301 of the Clean Air Act. The parameters that will be initially subject to these requirements will be the same as those in the recently promulgated light-duty vehicle parameter adjustment regulations (a complete copy of the light-duty parameter adjustment rulemaking package can be found in the Public Docket pertaining to this NPRM (No. OMSAPC-78-4)); idle fuel-air mixture, idle speed, initial spark timing, and choke valve action. Any other parameter which is physically capable of being adjusted, may significantly affect emissions, and was not present on engines of the same engine family in the previous model year may also be subjected to adjustment. Other parameters which were present on engines of the same engine family in the previous year may be added to the list of four parameters given in this paragraph, but only with sufficient lead time notice to the manufacturers.

These proposed requirements, which are identical to those promulgated recently for light-duty vehicles, will en-

courage manufacturers to design engines to be less susceptible to in-use maladjustment. Such maladjustment is capable of causing in-use emissions to be substantially higher than allowed by the standards. EPA does not have test data which indicate how serious this problem may become for heavy-duty vehicles with the use of advanced emission control technology. However, there is no reason to believe that the degree of HD in-use maladjustments will be much different than has been the case with catalyst equipped light-duty vehicles and light-duty trucks. Based on this experience with catalyst technology, EPA expects that the relative impact of this proposed action will be similar to those projected for light-duty vehicles and light-duty trucks. (For additional information refer to the light-duty parameter adjustment rulemaking package contained in Public Docket No. OMSAPC-78-4.) EPA solicits comments on EPA's judgment in this regard. In particular, if a manufacturer feels that because of some difference in the use or maintenance of heavy-duty vehicles, emission-related parameters will not be adjusted and set to specifications other than the manufacturer's, then the rationale and/or data to support this judgement is requested. The proposed parameter adjustment provision will help ensure that the 90% reductions in HC and CO mandated by statute are actually achieved by in-use engines.

6. ALLOWABLE MAINTENANCE

These regulations include definitions for non-emission related maintenance and emission-related maintenance. (These definitions and the allowable maintenance provisions described below are being proposed under the statutory authority granted by the Clean Air Act in Section 207(c)(3)(A) and 206(d). The definitions are as follows:

"Non-emission related maintenance" means that maintenance which does not substantially affect emissions and which does not have a lasting effect on the deterioration of the vehicle or engine with respect to emissions, once the maintenance is performed at any particular date.

"Emission-related maintenance" means that maintenance, which does substantially affect emissions, or which is likely to have a lasting effect on the deterioration of the vehicle or engine with respect to emissions, even if the maintenance is performed at some time other than that which is recommended.

A replacement of the air cleaner would be an example of non-emission related maintenance. A dirty air cleaner may affect emissions to some extent by enriching the fuel-air mixture, but

the effect would not be expected to be a large one. The effect of a dirty air cleaner could also be completely reversed by replacement with a clean air cleaner. A dirty air cleaner should not cause any component to be permanently damaged.

Spark plug replacement would be an example of emission-related maintenance, since a malfunctioning spark plug can greatly increase hydrocarbon emissions. A malfunctioning spark plug can also cause catalyst activity to deteriorate at a faster rate than normal and such deterioration would not be reversed by replacement with a good spark plug.

These regulations also include provisions limiting the amount of emissions-related maintenance which can be performed on durability vehicles. These regulations limit emissions-related maintenance to that which is technologically necessary and also has a reasonable likelihood of being performed in-use. Included in the provisions are minimum mileage intervals for the maintenance of emission-related components. EPA has determined that these intervals are technologically feasible and that shorter intervals are not technologically necessary. The manufacturer will still need to show that his emission-related maintenance is technologically necessary, even if these intervals are "longer" than the minimum intervals included in the provisions. EPA believes that these provisions are necessary to help insure that in-use emissions do not exceed the standards due to manufacturers using emission control technology which require extensive maintenance and then not having such maintenance performed. No costs for these provisions have been included in the regulatory analysis because EPA believes that the savings due to decreased maintenance requirements will pay for any first cost increases incurred due to these limitations.

7. SELECTIVE ENFORCEMENT AUDITING

As a further step to insure HD engines achieve the mandated emission reduction in the real world, EPA is proposing Selective Enforcement Auditing (SEA) regulations (see Subpart K). Selective Enforcement Auditing (SEA) is emission testing performed on a sample of heavy-duty engines coming off the assembly line to determine whether they conform to the regulations under which their respective certificates of conformity were issued.

The authority to conduct SEA testing is contained in Sections 206(b) and (g) of the Clean Air Act. Section 206(b) authorizes the Administrator to test, or to have manufacturers test, new production motor vehicle engines to determine whether the engines con-

form to the regulations with respect to which a certificate of conformity was issued. The Clean Air Act Amendments of 1977 added Section 206(g), which requires testing of heavy-duty production engines as necessary to determine the percentage not in compliance with the regulations with respect to which a certificate of conformity was issued.

An SEA audit is initiated by a test order to the engine manufacturer. The test order will be confined to a single engine configuration. Each manufacturer will have a preliminary limit on the number of test orders with which it has to comply each year based on projected annual sales.

The manufacturer is required to test the specified engines or to provide the engines to EPA for Agency testing. EPA Enforcement Officers are authorized to enter the manufacturer's facilities to monitor SEA-related activities, either through the consent of the manufacturer or, if consent is refused, under the authority of a warrant or court order in accordance with the Supreme Court's decision in *Marshall v. Barlow's, Inc.* (98 S.Ct. 1816 (1978)). The manufacturer is also required to retain records related to the SEA audits it conducts and, if the manufacturer has its own assembly-line testing program, to report test results from such a program to the EPA on a quarterly basis.

The sampling plans and decision criteria for SEA are based on an Acceptable Quality Level (AQL) of 10%. This AQL would provide assurance that all engines meet applicable standards after adjustment for deterioration with only 10% allowed to exceed standards to provide for test variability and isolated instances of nonconformity. (Any engine that failed the initial test would be required to pass a subsequent test before it could be sold.) This is consistent with the requirement of the Clean Air Act that every engine be warranted to meet emission standards throughout its useful life.

A 10% AQL also was proposed for the SEA program for light-duty vehicles (39 FR 45360 (1974)). In that proposal, emission standards for light-duty vehicles had already been fixed, and comments on the proposal asserted that adverse economic repercussions could occur to the light-duty vehicle industry by immediately imposing a 10% AQL. Under the production practices of the industry in effect at that time, production was not geared so that all manufacturers of light-duty vehicles would comply with emission standards, but so that the total production of light-duty vehicles would meet standards on the average. Thus, a 40% AQL was adopted in the final regulations to avoid an unreasonable

economic impact on the industry (41 FR 31422 (1976)).

In this NPRM, EPA is proposing a 10% AQL as part of a total compliance strategy for heavy-duty engines. EPA believes that a 10% AQL can be met within the costs estimated for this proposed action, and that such costs should not place an unreasonable economic burden on the manufacturers.

The test order will specify the manner and location of the selection of test engines. Since the sampling plans are designed to be "sequential" in the sense that a decision can be made on compliance with the AQL after each engine is tested (a minimum number of engines must be tested), the test engines can be selected in several ways: one at a time as required to keep the audit progressing, a large group over a short period of time, or a small group on a daily basis.

The manufacturer will be permitted to "break in" engines before testing, up to a maximum service accumulation limit of 125 hours. The emission measurements will then be performed according to the test procedure described in Subpart I, N and P. The results obtained will be adjusted to be in accordance with the deterioration factors developed during the certification process to assure that the engines are in conformance with the regulations under which their certificate of conformity was issued. The manufacturer is expected to complete at least two tests per day. If a manufacturer can be classified as a "low-volume manufacturer," as defined in Subpart K, it is required to complete only one test per day.

Passing or failing an SEA audit is determined by testing individual engines consecutively until the number of failing engines, relative to the total number of engines tested to that point, corresponds to the pass or fail number specified in the decision rule for the applicable sampling plan. Classifying individual engines as either passing or failing the SEA emissions test, rather than examining their respective emission levels actually measured, reflects the "attributes" rather than a "variables" decision-making approach of the SEA sampling plans. The choice of an "attributes" approach is based primarily on current uncertainty regarding the characteristic distribution of emissions throughout the population of heavy-duty production engines.

Failure of an SEA audit may result in suspension or revocation of the certificate of conformity for the test configuration. The certificate can be reinstated only after the manufacturer demonstrates compliance through additional audit testing following implementation of a design or quality control change on the affected configura-

tion. The follow-up audit, however, is conducted according to a different sampling plan designed to reduce the "consumer's risk" that the manufacturer might pass the audit when it is in fact not complying with the AQL. In the case of any suspension or revocation of a certificate arising from an SEA failure, the hearing provisions of Subpart K allow the manufacturer to dispute the Agency's decision on the basis of application of the sampling plans or the manner in which emission tests were conducted.

These regulations will permit heavy-duty engines to be certified, even when their emissions as measured during certification testing, exceed the HC and CO standards. In that event a certificate of conformity would be issued only as long as the measured emissions do not exceed maximum levels, termed "upper limits", which EPA would establish above the emission standards for the two pollutants. If such engines are certified above the standards, but below the "upper limit," the manufacturer will be subjected to an SEA (using the follow-up audit sampling plans as described in the previous paragraphs) and if necessary, a Production Compliance Audit (PCA) to establish the nonconformance penalty. (See the following section on Production Compliance Auditing and Nonconformance Penalties.) If upper limits are set for the 1983 standards for HC or CO (or both), several decisions could be made as a result of an SEA audit: the test configuration passes with respect to the standard, fails with respect to the standard but not with respect to the upper limit, or fails with respect to the upper limit. In the second case, if the manufacturer did not wish to institute a change to rectify the nonconformity, it could avoid a certificate suspension or revocation by electing to pay a nonconformance penalty on the basis of Production Compliance Audit testing.

8. PRODUCTION COMPLIANCE AUDITING (PCA) AND NONCONFORMANCE PENALTIES

In Section 206(g), the Clean Air Act Amendments of 1977 also added a requirement that a certificate of conformity be issued and remain in effect for engines exceeding an emission standard, yet within a specified upper limit, if the manufacturer of these engines paid a nonconformance penalty based in part on the extent to which those engines are exceeding the standard(s). Therefore, a Production Compliance Auditing (PCA) program and a nonconformance penalty system is also being proposed in Subpart K. Production Compliance Auditing is emission testing performed on a sample of heavy-duty engines to determine the "compliance level." As indicated above, a PCA would be conducted

when a manufacturer elects to pay a penalty upon failure of an SEA in lieu of bringing the engines into compliance. The compliance level established is in turn used to determine the amount of the nonconformance penalty that will be imposed on the manufacturer.

A PCA is not initiated by a test order but rather upon a request by a manufacturer. The terms of the test order initiating the original failing SEA would still apply. The aspects of SEA testing relating to testing by EPA, maintenance of records, entry and access of Enforcement Officers, engine selection and break-in, test procedures, test per day requirements, and application of deterioration factors still apply to PCA testing. Engines tested during a PCA are not classified as "passes" or "failures." Instead, the emission test results obtained are used to make a point estimate of the 90th percentile of the data distribution. This point estimate is the "compliance level."

The PCA sampling plans indicate the number of engines that must be tested to determine the compliance level. The plans also allow a determination as to whether the configuration is in compliance with the AQL at the upper limits (or at the standard for a pollutant that has no upper limit). If the PCA is failed with respect to the upper limit (or the standard if there is no upper limit) the same sanctions of certificate suspension or revocation may be imposed as in SEA testing. The manufacturer can dispute the Agency's sanction decision on the same bases as described in the SEA program and request a hearing. If the PCA is conducted and no fail decision is reached, a nonconformance penalty will be imposed.

Two alternative approaches to calculating the nonconformance penalty were considered. Both approaches are based on incremental costs, i.e., those avoided by an engine's not meeting emissions standards. Such costs include those borne by the manufacturer, such as the variable costs associated with each engine and amortization of fixed costs, and those borne by the end-user, such as increased fuel consumption and maintenance requirements.

In the first approach considered, the "actual cost" approach, the penalty is equal to the full cost (including the indirect cost of any performance degradation borne by consumers) of bringing a particular nonconforming engine configuration into compliance with the standards. The underlying philosophy is that a potential purchaser ought to be indifferent, in economic terms, to purchasing the nonconforming engine with its price increased to reflect the penalty and the same

engine brought into conformance. The penalty will automatically increase with the degree of nonconformity, since the cost of bringing an engine into compliance generally increases with the degree of nonconformance. After the initial penalty has been set, the penalty can be increased by a fixed percentage over subsequent time periods so as to create incentives for the development of production engines which meet standards.

In the second approach, the penalty is based on the "marginal cost" of reducing emissions for a "typical" engine to bring it into compliance with the standards. As one moves towards the standard from higher emission levels, it generally becomes more expensive to remove each incremental unit of emissions, although it is still cost-effective to do so. The most expensive incremental reduction is to move to the standard from a level just above the standard; the cost of doing this is referred to as the "marginal cost" of compliance at the standard. The nature of this approach is such that it can result in penalties significantly higher than the cost of bringing a particular engine into compliance with the standards. These generally high penalties should provide a substantial degree of protection to the conforming manufacturer, as required by the Act: "Such penalties . . . shall remove any competitive disadvantage to manufacturers whose engines or vehicles achieve the required degree of emission reduction. . . ." (Section 206(g)(3)(E)). Like the "actual cost" approach, the penalty assessed will escalate over time to provide an increasing incentive to conform.

A more thorough discussion of both alternative approaches to calculating the nonconformance penalty can be found in a paper in the rulemaking docket entitled "Nonconformance Penalties for Heavy Duty Engines." As described in this paper, both alternatives satisfy the three mandatory criteria for the nonconformance penalty required by the Act (Section 206(g)(3)(C), (D), (E)). However, they do differ significantly in the areas of equity, ease of administration and degree of emission reduction expected.

The Agency has chosen to use the "marginal cost" approach in its proposal because of the relative merits of this alternative compared with the cost-based approach. In the area of equity, the choice of one approach over the other may well depend upon how one defines "equity." The "marginal cost" approach is considered to be the more equitable alternative in the sense that engines with the same degree of noncompliance will incur the same penalty, regardless of type of manufacturer or the possibility that one may actually cost less to bring

into compliance than the other. In the area of administrative burden, the "marginal cost" approach has the decided advantage because it will not require extensive cost estimating and documentation by the manufacturers and subsequent verification and auditing by the Agency. In the area of expected emission reductions, the "marginal cost" approach is again favored because it is set up to be economically advantageous to the manufacturer to comply with standards rather than to pay a penalty.

There is some question as to when nonconformance penalties should be applicable. Section 206(g)(1) of the Act states that a nonconformance penalty should be available "in the case of any class or category of heavy-duty vehicles or engines to which a standard promulgated under section 202(a) of this Act applies." However, the House Committee, which initially proposed the nonconformance penalty provision, which eventually was adopted by Congress, indicated in its committee report that the nonconformance penalties would be used only in conjunction with "revised standards," i.e., revisions to the 1983 statutory standards for HC and CO and revision to the 1985 statutory standard for NOx. (H.R. Rep. No. 95-294, 95th Cong. 1st Sess 275).

Congress indicated that revised standards were to be implemented if EPA determined that manufacturers would be unable to meet the statutory emission standards within the time frame provided in the Act. To ensure that standards would not be relaxed more than necessary in moving from statutory to revised levels, EPA was directed to set revised standards at levels based on the capability of the industry's "technological leader." A nonconformance penalty alternative was then to be made available to accommodate those "technological laggards" unable to meet established standards. By paying the nonconformance penalty, the laggards would be able to continue selling engines while improving their technology to the point where they could meet the standards.

EPA's position on the applicability of nonconformance penalties is that they should not be available until 1983 for HC and CO, and until 1985 for NOx, and then only if standards (either revised or statutory) are set so that technological laggards need to be accommodated. Since the interim standards that went into effect for the 1979 model year were set on the basis of technology currently available and one year was judged to be sufficient time to incorporate this technology into production engines, nonconformance penalties will not be available which the interim standards remain in effect.

A general formula for the nonconformance penalty has been proposed in these amendments. This formula is based on the emissions charge (marginal cost of compliance) approach. It is not possible to determine the actual dollar amount of the penalty at this time because the marginal cost of meeting the proposed 1983 standards have not been established.

Paragraph (g)(3) of Section 206 of the Clean Air Act sets five criteria for the establishment of a nonconformance penalty formula. One of these criteria is that the penalty be increased periodically, beyond the amount determined by the "marginal cost," to create incentive for the development of production engines which achieve the required degree of emission reduction. These proposed amendments establish a 25% increase in the penalties each model year. This value was selected on the basis of being a sufficient increase in the amount of the penalty to provide additional incentive to bring nonconforming engines into compliance, yet not so large an increase that it would preclude a manufacturer from selling noncomplying engines if it in fact required more than a year to bring them into compliance.

In the event that a nonconformance penalty is assessed against a particular engine configuration, the regulations provide that the penalty shall apply to the engines of that configuration produced since the beginning of the model year and all produced after the penalty has been set. If no changes have been made to the engine configuration up to the time of PCA testing (which establishes the penalty) and thereafter, the Agency has no reason to believe that engines other than those in the test sample will have emissions different from engines in the test sample. This assumes that the emissions performance of the configuration is consistent throughout the year so that the sample of engines selected during a PCA is representative of the entire year's production. As a result, the penalty must be paid on all engines of the noncomplying configuration.

The heavy-duty engine emission standards, as well as the upper limits for HC or CO, if any, will be finalized during the course of this rulemaking. At this time EPA believes that the proposed standards are practical and achievable by all manufacturers. Therefore, no technological laggards need accommodating, no upper limit need be set and the nonconformance penalty would not be available to the manufacturers. However, if the comments in response to this proposal support the need for nonconformance penalty provisions to accommodate any technological laggards, EPA will

proceed to determine a marginal cost factor and establish an upper limit through an evaluation of information obtained from the comments and other sources. The upper limit will correspond to the lowest emission level which the Agency determines any technological laggard has the capability of achieving. Under that approach, no manufacturer would be forced to suspend engine production when the new standards go into effect. EPA would repropose nonconformance penalty provisions incorporating the calculated marginal cost factor and upper limit to ensure that the public would have adequate opportunity to comment on that portion of the regulations.

Heavy-duty engine manufacturers are encouraged to submit data on the cost of compliance with the proposed standards and with hypothetical standards more or less stringent than those proposed, including support documentation. Such data and documentation will be used in determining the marginal cost factor in the nonconformance penalty formula.

ANTICIPATED NEED FOR INSPECTION AND MAINTENANCE PROGRAMS

EPA anticipates that the proposed levels of HC and CO will require the use of catalyst emission control technology for gasoline-fueled engines. This type of emission control system is susceptible to significant in-use deterioration. The proposed parameter adjustment requirements and redefinition of useful life will aid in decreasing catalyst system deterioration, but the problem may still be serious. Therefore EPA expects that an inspection and maintenance (I/M) program will be necessary for in-use heavy-duty vehicles. The chief purpose of such a program would be to identify failed catalysts caused by improper maintenance and/or maladjustment(s) and consequently insure that the full benefits of the more stringent standards are achieved. The costs of an I/M program were included in the economic impact analysis of this proposed regulation. However, the regulations being proposed in this action do not include I/M requirements.

LEAD TIME AND FEASIBILITY

This notice of proposed rulemaking (NPRM) represents official notice that EPA intends to implement the statutory standards prescribed by Congress under Section 202(a)(3)(A)(ii) of the Clean Air Act as amended in August 1977 for the 1983 model year. Based upon information available at this time, EPA believes that sufficient lead time is available to acquire the necessary test equipment, modify test cells, develop and apply the necessary emission control technology and to con-

duct compliance testing by 1983. Therefore, EPA cannot make the findings under Section 202(a)(3)(C) necessary to permit consideration of revised standards at this time. However, manufacturers' comments on the feasibility of meeting the proposed standards will be considered in setting final standards. If revisions to the statutory standards are warranted, they will be made.

For the gasoline engine manufacturers, test equipment acquisition involves the procurement of CVS samplers, analytical equipment, and engine dynamometer modifications. Unlike most diesel manufacturers, the gasoline engine manufacturers are currently using electric motoring dynamometers which can be modified for transient control without acquiring all new dynamometers. Based on recent EPA experience in these areas, total lead time for these actions is 10 months, with CVS procurement probably being the critical path item. All of these procurements can proceed simultaneously. If procurement of the required test equipment and modifications were initiated on January 1, 1980, test facilities would be operational by October 1980. Allowing 12 months for certification testing, a full 14 months of development time would be available between October 1980 and January 1982.

EPA anticipates that gasoline-fueled engines will require the use of catalyst based emission control systems to meet the proposed emission standards. For the most part, the HD manufacturers will be able to utilize the catalyst control technology currently used on light-duty vehicles and light-duty trucks. The light-duty catalyst systems are presently achieving percentage emission reductions in excess of those required for HD engines in 1983. Also, catalyst light-off during cold starts will be less of a problem for HD vehicles than for light-duty vehicles because HD vehicles have significantly fewer cold starts and thus have less emphasis in the test. EPA projects that catalyst durability may require some work by the HD manufacturers, since HD operation can be more severe than light-duty operation. The minimum of 14 months, after the acquisition of test facilities, available to the gasoline engine manufacturers for development efforts should be sufficient time to resolve final catalyst system integration and optimization problems. Considering the clearly established Clean Air Act mandate, the industry should already be pursuing catalyst development and durability work. Much of the work can be done using actual vehicles before the transient engine dynamometer test equipment is obtained. An additional year's

development time is gained if this approach is used.

For the diesel engine manufacturers, test facility acquisition and modifications will take 10 months longer than for gasoline engine manufacturers because complete dynamometers rather than modifications will be required. The engine dynamometers currently used by the diesel manufacturers, eddy-current type, cannot be readily converted to transient operation. The additional time necessary for equipment procurement will reduce the time period available to the diesel manufacturer for development effort. However, to obtain more time, facility acquisition can be begun before promulgation of final rules. Some companies have already initiated plans to acquire new dynamometer systems.

The development time period is admittedly short for the diesel manufacturers, but they should not have significant developmental requirements to comply with the 1983 standards. Their engines are already close to compliance. EPA recognizes that the planned promulgation of the HD diesel particulate regulations for 1983 may alter the manufacturer's development requirements because there may be an interaction between the control of diesel particulates and the control of HC, CO and NO_x emissions. If there is an interaction, the development effort required by the diesel manufacturers (to meet the proposed emission levels) could be increased. These potential interactions and possible lead time impacts are not quantified in this proposal, but will be considered when EPA proposes the HD diesel particulate regulations and standards.

The heavy-duty engine manufacturers have been aware of the Clean Air Act amendments since their adoption in 1977 and should already be working toward meeting its requirements. In addition, EPA has kept the manufacturers well informed during the last several years of its planned implementation of transient test procedures. Even assuming that the manufacturers do nothing until promulgation of final rules (assumed promulgation date is December 1979), EPA concludes that the proposed emission levels are achievable with already available emission control technology within the lead time existing.

The industry has traditionally argued that they cannot be expected to make major commitments toward compliance with a regulation until final regulations are promulgated. While it would be unreasonable to expect companies to order the numerous duplicate facilities required to run a full scale development and certification program prior to the promulgation of final regulations, EPA believes

this notice of proposed rulemaking coupled with the amendments to the Clean Air Act provide a sufficient basis for initiation of the acquisition of several basic developmental test cells. While it is conceivable that minor changes could be made to the proposed test procedure as a result of public comments received in response to this notice, there is no reason to expect changes great enough to void the basic specifications used by EPA to establish its own dynamometer and CVS capabilities.

ECONOMIC IMPACT

EPA anticipates that gasoline-fueled engines will require oxidation catalyst systems and calibration changes, in addition to EGR and air injection already in use, to comply with the 1983 standards. The added emission control system costs are estimated at \$171 per engine. Adding certification testing costs, SEA testing costs and amortized facility costs, the first cost increase per engine attributable to this proposed action will be \$204. This cost is equivalent to 1 to 2.5 percent of the price of a new gasoline-fueled HD vehicle. The increased cost of unleaded fuel, catalyst replacement (it is assumed that 60% of in-use catalysts will require replacement), and I/M fees are estimated to total \$1,016 (present worth on January 1, 1983, assuming 10% interest rate) over the useful life of a gasoline powered heavy-duty vehicle. The increase in cost attributable to the use of unleaded fuel (required because of expected catalyst usage on gasoline-fueled engines) is the major cost resulting from these proposed regulations. More than 80% of the total cost per gasoline-fueled vehicle is chargeable to unleaded fuel.

At present, EPA anticipates that diesel engines can meet the proposed 1983 standards with minor changes to injectors and calibration. These changes are estimated to cost an average of \$25 per engine. The total first cost increase resulting from these proposed regulations is estimated at \$185 per engine. This cost is equivalent to 0.2 to 1 percent of the price of a new diesel-fueled HD vehicle. This figure includes amortized facility costs, certification costs, and SEA testing costs.

EPA does not expect an increase in fuel consumption for either gasoline-fueled or diesel engines. Based on experience with LDV and LDT catalyst technology, fuel consumption may be decreased for gasoline-fueled engines, thus resulting in the cost savings. A fuel economy increase was not estimated, therefore no cost credit was included in the above cost estimates.

COST EFFECTIVENESS

It is not possible to present the individual cost effectiveness values of each

element (e.g., parameter adjustment and Selective Enforcement Auditing) of this proposal due to insufficient data on incremental effectiveness. This is because the individual elements are interrelated which makes it difficult to isolate the benefits for each element. Removing one element would seriously jeopardize the effectiveness of the remaining program. Each element was evaluated with respect to its criticalness and with respect to the reasonableness of its associated cost. Therefore, the overall cost effectiveness for the total compliance strategy was evaluated as a whole.

The cost effectiveness for the total action is summarized below.

COST EFFECTIVENESS (\$/TON)

	Pollutant		
	HC	CO	NOx
Gasoline-fueled engines.....	300*	15*	
Diesel engine.....	162*		

*The costs used in calculating these values are present worths on January 1, 1983 using a 10% interest rate.

Based on the above figures the proposed action appears cost effective when compared to other emission control strategies. Chapter VII of the Regulatory Analysis contains the cost effectiveness figures for other strategies.

REQUEST FOR COMMENTS AND INFORMATION

Although the HD engine manufacturers may not have the capability to conduct transient emission tests at this time, EPA maintains that they do have a genuine opportunity to comment on the proposed rule and aid EPA in formulating final rules. Since the early 1970's, EPA has been involved in the development of the proposed transient procedure and has continuously provided industry with periodic progress reports. These progress reports have taken the form of formal briefings, meetings, and numerous technical reports. The available information has provided the industry with a step-by-step description of EPA's development effort. The manufacturers should have a thorough understanding of this effort which can be used to provide EPA with meaningful comments on its proposed regulations. EPA has identified several areas in which the manufacturers can provide constructive input. These areas are listed below.

SPECIFIC COMMENT REQUESTS

1. Manufacturers are asked to comment on the technological feasibility of:

- Developing catalyst control systems which can survive in a heavy-duty vehicle environment;
- Achieving 90% control of HC and CO emissions with catalyst systems based on experience gained from light-duty vehicles and trucks and from retrofit programs; and
- Meeting more stringent levels of HC and CO than those proposed;
- Controlling diesel crankcase emissions such that none are discharged into the atmosphere.

2. Comments are requested on the representativeness of the emission test cycles, including the weighting factors for hot and cold starts, cycle, length, and cycle segment sequencing.

3. Manufacturers are asked to comment on the methodology used to develop the transient cycles, including the data base, horsepower models, data editing process, category analysis, and the cycle generation technique.

4. Comments concerning lead time requirements for acquiring CVS's, engine dynamometers, transient control systems, and building modifications are solicited.

5. The manufacturers are asked to evaluate the representativeness of the baseline engine sample and the methodology used to determine the baseline emission values (i.e., sales weighted average).

6. Manufacturers asserting that a nonconformance penalty alternative should be made available for model year 1983 are requested to comment on what emission levels should be used as upper limits. These estimates should be based on the lowest emission levels that the manufacturer projects it will be able to achieve.

7. Comments are requested on the proposed method for calculating nonconformance penalties.

8. Comments are requested on the following cost related items:

- Test facility modifications and costs;
- Certification costs;
- SEA costs; including costs associated with meeting a 10 percent AQL;

(d) Emission control system development costs;

(e) Emission control system and engine modification costs;

(f) Costs associated with the various emission control systems which have the potential for reducing HC and CO emissions by 90%;

(g) Costs associated with meeting HC and CO levels more stringent than those proposed (include development costs, hardware costs, etc.);

(h) Cost analysis methodology; and

(i) Fuel economy changes associated with different emission control systems and emission reductions (above and below the proposed standards.)

9. Manufacturers, particularly manufacturers with low sales, are asked to comment on the impact of these proposed regulations with respect to their survival in the heavy-duty market.

10. In estimating the emissions reductions and costs associated with this proposal, inspection maintenance (I/M) programs were assumed to play a significant role. Moreover, the implementation of I/M is not directly under the control of EPA. EPA specifically solicits comments on the cost-effectiveness of this proposal both with and without the implementation of heavy-duty I/M programs.

Comments submitted on the above items should be presented at least at the level of detail used in the Regulatory Analysis. Relevant comments, views, suggestions, and data from any individual or group on pertinent topics will be considered in drafting the final regulations. Comments submitted shall be available for public inspection during normal business hours at the Environmental Protection Agency, Public Information Reference Unit, Room 2922 (EPA Library), 4th and M Streets, S.W., Washington, DC 20460.

AVAILABILITY OF DOCUMENTS

The following EPA technical reports are available from the Director, Emission Control Technology Division, 2565 Plymouth Rd., Ann Arbor, MI 48105. These reports relate to the development of this proposed regulation.

TECHNICAL REPORTS DOCUMENTING THE DEVELOPMENT OF NEW HEAVY-DUTY ENGINE TEST PROCEDURES

EPA Report Number	Technical Report Title	Author	Public Release Date
HDV 76-03.....	Engine Horsepower Modeling for Diesel Engines.	C. France.....	October 1976.
HDV 76-04.....	Engine Horsepower Modeling for Gasoline Engine.	L. Higdon.....	December 1976.
HDV 77-01.....	Selection of Transient Cycles for Heavy-Duty Engines.	T. Wyrar and C. France.....	November 1977.
HDV 78-01.....	Category Selection for Transient Heavy-Duty Chassis and Engine Cycles.	C. France.....	May 1978.
HDV 78-02.....	Selection of Transient Cycles for Heavy-Duty Vehicles.	T. Wyrar and C. France.....	June 1978.
HDV 78-03.....	Truck Driving Patterns and Use Survey, Phase II, Final Report, Part II, Los Angeles.	L. Higdon.....	May 1978.

TECHNICAL REPORTS DOCUMENTING THE DEVELOPMENT OF NEW HEAVY-DUTY ENGINE TEST PROCEDURES—Continued

EPA Report Number	Technical Report Title	Author	Public Release Date
HDV 78-04.....	Transient Cycle Arrangement for Heavy-Duty Engine and Chassis Emission Testing.	C. France.....	July 1978
HDV 78-05.....	Analysis of Hot/Cold Cycle Requirements for Heavy-Duty Vehicles.	C. France.....	July 1978.
HDV 78-06.....	A Preliminary Examination of the Repeatability of the Heavy-Duty Transient Dynamometer Emission Test.	W. Clemmens	June 1978.
HDV 78-07.....	Draft—Recommended Practice for Determining Exhaust Emissions from Heavy-Duty Engines Under Transient Conditions.	C. France and W. Clemmens.....	August 1978.
	Diesel Crankcase Emissions Characterizations: Final Report of Task No. 4, Contract 68-03-2196.	C. J. Hare and D. A. Montalvo, Southwest Research Institute.	May 1977.
	Nonconformance Penalties for Heavy-Duty Engines.	R. Hayes and S. Besse, Putnam, Hayes, and Barlett, Inc..	April 1978.
	Draft Preamble: Selective Enforcement Auditing and Production Compliance Auditing of New Gasoline-Fueled and Diesel Heavy-Duty Engines.		October 1978.
	Air Quality Analysis of 1983 and 1985 Mandated Heavy-Duty Vehicle Emission Standards.	EPA Office of Air Quality Planning and Standards.	August 1978.
	Analytical Development of Sampling Plans for Selective Enforcement Auditing.	Sylvia F. Leaver	December 1978.
	Analytical Development of Sampling Plans for Production Compliance Auditing.	Sylvia F. Leaver	December 1978.

Other reports available through the National Technical Information Service (U.S. Dept. of Commerce, 5285 Port Royal Road, Springfield, VA 22161) are:

EPA Report Number	Technical Report Title	Author	Release Date
APT.D-1523.....	Heavy-Duty Vehicle Driving Pattern and Use Survey, Final Report Part I, New York City.	J. C. Cosby, Wilbur Smith and Associates.	May 1973.
EPA-460/3-75-005.	Heavy-Duty Vehicle Driving Pattern and Use Survey: Part II—Los Angeles Basin Final Report.	Wilbur Smith and Associates.....	February 1974.
EPA-460/3-77-009.	Truck Driving Pattern and Use Survey Phase II—Final Report, Part I.	Wilbur Smith and Associates.....	June 1977.
EPA-460/3-78-008.	Heavy-Duty Vehicle Cycle Development.	Malcolm Smith Systems Control, Inc..	July 1977.

COMMENTS AND THE PUBLIC DOCKET: Copies of materials relevant to this rulemaking action are contained in Public Docket No. OMSAPC-78-4 at the U.S. Environmental Protection Agency, Central Docket Section, Waterside Mall Room 2903B (EPA Library), 401 M Street, S.W., Washington, D.C. 20460. (As provided in 40 CFR Part 2 the Agency may charge a reasonable fee for copying services.)

EVALUATION PLAN: EPA intends to review the effectiveness and need for continuation of the provisions contained in this action no more than five years after initial implementation of the final regulation. In particular, EPA will solicit comments from affected parties with regard to cost and

other burdens associated with compliance and will also review data on the gaseous emissions from heavy-duty vehicles built before and after promulgation of the regulation to determine how effective this measure has been.

REPORTING AND RECORD KEEPING REQUIREMENTS: While the EPA is not aware that this proposed regulation would impose any significant new or additional reporting or recordkeeping requirements on affected parties, the Agency specifically invites comments on ways that any such burdens might be reduced.

Under the EPA's new "sunset" policy for reporting requirements in regulations, the reporting requirements in this regulation will automatically expire five years from the date of

promulgation, unless EPA takes affirmative action to extend them. To accomplish this, a provision automatically terminating the reporting requirements at that time will be included in the text of the final regulation.

EPA intends to promulgate a final regulation, modified as the Administrator deems appropriate, after considering comments and in time to apply to the 1983 model year.

NOTE.—The Administrator has determined that this action is a "Significant" regulation. We have prepared a document entitled "Proposed Gaseous Emission Regulations for 1983 and Later Model Year Heavy-Duty Engines: Regulatory Analysis" detailing the Regulatory Analysis required by Executive Order 12044 and the Economic Impact Assessment required by Section 317 of the amended Clean Air Act. Anyone may review and reproduce this document in the EPA Central Docket Section. Copies are also available upon request from the Director, Emission Control Technology Division, Office of Mobile Source Air Pollution Control, 2565 Plymouth Rd., Ann Arbor, Michigan 48105.

Dated: January 25, 1979.

DOUGLAS M. COSTLE,
Administrator.

Part 86 of Chapter I, Title 40 of the Code of Federal Regulations is proposed to be amended as follows:

NOTE: This Notice of Proposed Rulemaking concerns only provisions of Part 86 applicable to heavy-duty engines. Certain of the proposed amendments listed here, if read literally, might indicate that provisions currently in effect for light-duty trucks are to be retained. This is not the case. Another, independent Notice of Proposed Rulemaking concerning only provisions of Part 86 applicable to light-duty trucks recently has been or will shortly be published. Interested persons should consult that Notice regarding the light-duty truck amendments proposed to take effect concurrently with the heavy-duty engine amendments being proposed here.

1. Paragraph (a) of § 86.077-2 is proposed to be revised to read as follows:

§ 86.077-2 Definitions.

(a) The definitions in this section apply to this subpart and also to Subparts B, D, H, I, J, N, and O of this part.

• • • • •

2. Paragraph (a) of § 86.078-3 is proposed to be revised to read as follows:

§ 86.078-3 Abbreviations.

(a) The abbreviations in this section apply to this subpart and also to Subparts B, D, H, I, J, N, O and P of this part and have the following meanings:

• • • • •

3. A new § 86.083-2 is proposed to read:

§ 86.083-2 Definitions.

The following definitions apply beginning with the 1983 model year. Section 86.080-2 remains effective excepting those definitions which are hereby superseded.

A "maximum torque curve" is a plot of engine torque versus engine speed.

The "measured rated rpm" is the engine speed at which the maximum horsepower occurs as derived from the maximum torque curve.

The "high idle speed" for a diesel engine means the governed speed at no load.

"Integrated brake horsepower" is the total work done by an engine during a transient test, calculated by the incremental summing of brake horsepower-hour segments.

"Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction, or anticipated as necessary to correct an overt indication of vehicle malfunction or failure for which periodic maintenance is not appropriate.

"Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction which was not anticipated.

"Useful life" means:

(1) For light-duty vehicles and light-duty trucks a period of use of 5 years or 50,000 miles, whichever first occurs.

(2) For heavy-duty engines the average period of use up to engine retirement or rebuild, whichever occurs first, as determined by the manufacturer based on survey information of in-service engines or, for new engines, based on durability testing of prototype engines. However, if the manufacturer determines that this period of use is less than 5 years or 50,000 miles (or the equivalent) whichever occurs first, the useful life shall be a period of use of 5 years or 50,000 miles (or the equivalent), whichever occurs first, as required by section 202(d)(2) of the Act. The manufacturer shall not determine the useful life to be less than the period of the basic mechanical warranty on the engine assembly.

"Non-emission related maintenance" means that maintenance which does not substantially affect emissions and which does not have a lasting effect on the deterioration of the vehicle or engine with respect to emissions once

the maintenance is performed at any particular date.

"Emission-related maintenance" means that maintenance which does substantially affect emissions or which is likely to have a lasting effect on the deterioration of the vehicle or engine with respect to emissions, even if the maintenance is performed at some time other than that which is recommended.

4. A new § 86.083-4 is proposed to read:

§ 86.083-4 Section numbering; construction.

(a) (1) *Section numbering.* (1) The model year of initial applicability is indicated by the last two digits of the 5-digit group. A section remains in effect for subsequent model years until it is superseded. The number following the hyphen designates what previous section is replaced by a future regulation.

EXAMPLES: Section 86.077-6 applies to the 1977 and subsequent model years until superseded. If a § 86.080-6 is promulgated it would take effect with the 1980 model year; § 86.077-6 would not apply after the 1979 model year. Section 86.077-10 would be replaced by § 86.078-10 beginning with the 1978 model year.

(2) Where a section still in effect references a section that has been superseded, the reference shall be interpreted to mean the superseding section.

(b) *Construction.* Except where indicated, the language in this subpart applies to both vehicles and engines. In many instances language referring to engines is enclosed in parentheses and immediately follows the language discussing vehicles.

5. A new § 86.083-5 is proposed to read:

§ 86.083-5 General standards; increase in emissions; unsafe conditions.

(a) (See paragraph (a) of § 86.081-5.)

(b)(1) Any system installed on or incorporated in a new motor vehicle (or new motor vehicle engine) to enable such vehicle (or engine) to conform to standards imposed by this subpart:

(i) Shall not in its operation or function cause the emission into the ambient air or any noxious or toxic substance that would not be emitted in the operation of such vehicle (or engine) without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) In establishing the physically adjustable range of each adjustable parameter on a new motor vehicle (or new motor vehicle engine), the manufacturer shall insure that, taking into

consideration the production tolerances, safe vehicle driveability characteristics are available within that range, as required by § 202(a)(4) of the Clean Air Act.

(3) Every manufacturer of new motor vehicles (or new motor vehicle engines) subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles (or motor vehicle engines) in accordance with good engineering practice to ascertain that such test vehicles (or test engines) will meet the requirements of this section for the useful life of the vehicle (or engine).

6. A new § 86.083-10 is proposed to read:

§ 86.083-10 Emission standards for 1983 gasoline-fueled heavy-duty engines.

(a)(1) Exhaust emissions from new 1983 model year gasoline-fueled heavy-duty engines shall not exceed:

(i) *Hydrocarbons.* (A) A level determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines, measured under transient operating conditions.

(B) A level expressed in parts per million (as carbon) of exhaust flow at curb idle and determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines.

(ii) *Carbon monoxide.* (A) A level determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines, measured under transient operating conditions.

(B) A level expressed in percentage of exhaust gas flow at curb idle and determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines.

(iii) *Oxides of nitrogen.* A level determined by the Administrator that requires the same relative degree of control as required by § 86.079-10 for 1979 model year gasoline-fueled heavy-duty engines.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over operating schedules set forth in Subparts N or P and measured and calculated in accordance with those procedures.

(b) [Reserved]

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1983 model year gasoline-fueled heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section

shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subparts N or P of this part to ascertain that such test engines meet the requirements of paragraph (a) and (c) of this section.

7. A new § 86.083-11 is proposed to read:

§ 86.083-11 Emission standards for 1983 diesel heavy-duty engines.

(a)(1) Exhaust emissions from new 1983 model year diesel heavy-duty engines shall not exceed:

(i) *Hydrocarbons.* (A) A level determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines, measured under transient operating conditions.

(B) A level expressed in parts per million (as carbon) of exhaust gas flow at curb idle and determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines, measured under transient operating conditions.

(ii) *Carbon monoxide.* (A) A level determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines, measured under transient operating conditions.

(B) A level expressed as a percentage of exhaust gas flow at curb idle and determined by the Administrator to be equal to 10% of a sales-weighted average of emissions from 1969 model year gasoline-fueled heavy-duty engines.

(iii) *Oxides of nitrogen.* A level determined by the Administrator that requires the same relative degree of control as required by § 86.079-11 for 1979 model year diesel heavy-duty engines.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust over operating schedules as set forth in Subparts N or P and measured and calculated in accordance with those procedures.

(b)(1) The opacity of smoke emissions from new 1983 and later model year diesel heavy-duty engines shall not exceed:

(i) 0 percent during the engine acceleration mode.

(ii) 15 percent during the engine lugging mode.

(iii) 50 percent during the peaks in either mode.

(2) The standards set forth in paragraph (b)(1) of this section refer to exhaust smoke emissions generated under the conditions set forth in Subpart I of this part and measured and calculated in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new 1983 model year diesel heavy-duty engine.

(d) Every manufacturer of new motor vehicle engines subject to the standards prescribed in this section shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicle engines in accordance with applicable procedures in Subparts I, N, or P of this part to ascertain that such test engines meet the requirements of paragraphs (a) (b) and (c) of this section.

8. A new § 86.083-21 is proposed to read:

§ 86.083-21 Application for certification.

(a) A separate application for a certificate of conformity shall be made for each set of standards and each class of new motor vehicles or new motor vehicle engines. Such application shall be made to the Administrator by the manufacturer and shall be updated and corrected by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1)(i) Identification and description of the vehicles (or engines) covered by the application and a description of their engine (vehicles only), emission control system and fuel system components. This shall include a detailed description of each auxiliary emission control device (AECD) to be installed in or on any certification test vehicle (or certification test engine).

(ii)(A) The manufacturer shall provide to the Administrator in the preliminary application for certification:

(1) A list of those parameters which are physically capable of being adjusted (including those adjustable parameters to which access is difficult) and that, if adjusted to settings other than the manufacturer's recommended setting, may affect emissions;

(2) A specification of the manufacturer's intended physically adjustable range of each such parameter, and the production tolerances of the limits or stops used to establish the physically adjustable range;

(3) A description of the limits or stops used to establish the manufacturer's intended physically adjustable range of each adjustable parameter, or any other means used to inhibit adjustment;

(4) The nominal or recommended setting, and the associated production tolerances, for each such parameter.

(B) The manufacturer may provide, in the preliminary application for certification, information relating to why certain parameters are not expected to be adjusted in actual use and to why the physical limits or stops used to es-

tablish the physically adjustable range of each parameter, or any other means used to inhibit adjustment, are expected to be effective in preventing adjustment of parameters on in-use vehicles to settings outside the manufacturer's intended physically adjustable ranges. This may include results of any tests to determine the difficulty of gaining access to an adjustment or exceeding a limit as intended or recommended by the manufacturer.

(C) The Administrator may require to be provided detailed drawings and descriptions of the various emission related components, and/or hardware samples of such components, for the purpose of making his determination of which vehicle or engine parameters will be subject to adjustment for certification and Selective Enforcement Audit (and Production Compliance Audit for heavy-duty engines) and of the physically adjustable range for each such vehicle or engine parameter.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles (or engines) for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4)(i) A description of the proposed mileage (or service) accumulation procedures for durability testing.

(ii) A description of the test procedures to be used to establish the evaporative emission deterioration factors required to be determined and supplied in § 86.083-23(b)(2).

(iii)(A) A description of the test procedures to be used to establish the preliminary exhaust emission deterioration factors for heavy-duty engines required to be determined and supplied in § 86.083-23(b)(3).

(B) A statement of the useful life of each heavy-duty engine as determined by the manufacturer. The useful life shall be expressed as a period of engine or vehicle operation or as an equivalent vehicle mileage (or both). The manufacturer shall include in the application the data or information on which it based its determination of the useful life.

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles (or engines) covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission-data and durability-data test fleet.

(c) Complete copies of the application and of any amendments thereto, and all notifications under §§ 86.079-32, 86.079-33, and 86.079-34 shall be

submitted in such multiple copies as the Administrator may require.

(d) Incomplete light-duty trucks shall have a maximum completed curb weight and maximum completed frontal area specified by the manufacturer.

9. A new § 86.083-22 is proposed to read:

§ 86.083-22 Approval of application for certification; test fleet selections; determinations of parameters subject to adjustment for certification and Selective Enforcement Audit and Production Compliance Audit, adequacy of limits, and physically adjustable ranges.

(a) through (c) (See paragraphs (a) through (c) of § 86.081-22).

(d)(1) The Administrator does not approve the test procedures for establishing the evaporative emission deterioration factors. The manufacturer shall submit the procedures as required in § 86.083-21(b)(4)(ii) prior to the Administrator's selection of the test fleet under § 86.083-24(b)(1) and if such procedures will involve testing of durability-data vehicles selected by the Administrator or elected by the manufacturer under § 86.083-24(c)(1), prior to initiation of such testing.

(2) The Administrator does not approve the test procedures for establishing preliminary exhaust emission deterioration factors for heavy-duty engines nor the manufacturer's determination of the useful life or lives of its heavy-duty engines. The manufacturer shall submit the procedures and useful life determinations as required in § 86.083-21(b)(4)(iii) prior to the initiation of durability testing.

(e) When the Administrator selects emission-data vehicles (engines) for the test fleet, he will at the same time determine those vehicle or engine parameters which will be subject to adjustment for certification, Selective Enforcement Audit and Production Compliance Audit testing, the adequacy of the limits, stops, seals, or other means used to inhibit adjustment, and the resulting physically adjustable ranges for each such parameter and notify the manufacturer of his determinations.

(1)(i) The Administrator may determine to be subject to adjustment the idle fuel-air mixture, idle speed, and initial spark timing parameters on gasoline-fueled vehicles (engines) (carbureted or fuel injected); the choke valve action parameter(s) on carbureted, gasoline-fueled vehicles (engines); or any parameter on any vehicle (engine) (diesel or gasoline-fueled) which is physically capable of being adjusted, may significantly affect emissions, and was not present on vehicles (engines) of the same engine family in the previous model year.

(ii) The Administrator may, in addition, determine to be subject to adjustment any other parameters on any vehicle or engine which is physically capable of being adjusted and which may affect emissions. However, the Administrator may do so only if he has previously notified the manufacturer that he might do so and has found, at the time he gave this notice, that the intervening period would be adequate to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period. In no event will this notification be given later than September 1 of the calendar year two years prior to the model year.

(iii) In determining the parameters subject to adjustment, the Administrator will consider the likelihood that, for each of the parameters listed in paragraphs (e)(1)(i) and (e)(1)(ii) of this section, settings other than the manufacturer's recommended setting will occur on in-use vehicles (engines). In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application, surveillance information from similar in-use vehicles (engines), the difficulty and cost of gaining access to an adjustment, damage to the vehicle (engine) if an attempt is made to gain such access and the need to replace parts following such attempt, and the effect of setting other than the manufacturer's recommended setting on vehicle (engine) performance characteristics including emission characteristics.

(2)(i) The Administrator shall determine a parameter to be adequately inaccessible or sealed if:

(A) In the case of an idle mixture screw, the screw is recessed within the carburetor casting and sealed with lead, thermosetting plastic, or an inverted elliptical spacer or sheared off after adjustment at the factory, and the inaccessibility is such that the screw cannot be accessed and/or adjusted with simple tools in one-half hour.

(B) In the case of a choke bimetal spring, the plate covering the bimetal spring is riveted or welded in place, or held in place with nonreversible screws.

(C) In the case of a parameter which may be adjusted by elongating or bending adjustable members (e.g., the choke vacuum break), the elongation of the adjustable member is limited by design or, in the case of a bendable member, the member is constructed of a material which when bent would return to its original shape after the force is removed (plastic or spring steel materials).

(D) In the case of any parameter, the manufacturer demonstrates that

adjusting the parameter to settings other than the manufacturer's recommended setting takes more than one-half hour or costs more than \$20 (1978 dollars).

(ii) The Administrator shall determine a physical limit or stop to be an adequate restraint on adjustability if:

(A) In the case of a threaded adjustment, the threads are terminated, pinned or crimped so as to prevent additional travel without breakage or need for costly repairs.

(B) The adjustment is ineffective at the end of the limits of travel regardless of additional forces or torques applied to the adjustment.

(C) The manufacturer demonstrates that travel or rotation limits cannot be exceeded with the use of simple and inexpensive tools (screwdriver, pliers, open-end or box wrenches, etc.) without incurring significant and costly damage to the vehicle (engine) or control system or without taking more than one-half hour or costing more than \$20 (1978 dollars).

(iii) If manufacturer service manuals or bulletins describe routine procedures for gaining access to a parameter or for removing or exceeding a physical limit, stop, seal or other means used to inhibit adjustment, or if surveillance data indicate that gaining access, removing, or exceeding is likely, paragraphs (e)(2)(i) and (e)(2)(ii) of this section shall not apply for that parameter.

(iv) In determining the adequacy of a physical limit, stop, seal, or other means used to inhibit adjustment of a parameter not covered by paragraph (e)(2)(i) or (e)(2)(ii) of this section, the Administrator will consider the likelihood that it will be circumvented, removed, or exceeded on in-use vehicles. In determining likelihood, the Administrator may consider such factors as, but not limited to, information contained in the preliminary application; surveillance information from similar in-use vehicles (engines); the difficulty and cost of circumventing, removing, or exceeding the limit, stop, seal, or other means; damage to the vehicle (engine) if an attempt is made to circumvent, remove, or exceed it and the need to replace parts following such attempt; and the effect of settings beyond the limit, stop, seal, or other means on vehicle (engine) performance characteristics other than emission characteristics.

(3) The Administrator shall determine two physically adjustable ranges for each parameter subject to adjustment:

(i)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator may include within the physically adjustable range applicable to testing under this subpart (certification testing) all set-

tings within the production tolerance associated with the nominal setting for that parameter, as specified by the manufacturer in the preliminary application for certification.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability. The Administrator may also include the production tolerances on the location of these limits or stops when determining the physically adjustable range.

(ii)(A) In the case of a parameter determined to be adequately inaccessible or sealed, the Administrator shall include within the physically adjustable range applicable to testing under Subpart G or K (Selective Enforcement Audit and Production Compliance Audit for heavy-duty engines) only the actual settings to which the parameter is adjusted during production.

(B) In the case of other parameters, the Administrator shall include within this range all settings within physical limits or stops determined to be adequate restraints on adjustability, as they are actually located on the test vehicle (engine).

(f) If the manufacturer submits the information specified in § 86.083-21(b)(1)(i) in advance of its full preliminary application for certification, the Administrator shall review the information and make the determinations required in paragraph (e) of this section.

(g) Within 30 days following receipt of notification of the Administrator's determinations made under paragraph (e) of this section, the manufacturer may request a hearing on the Administrator's determinations. The request shall be in writing, signed by an authorized representative of the manufacturer, and shall include a statement specifying the manufacturer's objections to the Administrator's determinations, and data in support of such objections. If, after review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 86.078-6 with respect to such issue.

10. A new § 86.083-23 is proposed to read:

§ 86.083-23 Required data.

(a) (See paragraph (a) of § 86.079-23).

(b)(1) Exhaust emission durability data on such vehicles (or engines) tested in accordance with applicable test procedures and in such numbers as specified, which will show the performance of the systems installed on, or incorporated in, the vehicle (or engine) for extended mileage, (or ex-

tended operation), as well as a record of all pertinent maintenance (all maintenance and servicing for diesel heavy-duty engines) performed on the test vehicles (or test engines).

(2) Evaporative emission deterioration factors for each evaporative emission family-evaporative emission control system combination and all test data that are derived from testing described under § 86.083-21(b)(4)(ii) designed and conducted in accordance with good engineering practice to assure that the vehicles covered by a certificate issued under § 86.079-30 will meet the evaporative emission standards in § 86.081-8 or 86.081-9, as appropriate, for the useful life of the vehicle.

(3) For each heavy-duty engine family-emission control system combination for which application for certification is made for the first time, preliminary emission deterioration factors and all test data that are derived from testing described under § 86.083-21(b)(4) (iii) designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.083-30 will meet the emission standards in § 86.083-10 or § 86.083-11, as appropriate, for the useful life of the engines. Preliminary deterioration factors shall also be submitted for each combination for which certification has been granted in the previous model year and for which the Administrator has waived the requirement for in-use service accumulation under the waiver provision of § 86.083-26(b)(7)(i).

(c) through (e)(1) (See paragraphs (c) through (e)(1) of § 86.079-23).

(2) For evaporative emission durability and heavy-duty engine exhaust emission durability, the statement of compliance with paragraph (b)(2) or (b)(3) of this section.

11. A new § 86.083-24 is proposed to read:

§ 86.083-24 Test vehicles and engines.

(a)(1) The vehicles or engines covered by an application for certification will be divided into groupings of engines which are expected to have similar emission characteristics throughout their useful life. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following aspects:

(i) the cylinder bore center-to-center dimensions.

(ii) the dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L-6, 90°, V-8, etc.).

(v) The location of the intake and exhaust valves (or ports) and the valve (or port) sizes (within a 1/8-inch range on the valve head diameter or within 10 percent on the port area).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(viii) Catalytic converter characteristics.

(ix) Thermal reactor characteristics.

(x) Type of air inlet cooler (e.g., intercoolers and after-coolers) for diesel heavy-duty engines.

(3)(i) Engines identical in all the respects listed in paragraph (a)(2) of this section may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(A) The bore and stroke.

(B) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center positions.

(C) The intake manifold induction port size and configuration.

(D) The exhaust manifold port size and configuration.

(E) The intake and exhaust valve sizes.

(F) The fuel system.

(G) The camshaft timing and ignition or injection timing characteristics.

(ii) Heavy-duty engines produced in different model years and distinguishable in the respects listed in paragraph (a)(2) of this section shall be treated as belonging to a single engine family if the Administrator requires it, after determining that the engines may be expected to have similar emission deterioration characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a) (2) and (3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics.

(5) The gasoline-fueled vehicles covered by an application for certification will be divided into groupings which are expected to have similar evaporative emission characteristics throughout their useful life. Each group of vehicles with similar evaporative emission characteristics shall be defined as a separate evaporative emission family.

(6) To be classed in the same evaporative emission family, vehicles must be similar with respect to:

(i) Type of vapor storage device (e.g., canister, air cleaner, crankcase).

(ii) Basic canister design.

(iii) Fuel system.

(7) Where vehicles are of a type which cannot be divided into evaporative emission families based on the criteria listed above, the Administrator will establish families for those vehicles based upon the features most related to their evaporative emission characteristics.

(b) Emission data:

(1) *Emission-data vehicles.* Paragraph (b)(1) of this section applies to light-duty vehicle and light-duty truck emission-data vehicles.

(b)(1)(i) through (b)(1)(vii). (See paragraphs (b)(1)(i) through (b)(1)(vii) of § 86.080-24).

(2) *Gasoline-fueled heavy-duty emission-data engines.* Paragraph (b)(2) of this section applies to gasoline-fueled heavy-duty engines.

(b)(2)(i) through (b)(2)(iv). (See paragraphs (b)(2)(i) through (b)(2)(iv) of § 86.080-24).

(3) *Diesel heavy-duty emission-data engines.* Paragraph (b)(3) of this section applies to diesel heavy-duty emission-data vehicles.

(i) Engines will be chosen to be run for emission data based upon engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(ii) Engines of each engine family will be divided into groups based upon their exhaust emission control systems. One engine of each engine system combination shall be run for smoke emission data and gaseous emission data. Either the complete gaseous emission test or the complete smoke test may be conducted first. Within each combination, the engine that features the highest fuel feed per stroke, primarily at the speed of maximum rated torque and secondarily at rated speed, will usually be selected. If there are military engines with higher fuel rates than other engines in the same engine system combinations, then one military engine shall also be selected. The engine with the highest fuel feed per stroke will usually be selected.

(iii) The Administrator may select a maximum of one additional engine within each engine-system combination based upon features indicating that it may have the highest emission levels of the engines of that combination. In selecting this engine, the Administrator will consider such features as the injection system fuel system, compression ratio, rated speed, rated horsepower, peak torque speed, and peak torque.

(c) Durability data:

(1) *Durability-data vehicles.* Paragraph (c)(1) of this section applies to light-duty vehicle and light-duty truck durability-data vehicles.

(i) A durability-data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of

the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, inertia weight class, and test weight.

(ii) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of paragraph (c)(1)(i) of this section. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(2) *Heavy-duty durability-data engines.* Paragraph (c)(2) of this section applies to engines, subsystems, or components used to establish preliminary deterioration factors for heavy-duty engines, and to heavy-duty durability-data engines.

(i) The manufacturer shall select the engines, subsystems, or components to be used to determine preliminary exhaust emission deterioration factors for each engine family-control system combination for the initial year(s) of certification of the combination.

(ii) For each engine family-control system combination for which a manufacturer applies for a certificate of conformity with the applicable emission standards of § 86.083-10 or § 86.083-11 for the first time, the manufacturer shall select at least three durability-data engines to represent the combination during the in-vehicle service accumulation required by § 86.083-26(b). At least one of these three engines shall be of the displacement with the largest projected sales volume of engines in the combination. The selected engines shall be randomly selected production engines. Emission tests of any kind shall not be used to select specific production engines to be durability-data engines. The manufacturer shall notify the Administrator of the engine configuration(s) of the durability-data engines to be selected under this paragraph no later than when it submits the compiled information required by § 86.083-23. The manufacturer shall select specific production engines to be durability-data engines not later than two months after the start of production of the configuration(s).

(d) through (e). (See paragraphs (d) through (e) of § 86.083-24).

(f) In lieu of testing an emission-data or durability-data vehicle (or engine) selected under paragraph (b) or (c) of this section, and submitting data therefore, a manufacturer may,

with the prior written approval of the Administrator, submit exhaust emission data and/or fuel evaporative emission data, as applicable on a similar vehicle (or engine) for which certification has previously been obtained or for which all applicable data required under § 86.083-23 has previously been submitted. For heavy-duty engine durability data required to be obtained from in-vehicle service accumulation, the Administrator will grant this approval only if each durability-data engine in an engine family-control system has completed service accumulation up to its useful life or up to the point at which it was no longer functional as required by § 86.083-26(b).

(g) (See paragraph (g) of § 86.080-24).

12. A new § 86.083-25 is proposed to read:

§ 86.083-25 Maintenance.

(a) through (b) (See paragraphs (a) through (b) of § 86.079-25).

(c) *Heavy-duty engines.* Paragraph (c) of this section applies to heavy-duty engines.

(1) All emission-related scheduled maintenance which is performed on durability-data engines must be technologically necessary and must have a reasonable likelihood of being performed in-use.

(i) The manufacturer must submit data to the Administrator which demonstrates that all of the emission-related maintenance which is to be performed on the durability-data engines is technologically necessary. EPA has determined that emissions-related maintenance in addition to, or at shorter intervals than, that outlined in paragraphs (c)(1)(ii) and (c)(1)(iii), is not technologically necessary. The Administrator may determine that even maintenance more restrictive (e.g., longer intervals) than that listed in paragraphs (c)(1)(ii) and (c)(1)(iii) is not technologically necessary.

(ii) For gasoline-fueled engines, emission-related maintenance in addition to, or at shorter intervals than, that listed below will not be accepted as technologically necessary, except as provided in paragraph (c)(1)(iv).

(A) The cleaning or replacement of spark plugs at 30,000 miles and at 30,000 mile intervals thereafter.

(B) The inspecting, cleaning, adjustment, or replacement of the following at 50,000 miles of use and at 50,000-mile intervals thereafter:

- (1) Positive crankcase ventilation and exhaust gas recirculation valves;
- (2) Emission-related hose and tubes;
- (3) Ignition wires;
- (4) Oxygen sensor;
- (5) Idle mixture.

(C) The replacement of the catalytic converter or inspecting and cleaning

of the injector tips at 100,000 miles of use and at 100,000-mile (or longer) intervals thereafter.

(iii) For diesel engines, emission-related maintenance in addition to, or at shorter intervals than, that listed below will not be accepted as technologically necessary, except as provided in paragraph (c)(1)(iv).

(A) The cleaning or replacement of the exhaust gas recirculation and positive crankcase ventilation valves at 50,000 miles of use and at 50,000-mile intervals thereafter.

(B) The cleaning of injector tips at 100,000 miles of use and at 100,000-mile intervals thereafter.

(C) The cleaning, rebuilding, or replacement of the following at 200,000 miles of use and at 200,000-mile intervals thereafter:

(1) Turbocharger;

(2) Injectors.

(iv) Requests for authorization of scheduled maintenance of emission control related components in addition to those items of maintenance covered under paragraphs (c)(1)(ii) and (c)(1)(iii) will be considered if the maintenance is a direct result of the implementation of new technology. New technology means any technology not found in production on any motor vehicle prior to the 1980 model year.

(v) Emission-related scheduled maintenance items which satisfy one of the following will be accepted as having a reasonable likelihood of being performed in-use.

(A) Data is presented to the Administrator which adequately demonstrates that vehicle performance will quickly deteriorate to a point unacceptable for typical driving if the maintenance item is not performed at the recommended interval.

(B) The manufacturer provides this maintenance free of charge.

(C) Survey data is submitted to the Administrator which adequately demonstrates that 90 percent of such engines (at an 80% confidence level) already have this maintenance item performed in-use at the recommended interval and throughout the useful life of the engine for which certification is being sought.

(D) For maintenance for which there is no in-use experience on heavy-duty engines, a clearly displayed visual signal alerts the vehicle driver that maintenance is due. This option is available only for a period sufficient to allow the manufacturer to collect the appropriate survey data to demonstrate that the signal is at least contributing to the adequate demonstration (paragraph (C) above) that the specific maintenance is actually being performed in-use. This survey data must be submitted at least once every 2 years. The signal must be continuous while the engine is in operation, but

may be overridden by the driver after each engine start-up. The signal, with the possible addition of a label, must also direct the driver to that place in the owner's manual where this maintenance item is recommended and also show the driver which maintenance item is due. The signal may be eliminated by the performance of the required maintenance.

(vi) Non-emission related engine maintenance which is reasonable and necessary (e.g., oil change, oil filter change, fuel filter change, air filter change, cooling system maintenance, accessory belt inspection, adjustment of idle speed, governor, engine bolt torque, valve lash, injector lash, timing, etc.) may be performed on durability-data engines at the intervals recommended by the manufacturer to the ultimate purchaser.

(vii) Unscheduled maintenance may be performed on durability-data engines, except as provided in paragraph (c)(1)(viii)(A) of this section, only under the following provisions:

(A) An injector or spark plug may be changed if a persistent misfire is detected.

(B) Readjustment of a gasoline-fueled engine cold-start enrichment system may be performed if there is a problem of stalling.

(C) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, if the idle speed exceeds the manufacturer's recommended idle speed by 300 rpm or more, or if there is a problem of stalling.

(viii) any other unscheduled engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability-data engines shall be performed only with the advance approval of the Administrator.

(A) Such approval will be given if the Administrator:

(1) Has made a preliminary determination that the part failure or system malfunction, or the repair of such failure or malfunction, does not render the engine unrepresentative of engines in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and,

(2) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfiring, engine stalling, overheating, fluid leakage, loss of oil pressure, excessive fuel consumption or excessive power loss.

(B) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (c)(1)(vii) of this section.

(ix) If the Administrator determines the part failure or system malfunction occurrence and/or repair rendered the engine unrepresentative of engines in use, the engine shall not continue to be used as a durability-data engine. The emission data from an engine that is discontinued as a durability-data engine shall not be included in the evaluation of the deterioration factor for the family-system combination if its calculated deterioration factor is less than the average deterioration factor for the remaining durability-data engines in the combination, unless the manufacturer's engineering analysis demonstrates, to the satisfaction of the Administrator, that the data is representative.

(2) [Reserved]

(3)(i) Scheduled maintenance on emission-data engines is limited to the adjustment of idle speed once before the 125-hour test point, provided the idle speed is outside the manufacturer's specifications.

(ii) Any other engine, emission control system, or fuel system, adjustment, repair, removal, disassembly, cleaning, servicing, or replacement shall be performed only with the advance approval of the Administrator.

(4) [Reserved]

(5)(i) Complete emission tests (see Subparts I, N, and P of this part) are required, unless waived by the Administrator, before and after catalytic converter or oxygen sensor servicing on any engine and before and after turbocharger and injector maintenance at 200,000 miles on diesel engines.

(ii) The Administrator may require emission tests before and after any unscheduled maintenance.

(iii) [Reserved]

(c)(5)(iv) through (c)(7). (See paragraphs (c)(5)(iv) through (c)(7) of § 86.079-25).

13. A new § 86.083-26 is proposed to read:

§ 86.083-26 Mileage and service accumulation; emission measurements.

(a) (See paragraph (a) of § 86.079-26).

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) There are three types of service accumulation applicable to heavy-duty engines:

(i) Service accumulation on engines, subsystems, or components selected by the manufacturer under § 86.083-24(c)(2)(i). The manufacturer determines the form and extent of this service accumulation, consistent with good engineering practice, and describes it in the application for certification.

(ii) Dynamometer service accumulation on emission-data engines selected under § 86.083-24(b)(2) or § 86.083-24(b)(3), and on durability-data en-

gines selected under § 86.083-24(c)(2)(ii). The manufacturer determines the engine operating schedule to be used for dynamometer service accumulation, consistent with good engineering practice. A single engine operating schedule shall be used for all engines in an engine family-control system combination. Operating schedules may be different for different combinations.

(iii) In-vehicle service accumulation on durability-data engines selected under § 86.083-24(c)(2)(ii). The manufacturer determines the host vehicles and vehicle service applications to be used in this service accumulation, subject to the requirements of paragraph (b) of this section and consistent with good engineering practice.

(3) Preliminary exhaust emission deterioration factors will be determined on the basis of the service accumulation described in paragraph (b)(2)(i) of this section and related testing, according to the manufacturer's procedures. These preliminary factors shall be used for the first model year for which a certificate of conformity with applicable standards of § 86.083-10 or § 86.083-11 is sought for the engine family-control system combination. They may be used for the second model year also if 30,000 miles of in-vehicle service has not been accumulated three months prior to the second model year.

(4)(i) Each emission-data engine and each durability-data engine selected for in-vehicle service accumulation shall be operated on a dynamometer for 125 hours plus or minus eight hours with all emission control systems installed and operating. An emission test shall be conducted at the end of this dynamometer service accumulation. The manufacturer may conduct up to three emission tests on durability-data engines, provided it stated it would do so in the application and provided all durability-data engines in an engine family-control system combination receive the same number of tests. A zero-hour emission test may be performed after the engine has been approved by the Administrator to begin service accumulation. Evaporative emission controls need not be connected provided normal operating conditions are maintained in the engine induction system. If a break-in procedure is used the procedure must be the same as recommended to the ultimate purchaser. The hours accumulated during the break-in procedure will not be counted as part of the service accumulation.

(ii) If the emission test conducted at the end of the 125 hours of dynamometer service accumulation on a durability-data engine, in combination with the appropriate preliminary deterioration factors, indicates that the engine

is projected to fail the emission standards at its useful life, the engine shall not be used as a durability-data engine. The manufacturer shall randomly select another production engine of the same configuration to replace the failed engine. The certificate of conformity is suspended with respect to the failed engine.

(5)(i) Within one month of the selection of each specific production engine to be used as a durability-data engine, the manufacturer shall have completed the dynamometer service accumulation and emission testing of the engine as required by paragraph (b)(4) of this section, shall have installed the engine in the host vehicle, and shall have put the host vehicle into service.

(ii) The physical characteristics of each host vehicle shall be representative of those vehicles commonly used in combination with engines of the same configuration as the durability-data engine.

(iii) The service application of the host vehicles shall be typical of commercial or consumer applications of vehicles commonly used in combination with engines of the same configuration as the durability-data engine. The manufacturer shall document before beginning in-vehicle service accumulation that the selected service application of the host vehicles will normally provide an annual mileage accumulation of at least 15,000 miles or 10 percent of the useful life mileage, whichever is greater, and at most 40,000 miles or 40 percent of the useful life mileage, whichever is greater.

(iv) At least 15,000 miles or 10 percent of the useful life mileage, whichever is greater, and at most 40,000 miles or 40 percent of the useful life mileage, whichever is greater, shall be accumulated on each durability-data engine representing the engine family-control system combination in each year. Service accumulated on a test track or on a public or private road when the only purpose is to accumulate service may not be credited toward the required amount of in-vehicle service accumulation.

(v) At least 30,000 miles shall be accumulated on at least one of the durability-data engines representing the engine family-control system combination in time to allow in-use deterioration factors to be calculated and used for the third model year for which the manufacturer applies for a certificate of conformity for the combination. This test data must be supplied not later than three months prior to the third model year.

(vi) Each durability-data engine shall be removed from the host vehicle, tested for emissions, and reinstalled in the host vehicle as follows. At least one complete emission test

(see Subpart N and P for gasoline-fueled engines and Subparts I, N, and P for diesel engines) shall be conducted at each point specified. The manufacturer may conduct up to three tests at each point, provided it stated it would do so in the application and provided all durability-data engines in an engine family-control system combination receive the same number of tests at all test points.

(A) Each engine shall be removed and tested between the 30,000 and 35,000 mileage points. After this test has been completed for at least one durability-data engine in an engine family-control system combination, the preliminary deterioration factors determined under paragraph (b)(3) of this section shall not be used in determining compliance by the combination with emission standards, for any model year for which a certificate of conformity has not yet been granted. Instead, in-use deterioration factors will be calculated based on all emission test results from all engines in the combination which have accumulated at least 30,000 miles of service, except those emission test results excluded from the calculation under § 86.083-25(c)(1)(ix) or under paragraph (b)(5)(vii) of this section.

(B) Each engine shall be removed and tested before and after those maintenance operations requiring such testing under § 86.083.25.

(C) The interval between successive removals and tests after the test between 30,000 and 35,000 miles shall not exceed twelve months. The interval between successive removal and tests may be less than four months only if such testing is required by this subpart or by the Administrator.

(D) After 30,000 miles, the manufacturer shall perform removals and tests on a schedule which provides at least one additional test point for each engine for use in determining updated in-use deterioration factors for each successive model year. This additional test data shall be provided not later than three months prior to the new model year. Any test data supplied after that time will apply to the following model year's deterioration factors.

(E) The manufacturer may perform one removal and test prior to 30,000 miles, in addition to any which this subpart or the Administrator requires the manufacturer to conduct before and after maintenance.

(F) Each engine shall be removed and tested upon completion of its in-vehicle service accumulation, if still functioning.

(vii) In-vehicle service accumulation for each engine shall continue until the engine has reached the end of its useful life as previously determined by the manufacturer. For any engine which stops functioning before reach-

ing the end of its useful life, the manufacturer must submit to the Administrator an engineering analysis of why the engine stopped functioning. Any emission data from an engine which stops functioning before reaching the end of its useful life shall not be included in the calculation of the deterioration factor for the family-system combination if its calculated deterioration factor is less than the average deterioration factor for the remaining durability-data engines in the combination, unless the manufacturer's engineering analysis demonstrates to the satisfaction of the Administrator that the data is representative. A credit of 4,000 miles is allowed when determining when the useful life point has been reached, to account for the 125 hours of dynamometer service accumulation.

(6)(i) Upon completion of in-vehicle service accumulation for all engines in an engine family-control system combination, the emission test results collected during service accumulation will be used in the calculation of the in-use deterioration factors in all model years for which certification has not yet been granted. However, the manufacturer may elect to replace the emission test results from the original durability-data fleet with results from an additional fleet.

(ii) At the request of the manufacturer, the Administrator shall select durability-data engine configurations for the additional fleet, equal in number to the original fleet. Once notified of the Administrator's selection, the manufacturer may select a specific production engine for each configuration from the current model year and begin to accumulate dynamometer and in-vehicle service on those engines. The manufacturer shall meet the requirements of this section in conducting this service accumulation.

(iii) The manufacturer is not required to wait until the original fleet completes service accumulation before beginning an additional fleet. Multiple additional fleets are allowed. No two fleets for a single combination may contain engines produced in a single model year.

(iv) Emission test results from the original fleet shall be used to calculate all official in-use deterioration factors until an additional fleet has completed service accumulation. Once an additional fleet has done so, emission test results from that additional fleet shall be used to calculate deterioration factors until another additional fleet of later model year engines has completed service accumulation.

(7) If the manufacturer states in its application for certification that an engine family-control system combination, for which it seeks a certificate of conformity with applicable standards

of § 86.083-10 or § 86.083-11 for the 1983 or 1984 model year will not be produced past the 1984 model year, the Administrator shall waive the requirement for in-vehicle service accumulation for that combination.

(8)(i) The Administrator may waive the requirement for in-vehicle service accumulation for a small volume manufacturer (one which meets the requirements of § 86.083-24(e)), for any engine family-control system combination which the Administrator determines may be expected to have exhaust emission deterioration characteristics similar to those of another combination (produced by any manufacturer) which is undergoing or has completed in-vehicle service accumulation. The Administrator will base the determination on the physical similarity of the two combinations and on the service applications to which engines belonging to the combinations are commonly put. If the Administrator does waive in-vehicle service accumulation, the in-use deterioration factors derived from the other combination which is undergoing or has completed in vehicle service accumulation will be applied to the combination for which the requirement is waived.

(ii) If a manufacturer for which the Administrator has previously waived in-vehicle service accumulation under paragraph (b)(8)(i) of this section ceases to be a small volume manufacturer, the Administrator may withdraw the waiver and require the manufacturer to begin in-vehicle service accumulation using production engines from the model year in which the manufacturer ceased to be a small volume manufacturer. In-use deterioration factors derived from the other combination (which has been undergoing or has completed in-vehicle service accumulation) shall continue to be used until one engine in the manufacturer's own fleet has reached the 30,000-mile point.

(9)(i) Data from all emission tests (including voided tests) shall be air posted to the Administrator within 72 hours (or delivered within 5 working days). The manufacturer shall furnish to the Administrator an explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. The Administrator may require emission tests at points in addition to those specified in this subpart. In addition, all test data shall be compiled and provided to the Administrator in accordance with § 86.083-23. Where the Administrator conducts a test on a durability-data engine at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(ii) The results of all emission tests shall be recorded and reported to the Administrator using two places to the right of the decimal point. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29-67.

(10) Whenever the manufacturer proposes to operate and test an engine which may be used for emission or durability data, it shall provide such information concerning components used on the engine as the Administrator may require and make the engine available for such testing under § 86.083-29 as the Administrator may require, before beginning to accumulate hours on the engine. Failure to comply with this requirement will invalidate all test data later submitted for this engine.

(11) Once the manufacturer begins to operate an emission-data or durability-data engine, as indicated by compliance with paragraph (b)(10) of this section, it shall continue to run any emission-data engine to 125 hours plus or minus eight hours and shall complete the in-vehicle service accumulation as required by this section. The manufacturer may not remove a durability-data engine from the durability fleet except as required or permitted by this section.

(12)(i) The Administrator may elect to test any test engine at any time during the service accumulation and testing procedure. In such cases the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing.

(ii) The test procedures (Subparts N and P of this part for gasoline-fueled engines, and Subpart I, N, and P of this part for diesel engines) will be followed by the Administrator. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(iii) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(13) Emission testing of any type with respect to any certification engine other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

14. A new § 86.083-27 is proposed to read:

§ 86.083-27 Special test procedures.

(a) (See paragraph (a) of § 86.079-27).

(b) For heavy-duty engines:

(1) The Administrator may, on the basis of a written application by a manufacturer, prescribe test procedures, other than those set forth in this subpart, for any motor-vehicle engine, which he determines is not susceptible to satisfactory testing by the procedures set forth herein or in Subparts N, I, and P of this part.

(2) If the manufacturer does not submit a written application for use of special test procedures but the Administrator determines that a motor-vehicle engine is not susceptible to satisfactory testing by the procedures set forth herein, the Administrator will reject the applicable portions of the application. The Administrator shall notify the manufacturer in writing and set forth the reasons for such rejection in accordance with the provisions of § 86.083-22(c).

15. A new § 86.083-28 is proposed to read:

§ 86.083-28 Compliance with emission standards.

(a) (See paragraph (a) of § 86.079-28).

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The exhaust emission standards for gasoline-fueled engines in § 86.083-10 or for diesel engines in § 86.083-11 apply to the emissions of engines for their useful life.

(3) Since emission control efficiency generally decreases with the accumulation of service on the engine, deterioration factors will be used in combination with emission-data engine test results as the basis for determining compliance with the standards.

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new engine with emission standards, based on preliminary deterioration factors supplied by the manufacturer. The procedure described here shall be used for the first model year for which the manufacturer applies for a certificate of conformity with the standards of § 86.083-10 or § 86.083-11 for an engine family-control system combination. The procedure also shall be used for the following model year if no durability-data engine in the combination has accumulated at least 30,000 miles of in-vehicle service three months prior to the new model year, or if the Administrator has waived the requirement for in-vehicle service accumulation under the waiver provision of § 86.083-26(b)(7).

(ii) Separate preliminary exhaust emission deterioration factors, determined from tests of engines, subsystems, or components conducted by the

manufacturer, shall be supplied for each engine-system combination. Separate factors shall be established for transient HC, CO, and NOx and for idle HC and CO. For diesel engines, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and the peak opacity (designated as "C").

(iii)(A) For transient HC, CO, and NOx and for idle HC, and CO, the official exhaust emission results for each emission-data engine at the 125-hour test point shall be adjusted by multiplication by the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than one, it shall be one for the purposes of this paragraph.

(B) For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the 125-hour test point shall be adjusted by the addition of the appropriate deterioration factor. However, if the deterioration factor supplied by the manufacturer is less than zero, it shall be zero for the purposes of this paragraph.

(iv) The emission values to compare with the standards shall be the adjusted emission values of paragraph (b)(4)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each emission-data engine.

(5)(i) Paragraph (b)(5) of this section describes the procedure for determining compliance of a new engine with emission standards, based on partial or full results of in-vehicle service accumulation. The procedure described here shall be used for any engine family-control system combination which has been certified in a previous model year and for which at least one engine in the durability-data fleet has accumulated 30,000 miles of in-vehicle service three months prior to the new model year.

(ii) Separate emission deterioration factors shall be determined from the emission results collected to date from the durability-data engines in each engine-system combination. Separate factors shall be established for transient HC, CO and NOx and for idle HC and CO. For diesel engines, separate factors shall also be established for the acceleration mode (designated as "A"), the lugging mode (designated as "B"), and the peak opacity (designated as "C").

(A) The applicable results to be used in determining the deterioration factors for each combination shall be:

(1) The results of the emission tests conducted on durability-data engines after completion of 125 hours of dynamometer service accumulation. The mileage point for these results shall be

taken to be 4,000 miles for the purpose of this section.

(2) The results of all emission tests conducted on durability-data engines during in-vehicle service accumulation, as required or permitted by § 86.083-26(b)(5)(vi), except those excluded under §§ 86.083-25(c)(1)(ix) or 86.083-26(b)(5)(vii). The mileage points for these results shall be adjusted by the addition of 4,000 miles for the purpose of this section.

(B) All applicable emission results for (1) transient HC, (2) transient CO, (3) transient NOx, (4) idle HC, (5) idle CO, (6) acceleration smoke ("A"), (7) lugging smoke ("B"), and (8) peak smoke ("C"), shall be plotted as a function of miles of in-vehicle service. Separate plots shall be made for each durability-data engine which has been tested in the 30,000 to 35,000 mileage interval. Emission results from engines which have not yet been tested in this interval shall not be used in the calculation of the deterioration factors. The best fit straight lines, fitted by the method of least squares, shall be drawn through these data points.

(C) Deterioration factors for each engine contributing emission results to the calculation, for transient HC, CO, and NOx and for idle HC and CO, shall be calculated by whichever of the following two methods results in the larger factor:

(1) Divide exhaust emissions extrapolated using the best fit straight line (or interpolated if in-vehicle service accumulation is complete) to the useful life point of each engine by the exhaust emissions interpolated to the 4,000-mile point. A factor less than one shall be set equal to one.

(2) Divide the largest emission test result (or the largest average of results at a single test point if the manufacturer conducted multiple tests at each point) for each engine by the result of the test (or the average of the tests) of the engine after 125 hours of dynamometer service accumulation. A factor less than one shall be set equal to one.

(D) The single deterioration factor for each engine family-control system combination, for each of transient HC, CO, and NOx and idle HC and CO, shall be the arithmetic mean of the corresponding factors for each engine as determined in paragraph (b)(5)(ii)(C) of this section.

(E) Deterioration factors for each engine contributing emission results to the calculation, for acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), shall be calculated by whichever of the following two methods results in the larger factor:

(1) Subtract exhaust emissions interpolated to the 4,000-mile point from exhaust emissions extrapolated (or interpolated if in-vehicle service accu-

mulation is complete) to the useful life point of each engine. A negative factor shall be set equal to zero.

(2) Subtract the result of the test (or the average of the results of the tests if the manufacturer conducted more than one test) of each engine after 125 hours of dynamometer service accumulation from the largest emission test result (or the largest average of the results at a single test point) for the engine. A negative factor shall be set equal to zero.

(F) The single deterioration factor for each engine family-control system combination, for each of acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), shall be the arithmetic mean of the corresponding factors for each engine as determined in paragraph (b)(5)(ii)(E) of this section.

(iii)(A) For transient HC, CO, and NOx and for idle HC and CO, the official exhaust emission results for each emission-data engine at the 125-hour test point shall be adjusted by multiplication by the appropriate deterioration factor.

(B) For acceleration smoke ("A"), lugging smoke ("B"), and peak smoke ("C"), the official exhaust emission results for each emission-data engine at the 125-hour test point shall be adjusted by the addition of the appropriate deterioration factor.

(iv) The emission values to compare with the standards shall be the adjusted emission values of paragraph (b)(5)(iii) of this section rounded to two significant figures in accordance with ASTM E 29-67 for each emission-data engine.

(6) [Reserved]

(7) Every test engine of an engine family must comply with all applicable standards, as determined in paragraph (b)(4)(iv) or (b)(5)(iv) of this section, before any engine in that family will be certified.

16. A new § 86.083-29 is proposed to read:

§ 86.083-29 Testing by the Administrator.

(a) (See paragraph (a) of § 86.081-29).

(b)(1) Paragraph (b) of this section applies to heavy-duty engines.

(2) The Administrator may require that any one or more of the test engines be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(3)(i) Whenever the Administrator conducts a test on a test engine the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the engine at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(ii) Whenever the Administrator does not conduct a test on a test engine at a test point, the manufacturer's test data will be accepted as the official data for that test point. *Provided*, that if the Administrator makes a determination based on testing under paragraph (b)(2) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer. *And further provided*, that if the Administrator has reasonable basis to believe that any test data submitted by the manufacturer is not accurate or has been obtained in violation of any provision of this part, the Administrator may refuse to accept that data as the official data pending retesting or submission of further information.

(iii)(A)(1) The Administrator may adjust or cause to be adjusted any adjustable parameter of an emission-data engine which the Administrator has determined to be subject to adjustment for certification testing in accordance with § 86.083-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.083-22(e)(3)(i), prior to the performance of any tests to determine whether such engine conforms to applicable emission standards, including tests performed by the manufacturer under § 86.083-23(c)(1). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider

factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(2) For those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.083-22(e)(1), the emission-data engine presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the engine label (see § 86.083-35(a)(2)(ii)) as specified in the application for certification. If the Administrator determines that an engine is not within such tolerances, the engine shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the engine shall be used as an emission-data engine.

(B) If the Administrator determines that the test data developed under paragraph (b)(3)(ii)(A) of this section would cause the emission-data engine to fail due to excessive 125-hour emission values or by the application of the appropriate deterioration factor, then the following procedure shall be observed.

(1) The manufacturer may request a retest. Before the retest, those engine parameters which the Administrator has not determined to be subject to adjustment for certification testing in accordance with § 86.083-22(e)(1) may be readjusted to the manufacturer's specifications, if these adjustments were made incorrectly prior to the first test. The Administrator may adjust or cause to be adjusted any parameter which the Administrator has determined to be subject to adjustment in accordance with § 86.083-22(e)(3)(i). However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to a setting which causes a higher engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter on the engine before it accumulated any dynamometer service, all other parameters being identically adjusted for the purpose of the comparison. Other maintenance or repairs may be performed in accordance with 86.083-25. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(2) The engine will be retested by the Administrator and the results of this test shall comprise the official data for the emission-data engine.

(iv) If sufficient durability data are not available at the time of any emission test conducted under paragraph (b)(2) of this section to enable the Administrator to determine whether an emission-data engine would fail, the manufacturer may request a retest in accordance with the provision of paragraph (b)(3)(iii)(B) (1) and (2) of this section. If the manufacturer does not promptly make such a request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the engine from the test premises.

17. A new § 86.083-30 is proposed to read:

§ 86.083-30 Certification.

(a)(1) (See paragraph (a)(1) of § 86.079-30).

(2) Such certificate will be issued for such period not to exceed one model year as the Administrator may determine and upon such terms as he may deem necessary or appropriate to assure that any new motor vehicle (or new motor vehicle engine) covered by the certificate will meet the requirements of the Act and of this part. Each such certificate shall contain the following language:

This certificate covers only those new motor vehicles (or new motor vehicle engines) which conform, in all material respects, to design specifications that applied to those vehicles (or engines) described in the application for certification and which are produced during the model — year production period of the said manufacturer, as defined in 40 CFR § 86.079-2.

It is a term of this certificate that the manufacturer shall consent to all inspection described by 40 CFR §§ 86.078-7(c), 86.006, and 86.1006 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate as specified in 40 CFR § 86.083-30 (c), (d), or (e). It is also a term of this certificate that this certificate may be revoked or suspended for the other reasons stated in § 86.079-30 (c), (d), or (e).

(a)(3) through (b)(1)(i). (See paragraphs (a)(3) through (b)(1)(i) of § 86.079-30).

(ii) *Heavy-Duty Engines.* (A) A gasoline-fueled emission-data test engine selected under § 86.083-24(b)(2) (ii) and (iv) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(B) A gasoline-fueled emission-data test engine selected under § 86.083-24(b)(2)(iii) shall represent all engines in the same engine family of the same engine displacement-exhaust emission control system combination.

(C) A diesel emission-data test engine selected under § 86.083-24(b)(3)(ii) shall represent all engines in the same engine-system combination.

(D) A diesel emission-data test engine selected under § 86.083-24(b)(3) (iii) shall represent all engines of that emission control system at the rated fuel delivery of the test engine.

(E) The durability-data test engines selected under § 86.083-24(c)(2)(ii) shall together represent all engines of the same engine-system combination.

(b)(2) through (c)(1)(iv). (See paragraphs (b)(2) through (c)(1)(iv) of § 86.079-30).

(v) The manufacturer fails to select heavy-duty durability-data engines of the appropriate engine family-control system combination within two months of the start of production of the appropriate configurations, as required by § 86.083-24(c)(2)(ii), or the manufacturer fails to install the durability-data engines into host vehicles and place the host vehicles into service within one month of selecting the engines, as required by § 86.083-26(b)(5)(i).

(c)(2) through (c)(6). (See paragraphs (c)(2) through (c)(6) of § 86.079-30).

(d) *For light-duty vehicles and light-duty trucks.*

(d)(1) through (d)(6). (See paragraphs (d)(1) through (d)(6) of § 86.079-30).

(e) *For heavy-duty vehicles and engines.*

(1) Notwithstanding the fact that any engine configuration or engine family may be covered by a valid outstanding certificate of conformity, the Administrator may suspend such outstanding certificate of conformity in whole or in part with respect to such engine configuration or engine family if:

(i) The manufacturer refuses to comply with the provisions of a test order issued by the Administrator pursuant to § 86.1003; or

(ii) The manufacturer refuses to comply with any of the requirements of § 86.1003; or

(iii) The manufacturer submits false or incomplete information in any report or information provided pursuant to the requirements of § 86.1009; or

(iv) The manufacturer renders inaccurate any test data submitted pursuant to § 86.1009; or

(v) Any EPA Enforcement Officer is denied the opportunity to conduct activities related to entry and access as authorized in § 86.1006 of this part and in a warrant or court order presented to the manufacturer or the party in charge of a facility in question; or

(vi) EPA Enforcement Officers are unable to conduct activities related to entry and access as authorized in § 86.1006 of this part because a manufacturer has located a facility in a foreign jurisdiction where local law prohibits those activities; or

(vii) The manufacturer refuses to or in fact does not comply with the requirements of §§ 86.1004(a), 86.1005, 86.1007, 86.1008, 86.1010, 86.1011, or 86.1013.

(2) The sanction of suspending a certificate may not be imposed for the reasons in paragraphs (e)(1) (i), (ii), or (vii) of this section where such refusal or denial is caused by conditions and circumstances outside the control of the manufacturer which renders it impossible to comply with those requirements. Such conditions and circumstances shall include, but are not limited to, any uncontrollable factors which result in the temporary unavailability of equipment and personnel needed to conduct the required tests, such as equipment breakdown or failure or illness of personnel, but shall not include failure of the manufacturers to adequately plan for and provide the equipment and personnel needed to conduct the tests. The manufacturer will bear the burden of establishing the presence of the conditions and circumstances required by this paragraph.

(3) The sanction of suspending a certificate may be imposed for the reasons outlined in paragraph (e)(1) (iii), (iv), or (v) of this section only when the infraction is substantial.

(4) In any case in which a manufacturer knowingly submitted false or inaccurate information or knowingly rendered inaccurate any test data or committed any other fraudulent acts, and such acts contributed substantially to the Administrator's original decision not to suspend or revoke a certificate of conformity in whole or in part, the Administrator may deem such certificate void from the date of such fraudulent act.

(5) In any case in which certification of a heavy-duty engine is proposed to be suspended under paragraph (e)(1)(v) of this section and in which the Administrator has presented to the manufacturer involved reasonable evidence that a violation of § 86.1006 in fact occurred, if the manufacturer wishes to contend that, although the violation occurred, the engine configuration or engine family in question was not involved in the violation to a degree that would warrant suspension of certification under paragraph (e)(1)(v) of this section, he shall have the burden of establishing that contention to the satisfaction of the Administrator.

(6) Any suspension of certification under paragraph (e)(1) of this section shall:

(i) Be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014 and

(ii) Not apply to vehicles or engines no longer in the hands of the manufacturer.

(7) Any voiding of a certificate of conformity under paragraph (e)(4) of this section shall be made only after the manufacturer concerned has been offered an opportunity for a hearing conducted in accordance with § 86.1014.

18. A new § 86.083-35 is proposed to read:

§ 86.083-35 Labeling.

(a) through (a)(2)(ii) (See paragraphs (a) through (a)(2)(ii) of § 86.079-35).

(iii) The label shall contain the following information lettered in the English language in block letters and numerals which shall be of a color that contrasts with the background of the label:

(A) The label heading: IMPORTANT ENGINE INFORMATION;

(a)(2)(iii)(B) through (a)(2)(iii)(G) (see paragraphs (a)(2)(iii)(B) through (a)(2)(iii)(G) of § 86.079-35).

(H) The prominent statement: "(Manufacturer's corporate name) has determined that this engine has an average useful life before retirement or rebuild of — miles or — hours of operation, whichever occurs first. This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines, for this period." The manufacturer may alter this statement only to express the useful life in terms other than miles or hours (e.g., years, or hours only).

(a)(2)(iv) through (d) (See paragraphs (a)(2)(iv) through (d) of § 86.079-35).

(e) Incomplete heavy-duty vehicles having an 8,500-pound gross vehicle weight rating or less shall have the following prominent statement printed on the label required in paragraph (a)(2) of this section in lieu of the statement required by paragraph (a)(2)(iii)(H) of this section: "(Manufacturer's corporate name) has determined that this engine has an average useful life before retirement or rebuild of — miles or — hours of operation, whichever occurs first. This engine conforms to U.S. EPA regulations applicable to 19— Model Year New Heavy-Duty Engines when installed in a vehicle completed at a curb weight of more than 6,000 pounds or with a frontal area greater than 46 square feet, for this period."

(f) (See paragraph (f) of § 86.079-35).

19. A New § 86.083-38 is proposed to read:

§ 86.083-38 Maintenance instructions.

(a) through (d) (See paragraphs (a) through (d) of § 86.079-38.)

(e) For heavy-duty engines.

(1) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 86.083-25(c), and shall explain the conditions under which maintenance to emission-related components for which visual signals are employed is to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance). Scheduled maintenance in addition to that performed on the durability-data engine under § 86.083-25(c) may be recommended for reasons such as to offset the effects of operating conditions which differ from the conditions experienced by the durability-data engines or to increase the life of the engine beyond the useful life as determined by the manufacturer. The instructions may schedule maintenance on a calendar time basis, mileage basis, engine service time basis, or combinations of each.

(2) Such instructions shall specify the useful life of the engine as determined by the manufacturer. This useful life shall be expressed as a period of engine or vehicle operation or as an equivalent vehicle mileage (or both). The manufacturer shall also include in the instructions an explanation of the method(s) used to determine the useful life of the engine. The explanation shall be in clear, nontechnical language that is understandable to the ultimate purchaser.

20. A new § 86.085-23 is proposed to read:

§ 86.085-23 Required data.

(a) through (b)(2) (See paragraphs (a) through (b)(2) of § 86.083-23).

(3) For each heavy-duty engine family-emission control system combination for which application for certification is made for the first time, preliminary emission deterioration factors and all test data that are derived from testing described under § 86.083-21(b)(4)(iii), designed and conducted in accordance with good engineering practice to assure that the engines covered by a certificate issued under § 86.083-30, will meet the emission standards in effect for those engines, for the useful life of the engines.

(c) through (e) (See paragraphs (c) through (e) of § 86.083-23).

21. A new § 86.085-26 is proposed to read:

§ 86.085-26 Mileage and service accumulation; emission measurements.

(a) through (b)(6) (See paragraphs (a) through (b)(6) of § 86.083-26).

(7) [Reserved]

(b)(8) through (b)(13) (See paragraphs (b)(8) through (b)(13) of § 86.083-26).

22. A new § 86.085-28 is proposed to read:

§ 86.085-28 Compliance with emission standards.

(a) through (b)(3) (See paragraphs (a) through (b)(3) of § 86.083-28).

(4)(i) Paragraph (b)(4) of this section describes the procedure for determining compliance of a new engine with emission standards, based on preliminary deterioration factors supplied by the manufacturer. The procedure described here shall be used for the first model year for which the manufacturer applies for a certificate of conformity with the standards in effect for an engine family-control system combination. The procedure also shall be used for the following model year if no durability-data engine in the combination has accumulated at least 30,000 miles of in-vehicle service by the time the determination of compliance is made.

(b)(4)(ii) through (b)(8) (See paragraphs (b)(4)(ii) through (b)(8) of § 86.083-28).

23. A new Subpart K is proposed to be added to Part 86 and reads as follows:

Subpart K—Selective Enforcement Auditing and Production Compliance Auditing of New Gasoline-Fueled and Diesel Heavy-Duty Engines

Sec.

86.1001-83—Applicability.

86.1002-83—Definitions.

86.1003-83—Test orders.

86.1004-83—Testing by the Administrator.

86.1005-83—Maintenance of records; submission of information.

86.1006-83—Entry and access.

86.1007-83—Sample selection.

86.1008-83—Test procedures.

86.1009-83—Calculation and reporting of test results.

86.1010-83—Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits.

86.1011-83—Production Compliance Auditing.

86.1012-83—Suspension and revocation of certificates of conformity.

86.1013-83—Noncompliance penalties.

86.1014-83—Hearings on suspension, revocation and voiding of certificates of conformity.

Subpart K—Selective Enforcement Auditing and Production Compliance Auditing of New Gasoline-Fueled and Diesel Heavy Duty Engines

§ 86.1001-83 Applicability.

The provisions of this subpart are applicable for 1983 and later model year gasoline-fueled and diesel heavy-duty engines.

§ 86.1002-83 Definitions.

(a) The definitions in this section apply to this subpart.

(b) As used in this subpart, all terms not defined herein shall have the meaning given them in the Act.

"Acceptable Quality Level" (AQL) means the maximum percentage of failing engines that, for purposes of sampling inspection, can be considered satisfactory as a process average.

"Compliance level" means the emissions level at the 90th percentile point for a population of heavy-duty vehicles or engines subject to Production Compliance Audit testing pursuant to this subpart. A compliance level can be determined for each pollutant for which an upper limit has been established.

"Configuration" means a subclassification, if any, of an engine family for which a separate projected sales figure is listed in the manufacturer's Application for Certification and which can be described on the basis of emission control system, governed speed, injector size, engine calibration, and other parameters which may be designated by the Administrator.

"In the Hands of the Manufacturer" means that engines are still in the possession of the manufacturer and have not had their bills of lading transferred to another person for the purpose of transporting.

"Upper limit" means the emission level for a specific heavy-duty engine pollutant beyond which certification for that engine can not be granted or for which the certificate of conformity can be suspended. The upper limits will be established by amendments to this part.

§ 86.1003-83 Test orders.

(a) The Administrator will require any testing under this subpart by means of a test order addressed to the manufacturer.

(b) The test order will be signed by the Assistant Administrator for Enforcement or his designee. The test order will be delivered in person by an EPA Enforcement Officer to a company representative or sent by registered mail, return receipt requested, to the manufacturer's representative who signs the Application for Certification submitted by the manufacturer pursuant to the requirements of the applicable sections of Subpart A of this part. Upon receipt of a test order, the manufacturer shall comply with all of the provisions of this subpart and instructions in the test order.

(c) The test order will specify the engine configuration selected for testing, the manufacturer's vehicle or engine assembly plant or associated storage facility from which the engines must be selected, the time and location at which engines must be selected, and the procedure by which engines of the specified configuration must be selected. The test order may include alternative configurations to be selected for testing in the event that engines of the first specified con-

figuration are not available for testing because such engines are not being manufactured at the specified assembly plant, not being manufactured during the specified time, or not being stored at the specified assembly plant or associated storage facility. In addition, the test order may include other directions or information essential to the administration of the required testing.

(d) A manufacturer may indicate preferred assembly plants or associated storage facilities for the various engine families produced by the manufacturer for selection of engines in response to a test order. This shall be accomplished by submitting a list of engine families and the corresponding assembly plants or associated storage facilities from which the manufacturer desires to have engines selected for testing. In order that a manufacturer's preferred location be considered for inclusion in a test order for a configuration of a particular engine family, the list must be submitted prior to issuance of the test order. Notwithstanding the fact that a manufacturer has submitted the above list, the Administrator may order testing at other than a preferred plant.

(e) Upon receipt of a test order, a manufacturer shall proceed in accordance with the provisions of this subpart.

(f)(1) During a given model year, the Administrator will not issue to a manufacturer more Selective Enforcement Auditing (SEA) test orders than an annual limit determined by the following:

(i) For heavy-duty gasoline engine manufacturers, the number determined by dividing the projected sales for that year, as made by the manufacturer in its Application for Certification, by 30,000 and rounding to the nearest whole number, unless the projected sales are less than 15,000, in which case the number is one;

(ii) For heavy-duty diesel engine manufacturers, the number determined by dividing the projected sales for that year, as made by the manufacturer in its Application for Certification, by 10,000 and rounding to the nearest whole number, unless the projected sales are less than 5,000, in which case the number is one; or

(iii) For manufacturers producing both gasoline and diesel heavy-duty engines, the numbers determined by applying paragraphs (f)(1)(i) and (f)(1)(ii) of this section apply individually for gasoline and diesel engines.

(2) Any SEA test order for which the configuration fails in accordance with § 86.1010-83 or for which testing is not completed will not be counted against the annual limit.

(3) SEA test orders issued on the basis of any evidence which indicates

noncompliance of a configuration with the AQL will not count toward the annual limit. An SEA test order issued on this basis will include a statement as to the reason for its issuance.

§ 86.1004-83 Testing by the Administrator.

(a) The Administrator may require by test order that engines of a specified configuration be selected in a manner designated by him and submitted to him at such place as he may designate for the purpose of conducting emission tests. Such tests shall be conducted in accordance with § 86.1008-83 of these regulations to determine whether engines manufactured by the manufacturer conform with the regulations with respect to which the certificate of conformity was issued.

(b)(1) Whenever the Administrator conducts a test on a test engine or the Administrator and manufacturer each conduct a test on the same test engine, the results of the Administrator's test shall comprise the official data for that engine.

(2) Whenever the manufacturer conducts all tests on a test engine, the manufacturer's test data will be accepted as the official data: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a) of this section there is a substantial lack of agreement between the manufacturer's test results and the Administrator's test results, no manufacturer's test data from the manufacturer's test facility will be accepted for purposes of this subpart.

(c) In the event that testing conducted under paragraph (a) of this section demonstrates a lack of agreement under paragraph (b)(2) of this section, the Administrator will:

(1) Notify the manufacturer in writing of his determination that the test facility is inappropriate for conducting the tests required by the subpart and the reasons therefor, and

(2) Reinstate any manufacturer's data upon a showing by the manufacturer that the data acquired under paragraph (a) of this section was erroneous and the manufacturer's data was correct.

(d) The manufacturer may request in writing that the Administrator reconsider his determination in paragraph (b)(2) of this section based on data or information which indicates that changes have been made to the test facility and such changes have resolved the reasons for disqualification.

§ 86.1005-83 Maintenance of records; submittal of information.

(a) The manufacturer of any new heavy-duty engine subject to any of the provisions of this subpart shall establish, maintain, and retain the fol-

lowing adequately organized and indexed records:

(1) *General records.*

(i) A description of all procedures used to test engines pursuant to a test order issued under this subpart.

(ii) Test equipment; pre-test data; test data. Reference Subparts N and P for requirements for equipment and test data recording.

(2) *Individual records.*

(i)(A) Identification and description of all engines tested pursuant to a test order issued under this subpart.

(B) A description of all emission control systems installed on or incorporated in each test engine.

(ii) A properly filed application for certification, following the format prescribed by the EPA for the appropriate model year, fulfills both requirements of paragraph (a)(2)(i) of this section.

(iii) A complete record of all emission tests performed pursuant to this subpart (except tests performed by EPA directly), including the following chart records or exact copies thereof:

(A) The zero, span, and exhaust gas traces associated with each analyzer.

(B) The temperature trace of the heated sample line to the hydrocarbon detector (diesel only).

(C) In the case of diesel engine smoke emission testing, the engine load and RPM traces and a trace for the throttle position shall be identified, as well as any other applicable data.

(D) The smoke opacity trace for diesel engine smoke emission testing.

(iv) Individual worksheets and/or other documentation relating to each such test, or exact copies thereof.

(v) The date, time, and location of each test; the number of hours of service accumulated on each engine when the test began and ended; and the names of all personnel, including supervisory personnel, involved in the conduct of the test.

(vi) A record and description of any repairs performed prior to and/or subsequent to approval by the Administrator, giving the date and time of the repair, the reason for it, the person authorizing it, and names of all personnel involved in the supervising and performance of the repair.

(vii) The date when the engine was shipped from the assembly plant or associated storage facility and when it was received by the test facility.

(viii) A brief description of any significant events, commencing with the test engine selection process, but not described by any entry under one of the previous headings, including such extraordinary events as engine damage during shipment.

(b) All records required to be maintained under this subpart shall be retained by the manufacturer for a

period of one (1) year after completion of all testing in response to a test order. Records may be retained as hard copy or reduced to microfilm, punch cards, etc., depending upon the manufacturer's record retention procedure. *Provided*, That in every case all the information contained in the hard copy shall be retained.

(c) Heavy-duty engine manufacturers shall submit to the Administrator on a quarterly basis no later than thirty days after the close of each calendar quarter or other reporting schedule as approved by the Administrator all emission data, whether or not from FTP testing, from testing of production engines. The following information shall be provided with respect to such engines:

(1) Description of quality audit or other program under which production engines are selected including a description of sampling plans, method of sample selection and sampling rates.

(2) EPA engine family.

(3) Engine identification number.

(4) Configuration.

(5) Engine model year and build date.

(6) Number of hours of service accumulated on engine prior to testing.

(7) Description of any preparation, maintenance, modification or repair on test engines.

(8) Emission test results for each valid test. If the above information is available on Automatic Data Processing (ADP) equipment, it shall be submitted on an ADP storage device such as magnetic tape, magnetic disc, punched cards, etc. EPA will return ADP equipment submitted by the manufacturer or, upon a request by the manufacturer, furnish the necessary ADP storage devices. Information submitted once need not be submitted again if there are no subsequent changes.

(d) Pursuant to a request made by the Administrator, the manufacturer shall submit to him the following information with regard to engine production:

(1) Number of engines, by configuration and assembly plant, scheduled for production for the time period designated in the request.

(2) Number of engines, by configuration and assembly plant, produced during the time period designated in the request which are complete for introduction into commerce.

(e) Nothing in this section shall limit the Administrator's discretion in requiring the manufacturer to retain additional records or submit information not specifically required by this section.

(f) All reports, submissions, notifications, and requests for approvals made

under this subpart shall be addressed to:

Director, Mobile Source Enforcement Division, U.S. Environmental Protection Agency, EN-340, 401 M Street S.W., Washington, D.C. 20460.

§ 86.1006-83. Entry and access.

(a) In order to allow the Administrator to determine whether a manufacturer is complying with the provisions of this subpart and a test order issued thereunder, EPA Enforcement Officers are authorized to enter during operating hours and upon presentation of credentials any of the following:

(1) Any facility where any engine to be introduced into commerce or any emission related component is manufactured, assembled, or stored;

(2) Any facility where any tests conducted pursuant to a test order or any procedures or activities connected with such tests are or were performed;

(3) Any facility where any engine which is being tested, was tested, or will be tested is present; and

(4) Any facility where any record or other document relating to any of the above is located.

(b) Upon admission to any facility referred to in subsection (a) of this section, EPA Enforcement Officers are authorized to perform the following inspection-related activities:

(1) To inspect and monitor any aspects of such engine manufacture, assembly, storage, testing and other procedures, and the facilities in which such procedures are conducted;

(2) To inspect and monitor any part or aspect of such test procedures or activities, including, but not limited to, monitoring engine selection, preparation, service accumulation, preconditioning, emission test cycles, and maintenance; and to verify calibration of test equipment;

(3) To inspect and make copies of any records or documents related to the assembly, storage, selection and testing of an engine in compliance with a test order; and

(4) To inspect and photograph any part or aspect of any such engine and any component used in the assembly thereof that is reasonably related to the purpose of the entry.

(c) EPA Enforcement Officers are authorized to obtain reasonable assistance without charge from those in charge of a facility to help them discharge any function listed in this subpart and are authorized to request the recipient of a test order to make arrangements with those in charge of a facility operated for its benefit to furnish such reasonable assistance without charge to EPA whether or not the recipient controls the facility.

(d) EPA Enforcement Officers are authorized to seek a warrant or court order authorizing the EPA Enforcement

ment Officers to conduct activities related to entry and access as authorized in this section, as appropriate, to execute the functions specified in this section. EPA Enforcement Officers may proceed *ex parte* to obtain a warrant whether or not the Enforcement Officers first attempted to seek permission of the recipient of the test order or the party in charge of the facilities in question to conduct activities related to entry and access as authorized in this section.

(e) EPA Enforcement Officers who present a warrant or court order as described in paragraph (d) of this section shall be permitted to conduct activities related to entry and access as authorized in this section and as described in the warrant or court order. A recipient of a test order is required to cause those in charge of its facility or a facility operated for its benefit to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section pursuant to a warrant or court order whether or not the recipient controls the facility. In the absence of such a warrant or court order, EPA Enforcement Officers may conduct activities related to entry and access as authorized in this section only upon the consent of the recipient or the test order of the party in charge of the facilities in question.

(f) It is not a violation of this Part of the Clean Air Act for any person to refuse to permit EPA Enforcement Officers to conduct activities related to entry and access as authorized in this section without a warrant or court order.

(g) A manufacturer is responsible for locating its foreign testing and manufacturing facilities in jurisdictions in which local foreign law does not prohibit EPA Enforcement Officers from conducting the entry and access activities specified in this section. EPA will not attempt to make any inspections which it has been informed that local foreign law prohibits.

(h) For purposes of this section:

(1) "Presentation of Credentials" shall mean display of the document designating a person as an EPA Enforcement Officer.

(2) Where engine storage areas or facilities are concerned, "operating hours" shall mean all times during which personnel other than custodial personnel are at work in the vicinity of the area or facility and have access to it.

(3) Where facilities or areas other than those covered by paragraph (h)(2) of this section are concerned, "operating hours" shall mean all times during which an assembly line is in operation, or engine assembly is taking place, or all times during which testing, repair, service accumulation, preparation or compilation of records, or

any other procedure or activity related to testing, or to engine manufacture or assembly is being carried out in a facility.

(4) "Reasonable assistance" includes, but is not limited to, clerical, copying, interpreting and translating services, and the making available on an EPA Enforcement Officer's request of personnel of the facility being inspected during their working hours to inform the EPA Enforcement Officer of how the facility operates and to answer his questions. Any employee whom an EPA Enforcement Officer requests the manufacturer to cause to appear for questioning will be entitled to be accompanied, represented and advised by counsel.

§ 86.1007-83 Sample selection.

(a) Engines comprising a test sample which are required to be tested, pursuant to a test order issued in accordance with this subpart, will be selected at the location and in the manner specified in the test order. If a manufacturer determines that the test engines can not be selected in the manner specified in the test order, an alternative selection procedure may be employed: *Provided*, That the manufacturer requests approval of such a procedure in advance of the start of test sample selection and that the Administrator approves such a procedure.

(b) The test engines of the configuration selected for testing shall have been assembled by the manufacturer for distribution in commerce using his normal mass production processes. If the test engines are selected at a location where they do not have their operational and emission control systems installed, the test order will specify the manner and location for selection of components to complete assembly of the engines and the manner in which assembly is to be completed.

(c) No quality control, testing, or assembly procedures shall be used on the completed test engine or any portion thereof, including parts and subassemblies, that will not be used during the production and assembly of all other engines of that configuration: *Except*, That the Administrator may approve a deviation in the normal assembly procedures pursuant to paragraph (b) of this section.

(d) The test order may specify that EPA Enforcement Officers, rather than the manufacturer, will select the test engines according to the method specified in the test order.

(e) The test order will specify the order in which test results are to be used in applying the sampling plan.

(f) The manufacturer shall keep on hand all untested engines comprising the test sample until such time as a

pass or fail decision is reached in accordance with § 86.1010-83(d) or § 86.1011-83(d) or until such time as the compliance level is determined in accordance with § 86.1011-83(g), whichever is applicable.

§ 86.1008-83 Test procedures.

(a) The prescribed test procedure is the Federal Test Procedure as described in Subpart N, I and P of this Part.

(b)(1) The manufacturer shall not adjust, repair, prepare, or modify the engines selected for testing and shall not perform any emission tests on engines selected for testing pursuant to the test order unless such adjustment, repair, preparation, modification, and/or tests are documented in the manufacturer's engine assembly and inspection procedures, and are actually performed or unless such adjustments and/or tests are required or permitted under this subpart or are approved in advance by the Administrator.

(2) For 1983 and later model years the Administrator may adjust or cause to be adjusted any engine parameter which the Administrator has determined to be subject to adjustment for certification, Selective Enforcement Audit and Production Compliance Audit testing in accordance with § 86.083-22(e)(1), to any setting within the physically adjustable range of that parameter, as determined by the Administrator in accordance with § 86.083-22(e)(3)(ii), prior to the performance of any tests. However, if the idle speed parameter is one which the Administrator has determined to be subject to adjustment, the Administrator shall not adjust it to any setting which causes a lower engine idle speed than would have been possible within the physically adjustable range of the idle speed parameter if the manufacturer had accumulated 125 hours of service on the engine under paragraph (c) of this section, all other parameters being identically adjusted for the purpose of the comparison. The Administrator, in making or specifying such adjustments, may consider the effect of the deviation from the manufacturer's recommended setting on emissions performance characteristics as well as the likelihood that similar settings will occur on in-use heavy-duty engines. In determining likelihood, the Administrator may consider factors such as, but not limited to, the effect of the adjustment on engine performance characteristics and surveillance information from similar in-use engines.

(c) The manufacturer may accumulate up to 125 hours of service on each selected engine prior to performing exhaust emission testing. Service accumulation may be performed in any manner the manufacturer desires.

(1) The manufacturer shall accumulate service at a minimum rate of 16 hours during each 24 hour period, unless otherwise provided by the Administrator.

(2) Service accumulation shall be performed on a sufficient number of test engines during each 24 hour period to assure that the number of engines tested per day fulfills the requirements of paragraph (g) of this section.

(d) No maintenance will be performed on test engines after selection for testing nor will any test engine substitution or replacement be allowed, unless requested of the Administrator by the manufacturer and approved by the Administrator in advance of the performance of any maintenance or engine substitution.

(e) The manufacturer will be allowed 24 hours to ship test engines from the assembly plant or associated storage facility to the test facility if the test facility is not located at or in close proximity to the plant or storage facility. *Except*, That the Administrator may approve more time based upon a request by the manufacturer accompanied by a satisfactory justification.

(f) In the event that an engine is incapable of completing the service accumulation or emission tests because of engine malfunction, the manufacturer may request that the Administrator authorize him to repair or replace the engine. Any replacement engines will be selected in a manner prescribed in the test order.

(g) Within one working day of receipt of the test order, the manufacturer shall notify the Administrator which test facility will be used to comply with the test order. If no test cells are available at a desired facility, the manufacturer must provide alternate testing capability satisfactory to the Administrator.

(1) Heavy-duty gasoline engine manufacturers with projected annual sales of 30,000 or greater, and heavy-duty diesel engine manufacturers with projected annual sales of 10,000 or greater, as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of two engines per 24 hour period, including voided tests.

(2) Heavy-duty gasoline engine manufacturers with projected annual sales of less than 30,000, and heavy-duty diesel engine manufacturers with projected annual sales of less than 10,000, as made in their respective Applications for Certification, shall complete emission testing at their testing facility on a minimum of one engine per 24 hour period, including voided tests.

(3) The Administrator may approve a longer period of time for conducting emission tests based upon a request by

a manufacturer accompanied by a satisfactory justification.

(h) The manufacturer shall perform test engine selection, shipping, preparation, service accumulation, and testing in such a manner as to assure that the audit is performed in an expeditious manner.

(i) The manufacturer will be permitted to retest any engines tested during a Selective Enforcement Audit once a final decision for the audit has been reached in accordance with § 86.1010-83(d) based on the first test on each engine. Each engine can be tested a total of three times but they all must be tested the same number of times. The manufacturer may accumulate additional service before conducting a retest, although the total amount of service accumulation on each engine prior to testing shall not exceed 125 hours.

§ 86.1009-83 Calculation and reporting of test results.

(a) Initial test results shall be calculated following the Federal Test Procedure specified in paragraph (a) of § 86.1008-83.

(b) Final test results shall be calculated by summing the initial test results derived in paragraph (a) of this section for each test engine, dividing by the number of tests conducted on the engine, and rounding in accordance with ASTM E29-67 to two places to the right of the decimal point.

(c) *Final deteriorated test results.* For the purpose of this paragraph, if a deterioration factor as computed during the certification process is less than one, that deterioration factor shall be one.

(1) The final deteriorated test results for each engine tested according to Subpart N or P of this Part shall be calculated by multiplying the final test results by the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs.

(2) The final deteriorated test results for each engine tested according to Subpart I of this Part shall be calculated by adding the appropriate deterioration factor, derived from the certification process for the engine family-control system combination and model year for the selected configuration to which the test engine belongs, to the final test results.

(3) The final deteriorated test results shall be rounded to two significant figures in accordance with ASTM E29-67.

(d) Within five working days after completion of testing of all engines pursuant to a test order, the manufacturer shall submit to the Administrator

for a report which shall include the following:

(1) The location and description of the manufacturer's exhaust emission test facilities which were utilized to conduct testing reported pursuant to this section.

(2) The applicable standards against which the engines were tested.

(3) Deterioration factors for the engine family to which the selected configuration belongs.

(4) A description of the engine and any emission related component selection method used and the name of the manufacturer's representative in charge of the selection process.

(5) For each test conducted:

(i) Test engine description, including:

(A) Configuration and engine family identification,

(B) Year, make, and build date,

(C) Engine identification number, and

(D) Number of hours of service accumulated on engine prior to testing.

(ii) Location where service accumulation was conducted and description of accumulation procedure and schedule.

(iii) Test number, date, initial test results before and after rounding, final test results and final deteriorated test results for all exhaust emission tests, whether valid or invalid, and the reason for invalidation, if applicable.

(iv) A complete description of any modification, repair, preparation, maintenance, and/or testing which was performed on the test engine and has not been reported pursuant to any other paragraph of this subpart and will not be performed on all production engines.

(v) Where a replacement engine was authorized by the Administrator, the reason for the replacement and the information in (iii) above, if any, for the replacement engine.

(vi) Any other information the Administrator may request relevant to the determination as to whether the new heavy-duty engines being manufactured by the manufacturer do in fact conform with the regulations with respect to which the certificate of conformity was issued.

(6) The following statement and endorsement: This report is submitted pursuant to section 206 and section 208 of the Clean Air Act. All testing for which data is reported herein was conducted in strict conformance with applicable regulations under 40 CFR Part 86 et seq. All the data reported herein is a true and accurate representation of such testing. All other information reported herein is, to the best of

(Company name)

knowledge, true and accurate. I am aware of the penalties associated with

violations of the Clean Air Act and the regulations thereunder.

(Authorized Company Representative)

§ 86.1010-83 Compliance with acceptable quality level and passing and failing criteria for Selective Enforcement Audits (SEA).

(a) The prescribed acceptable quality level is 10 percent.

(b) A failed engine is one whose final deteriorated test results pursuant to paragraph 86.1009-83(c), for one or more of the applicable exhaust pollutants, exceed the applicable emission standard or compliance level as prescribed in paragraph (g) of § 86.1011-83, if applicable.

(c) The manufacturer shall test engines comprising the test sample until a pass or fail decision is reached for all pollutants, or a fail decision is reached for a pollutant for which no upper limit is established in this part, or a fail decision is reached with respect to the upper limit according to paragraph (f) of this section. A pass decision is reached when the cumulative number of failed engines, as defined in paragraph (b) of this section, for each pollutant is less than or equal to the pass decision number appropriate to the cumulative number of engines tested. A fail decision is reached when the cumulative number of failed engines for each pollutant is greater than or equal to the fail decision number appropriate to the cumulative number of engines tested. The pass and fail decision numbers associated with the cumulative number of engines tested shall be determined by use of the tables in Appendix X of this part appropriate for the annual projected sales as made by the manufacturer in its Application for Certification. In the Tables in Appendix X, sampling plan "state" refers to the cumulative number of engines tested.

(d) Passing or failing of an SEA audit takes place when the decision is made on the last engine required to make a decision under paragraph (c) of this section.

(e) The administrator may terminate testing earlier than required in paragraph (c) of this section.

(f) If a fail decision is reached in accordance with paragraph (d) of this section, then a determination will also be made based on the test results up to that point whether the configuration fails with respect to the upper limit, if one has been established.

(g) If a manufacturer conducts a follow-up SEA audit pursuant to paragraph (j)(2) or (k)(2) of § 86.1012-83 subsequent to suspension or revocation of a certificate of conformity for the purpose of reinstatement or reissuance of the certificate, the provisions of this section shall apply except that the tables in Appendix XI shall be utilized.

(h) Whenever a manufacturer conducts an SEA audit pursuant to a test order issued for a configuration whose official certification test results exceeded one or more standards, the provisions of this section shall apply except that the tables in Appendix XI shall be utilized.

(i) If a manufacturer is issued a test order to conduct an SEA of a configuration which serves as a replacement for a configuration which had its certificate of conformity suspended or revoked for failure of an SEA, the provisions of this section shall apply except that the tables in Appendix XI shall be utilized.

(j) A manufacturer may request that a Selective Enforcement Audit be conducted on a configuration on which the manufacturer is paying a nonconformance penalty pursuant to § 86.1013-83 in order to demonstrate that the engines of the configuration have been brought into compliance with the applicable emission standards. The provisions of this section shall apply except that the tables in Appendix XI shall be utilized.

§ 86.1011-83 Production Compliance Auditing.

(a) During a model year in which certification above the heavy-duty engine emission standards for one or more exhaust pollutants is specifically permitted by amendments to this part, a manufacturer can elect to conduct a Production Compliance Audit (PCA) for each configuration which did not pass a Selective Enforcement Audit in accordance with paragraph (d) of § 86.1010-83 with respect to a pollutant for which an upper limit had been established in this part and for which the manufacturer does not intend to make a design change or changes to the engine and/or emission control system as described in the Application for Certification or does not intend to institute a quality control procedure to remedy the nonconformity.

(b) Production Compliance Audits shall be initiated upon a written request from the manufacturer. All applicable conditions in the original SEA test order shall continue to apply. Test results from the SEA audit shall be utilized in establishing a noncompliance level or reaching a fail decision for the PCA audit.

(c) Unless specified as being appropriate only to Selective Enforcement Auditing or to model years in which certification above the emission standards for heavy-duty engines is not specifically permitted by regulations, all other sections of this subpart shall be applicable to Production Compliance Audit testing.

(d) The manufacturer shall test consecutive engines comprising the test sample until a fail decision at the upper limit is reached for each pollutant for which an upper limit has been established or the maximum sample size has been tested. A fail decision is reached for a pollutant for which an upper limit has been established when the number of engines whose final deteriorated test results exceed the upper limit for that pollutant is equal to or greater than the fail decision number. The fail decision number and maximum test sample size are determined from the tables in Appendix XII.

(e) A fail decision is reached for a pollutant for which no upper limit has been established when the number of engines whose final deteriorated test results exceed the standard for that pollutant is equal to or greater than the fail decision number in Table II of Appendix XII.

(f) The Administrator may terminate testing earlier than required in paragraph (d) of this section.

(g) If the maximum number of engines were tested pursuant to paragraph (d) of this section and a fail decision under paragraph (d) was not made for one or more pollutants for which an upper limit has been established, a compliance level shall be established for each such pollutant according to the following procedure:

(1) For each pollutant, rank all the final deteriorated test results obtained for that pollutant in order from the lowest to the highest value.

(2)(A) If using code letter A in Appendix XII, the sixteenth lowest test result in the sequence is the compliance level.

(B) If using code letter B in Appendix XII, the nineteenth lowest test result in the sequence is the compliance level.

(C) If using code letter C in Appendix XII, the twenty-fourth lowest test result in the sequence is the compliance level.

(D) If using code letter D in Appendix XII, the twenty-fifth lowest test result in the sequence is the compliance level.

§ 86.1012-83 Suspension and revocation of certificates of conformity.

(a) The certificate of conformity is suspended with respect to any engine failing pursuant to paragraph (b) of § 86.1010-83 effective from the time that testing of that engine is completed.

(b) During those model years in which heavy-duty engines are not permitted by this part to exceed emission standards for one or more pollutants, the Administrator may suspend the certificate of conformity for a configuration which does not pass an SEA,

pursuant to paragraph § 86.1010-83(c), based on the first test or all tests conducted on each engine or does not pass a PCA audit with respect to the standards for those pollutants for those engines produced at that plant. Such suspension shall not occur before ten days after failure to pass the audit.

(c) During those model years in which heavy-duty engines are permitted by amendments to this part to exceed the emission standards for one or more pollutants, the Administrator may suspend the certificate of conformity for a configuration which does not pass an SEA based on the first test or all tests conducted on each engine or does not pass a PCA audit with respect to the upper limits for those pollutants for those engines produced at that plant. Such suspension shall not occur before ten days after failure to pass the audit.

(d) If a manufacturer does not elect to conduct a PCA audit for a configuration pursuant to § 86.1011-83(a), the Administrator may suspend the certificate of conformity for all engines of that configuration produced at the plant where the configuration failed the SEA audit. A suspension for failure to elect a PCA pursuant to § 86.1011-83(a) shall not occur before ten days after failure to pass the audit.

(e) If the results of testing pursuant to these regulations indicate that engines of a particular configuration produced at one plant of a manufacturer do not conform to the regulations with respect to which the certificate of conformity was issued, the Administrator may suspend the certificate of conformity with respect to that configuration for engines manufactured by the manufacturer at all other plants.

(f) The Administrator may suspend the certificate of conformity for all engines of a configuration produced at all plants if a manufacturer fails to pay a nonconformance penalty on all engines for which a penalty is applicable within the time prescribed in § 86.1013-83(c).

(g) The Administrator will notify the manufacturer in writing of any suspension or revocation of a certificate of conformity in whole or in part: *Except*, That the certificate is immediately suspended with respect to any failed engines as provided for in paragraph (a) of this section.

(h) The Administrator may revoke a certificate of conformity for a configuration when the certificate has been suspended pursuant to paragraph (b), (c) or (e) of this section if the proposed remedy for the nonconformity, as reported by the manufacturer to the Administrator, is one requiring a design change or changes to the engine and/or emission control system as described in the Application for

Certification of the affected configuration.

(i) One a certificate has been suspended for a failed engine as provided for in paragraph (a) of this section, the manufacturer must take the following actions:

(1) Before the certificate is reinstated for that failed engine,

(i) Remedy the nonconformity, and
(ii) Demonstrate that the engine conforms to the applicable standards or compliance levels, if established, by retesting the engine in accordance with these regulations.

(2) Submit a written report to the Administrator within five working days after completion of testing which contains a description of the remedy and test results for each engine in addition to other information that may be required by this regulation.

(j) Once a certificate for a failed configuration has been suspended pursuant to paragraph (b), (c) or (e) of this section, the manufacturer must take the following actions before the Administrator will consider reinstating such certificate:

(1) Submit a written report to the Administrator which identifies the reason for the noncompliance of the engines, describes the proposed remedy, including a description of any proposed quality control and/or quality assurance measures to be taken by the manufacturer to prevent future occurrences of the problem, and states the date on which the remedies will be implemented, and

(2) Demonstrate that the engine configuration for which the certificate of conformity has been suspended does in fact comply with these regulations by testing engines selected from normal production runs of that engine configuration, at the plant(s) or associated storage facilities specified by the Administrator, in accordance with paragraph § 86.1010-83(g) and the conditions specified in the initial test order; *Except*, That if the manufacturer elects to continue testing individual engines after suspension of a certificate, the certificate is reinstated for any engine actually determined to be in conformance with the applicable standards through testing in accordance with the applicable test procedures: *Provided*, That the Administrator has not revoked the certificate pursuant to paragraph (g) of this section.

(k) Once the certificate has been revoked for a configuration and the manufacturer desires to continue introduction into commerce of such configuration, the following actions shall be taken before the Administrator will consider reissuing such certificate:

(1) If the Administrator determines that the proposed change or changes in engine design may have an effect on

emission performance deterioration, he will so notify the manufacturer within five (5) working days after receipt of the report in paragraph (h) of this section, whether subsequent testing under this subpart will be sufficient to evaluate the proposed change or changes or whether additional testing will be required.

(2) After implementing the change or changes intended to remedy the nonconformity, the manufacturer shall demonstrate that the engine configuration for which the certificate of conformity was revoked does in fact conform with these regulations by testing engines selected from normal production runs of that engine configuration in accordance with paragraph § 86.1010-83(g) and the conditions specified in the initial test order. This testing will be considered by the Administrator to satisfy the testing requirements of § 86.078-32 or § 86.079-33 if the Administrator had so notified the manufacturer. If the subsequent audit results in passing of the audit at the level of the standards, the Administrator will reissue or amend the certificate, as the case may be, to include that configuration: *Provided*, That the manufacturer has satisfied the testing requirements specified pursuant to paragraph (j)(2) of this section. If the subsequent audit is failed, the revocation shall remain in effect. Any design change approvals under this subpart shall be limited to the configuration affected by the test order.

(1) At any time subsequent to an initial suspension of a certificate of conformity for a test engine pursuant to paragraph (a) of this section, but not later than fifteen (15) days or such other period as may be allowed by the Administrator after notification of the Administrator's decision to suspend or revoke a certificate of conformity in whole or in part pursuant to paragraphs (b), (c), (d), (e) or (h) of this section or establishment of a compliance level in accordance with § 86.1011-83 which exceeds a standard, a manufacturer may request a hearing as to whether the tests have been properly conducted or any sampling methods have been properly applied.

(m) After the Administrator suspends or revokes a certificate of conformity pursuant to this section or notifies a manufacturer of his intent to suspend, revoke or void a certificate of conformity under paragraph § 86.079-30(e), and prior to the commencement of a hearing under § 86.1014-83, if the manufacturer demonstrates to the Administrator's satisfaction that the decision to suspend, revoke or void the certificate was based on erroneous information, the Administrator will reinstate such certificate.

(n) To permit a manufacturer to avoid storing non-test engines when

conducting an audit of a configuration subsequent to suspension or revocation of the certificate of conformity for that configuration resulting from failure of an SEA or PCA audit, it may request that the Administrator conditionally reinstate the certificate for that configuration. The Administrator may reinstate the certificate subject to the condition that the manufacturer consents to recall all engines of that configuration produced from the time

the certificate is conditionally reinstated if the configuration fails the subsequent audit at the level of the standard or upper limits, as applicable, and to remedy any nonconformity at no expense to the owner.

§ 86.1013-83 Nonconformance penalties.

(a) The nonconformance penalty shall be determined according to the following formula:

$$\left[\left(\frac{CL_{HC}}{HC_{STD}} + \frac{CL_{CO}}{CO_{STD}} + \frac{CL_{NOx}}{NOx_{STD}} \right) - 1 \right] \times 100 \times MC \times F$$

Where:

CL_{HC} = compliance level for HC, according to paragraph § 86.1011-83(g).

CL_{CO} = compliance level for CO, according to paragraph § 86.1011-83(g).

CL_{NOx} = compliance level for NOx, according to paragraph § 86.1011-83(g).

HC_{STD} = heavy-duty engine emission standard for HC for the model year in which CL_{HC} is established.

CO_{STD} = heavy-duty engine emission standard for CO for the model year in which CL_{CO} is established.

NOx_{STD} = heavy-duty engine emission standard for NOx for the model year in which CL_{NOx} is established.

MC = marginal cost of compliance with emission standards as determined in paragraph (b) (3) of this section.

F = periodic penalty adjustment factor, = 1.0 for the first model year in which the HC_{STD} , CO_{STD} and/or NOx_{STD} are applicable.

= $1 + (n-1) \times 0.25$ for the n^{th} model year in which the HC_{STD} , CO_{STD} and/or NOx_{STD} are applicable.

(1) The compliance level for a pollutant shall be set equal to the standard

for that pollutant in each of the following cases:

(i) No upper limit is established in this part for that pollutant.

(ii) An upper limit has been established in this part for that pollutant and the compliance level is less than the emission standard for that pollutant.

(iii) The configuration passed the Selective Enforcement Audit preceding the Production Compliance Audit with respect to the standard for that pollutant and did not fail the Production Compliance Audit with respect to the standard for that pollutant.

(2) If the compliance level determined pursuant to paragraph § 86.1011-83(g) exceeds the upper limit for the applicable pollutant, the compliance level shall be equal to the upper limit for purposes of performing the calculation in paragraph (a) of this section.

$$(3) MC = \frac{I.C.}{\left[\left(\frac{HC_{INC}}{HC_{STD}} + \frac{CO_{INC}}{CO_{STD}} + \frac{NOx_{INC}}{NOx_{STD}} \right) - 1 \right] \times 100}$$

Where:

HC_{INC} = a hydrocarbon emission standard an increment above HC_{STD} .

CO_{INC} = a carbon monoxide emission standard an increment above CO_{STD} .

NOx_{INC} = an oxides of nitrogen emission standard an increment above NOx_{STD} .

$I.C.$ = cost of bringing a heavy-duty gas or diesel engine which is in compliance with the incremental standards into

compliance with HC_{STD} , CO_{STD} and NOx_{STD} .

= $C_v + C_{se} + C_{user}$, where:

C_v = Variable costs of compliance with HC_{STD} , CO_{STD} , and NOx_{STD} (e.g., labor and materials for pollution control equipment and warranty obligations).

C_{se} = semi-variable costs of compliance (e.g., amortized research and development and retooling costs).

C_{user} = user-borne costs of compliance (e.g., mileage penalty and increased maintenance requirements).

(b) The nonconformance penalty determined in paragraph (a) of this section shall be assessed against the following engines of the noncomplying configuration:

(1) Those engines produced at all plants since the beginning of the model year and distributed into commerce, until the time that the non-compliance level(s) is (are) established; and

(2) Those engines produced at all plants after the noncompliance level(s) is (are) established and distributed into commerce, until such time, if any, that the configuration is brought into compliance with applicable emission standards as demonstrated by passing an SEA pursuant to § 86.1010-83(j).

(c) The nonconformance penalty or penalties shall be paid within 15 days of the end of each calendar quarter (March 31, June 30, September 30, and December 31) for all nonconforming engines produced by a manufacturer and distributed into commerce for that quarter. Payment shall be made to the United States Treasury and shall be delivered to:

Director, Mobile Source Enforcement Division (EN-340), U.S. Environmental Protection Agency, 401 M. Street S.W., Washington, D.C. 20460.

§ 86.1014-83 Hearings on suspension, revocation, and voiding of certificates of conformity.

(a) *Applicability.* The procedures prescribed by this section shall apply whenever a manufacturer requests a hearing pursuant to § 86.079-30(e)(6)(i), § 86.079-30(e)(7), or 86.1012-83(1).

(b) *Definitions.* The following definitions shall be applicable to this section:

(1) "Hearing Clerk" shall mean the Hearing Clerk of the Environmental Protection Agency.

(2) "Manufacturer" refers to a manufacturer contesting a suspension or revocation order directed at the manufacturer.

(3) "Party" shall include the Agency and the manufacturer.

(4) "Presiding Officer" shall mean an Administrative Law Judge appointed pursuant to 5 U.S.C. 3105 (see also 5 CFR Part 930 as amended).

(5) "Judicial Officer" shall mean an officer or employee of the Agency appointed as a Judicial Officer by the Administrator pursuant to this section who shall meet the qualifications and perform functions as follows:

(i) Officer—There may be designated for the purposes of this section one or more Judicial Officers. As work requires, there may be a Judicial Officer

designated to act for the purposes of a particular case.

(ii) **Qualifications**—A Judicial Officer may be a permanent or temporary employee of the Agency who performs other duties for the Agency. Such Judicial Officer shall not be employed by the Office of Enforcement or have any connection with the preparation or presentation of evidence for a hearing held pursuant to this subpart.

(iii) **Functions**—The Administrator may consult with Judicial Officer or delegate all or part of his authority to act in a given case under this section to a Judicial Officer. *Provided*, That this delegation shall not preclude the Judicial Officer from referring any motion or case to the Administrator when the Judicial Officer determines such referral to be appropriate.

(c) **Request for public hearing.**

(1) If the manufacturer disagrees with the Administrator's decision to suspend, revoke or void a certificate or disputes the basis for an automatic suspension pursuant to § 86.1012-83(a), he may request a public hearing as described in this section. Requests for such a hearing shall be filed with the Administrator not later than 15 days after the Administrator's notification of his decision to suspend or revoke unless otherwise specified by the Administrator. Two copies of such request shall simultaneously be served upon the Director of the Mobile Source Enforcement Division and two copies filed with the Hearing Clerk. Failure of the manufacturer to request a hearing within the time provided shall constitute a waiver of his right to such a hearing. Subsequent to the expiration of the period for requesting a hearing as a right, the Administrator may, in his discretion and for good cause shown, grant the manufacturer a hearing to contest the suspension or revocation.

(2) The request for a public hearing shall contain:

(i) A statement as to which engine configuration is to be the subject of the hearing;

(ii) A concise statement of the issues to be raised by the manufacturer at the hearing. *Provided, however*, that in the case of the hearing requested under § 86.1012-83(1), the hearing shall be restricted to the following issues:

(A) Whether test have been properly conducted, specifically, whether the tests were conducted in accordance with applicable regulations under this part and whether test equipment was properly calibrated and functioning; and

(B) Whether sampling plans have been properly applied, specifically, whether sampling procedures specified in Appendix X, XI, or XII, as applicable, were followed and whether there

exists a basis for distinguishing engines produced at plants other than the one from which engines were selected for testing which would invalidate the Administrator's decision under § 86.1012-83(e) or cause the compliance level to be different at the other plants.

(iii) A statement specifying reasons the manufacturer believes he will prevail on the merits of each of the issues so raised; and

(iv) A summary of the evidence which supports the manufacturer's position on each of the issues so raised.

(3) A copy of all requests for public hearings shall be kept on file in the Office of the Hearing Clerk and shall be made available to the public during Agency business hours.

(d) **Summary decision.**

(1) In the case of a hearing requested under § 86.1012-83(1), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issues specified in § 86.1014-83(c)(2)(ii), the Administrator will enter an order denying the request for a hearing and reaffirming the original decision to suspend or revoke a certificate of conformity, if such decision has been made pursuant to § 86.1012-83(g) at any time prior to the decision to deny the request for a hearing.

(2) In the case of a hearing requested under § 86.079-30 (e)(6)(i), to challenge a proposed suspension of a certificate of conformity for reasons specified in § 86.079-30(e)(1)(i) or (e)(1)(ii), when it clearly appears from the data and other information contained in the request for a hearing that there is no genuine and substantial question of fact with respect to the issue of whether the refusal to comply with the provisions of a test order or any other requirement of § 86.1003-83 was caused by conditions and circumstances outside the control of the manufacturer, the Administrator will enter an order denying the request for a hearing and suspending the certificate of conformity.

(3) Any order issued under paragraphs (d)(1) or (d)(2) of this section shall have the force and effect of a final decision of the Administrator, as issued to paragraph (w)(4) of this section.

(4) If the Administrator determines that a genuine and substantial question of fact does exist with respect to any of the issues referred to in paragraphs (d)(1) and (d)(2) of this section, he shall grant the request for a hearing and publish a notice of public hearing in accordance with paragraph (h) of this section.

(e) **Filing and service.**

(1) An original and two copies of all documents or papers required or permitted to be filed pursuant to this section shall be filed with the Hearing Clerk. Filing shall be deemed timely if mailed, as determined by the postmark, to the Hearing Clerk within the time allowed by this section. If filing is to be accomplished by mailing, the documents shall be sent to the address set forth in the notice of public hearing as described in paragraph (h) of this section.

(2) To the maximum extent possible, testimony shall be presented in written form. Copies of written testimony shall be served upon all parties as soon as practicable prior to the start of the hearing. A certificate of service shall be provided on or accompanying each document or paper filed with the Hearing Clerk. Documents to be served upon the Director of the Mobile Source Enforcement Division shall be sent by registered mail to:

Director Mobile Source Enforcement Division,
U.S. Environmental Protection
Agency, EN-340, 401 M Street, SW., Wash-
ington, D.C. 20460.

Service by registered mail is complete upon mailing.

(f) **Time.** (1) In computing any period of time prescribed or allowed by this section, except as otherwise provided, the day of the act or event from which the designated period of time begins to run shall not be included. Saturdays, Sundays, and Federal legal holidays shall be included in computing any such period allowed for the filing of any document or paper, except that when such period expires on a Saturday, Sunday, or Federal legal holiday, such period shall be extended to include the next following business day.

(2) A prescribed period of time within which a party is required or permitted to do an act shall be computed from the time of service, except that when service is accomplished by mail, three days shall be added to the prescribed period.

(g) **Consolidation.** The Administrator or the Presiding Officer in his discretion may consolidate two or more proceedings to be held under this section for the purpose of resolving one or more issues whenever it appears that such consolidation will expedite or simplify consideration of such issues. Consolidation shall not affect the right of any party to raise issues that could have been raised if consolidation had not occurred.

(h) **Notice of public hearings.** Notice of a public hearing under this section shall be given by publication in the *FEDERAL REGISTER* and by such other means as the Administrator finds appropriate to provide notice to the public. To the extent possible hearings under this section shall be scheduled to commence within 14 days of receipt

of the application in paragraph (c) of this section.

(i) *Amicus curiae*. Persons not parties to the proceeding wishing to file briefs may do so by leave of the Presiding Officer granted on motion. A motion for leave shall identify the interest of the applicant and shall state the reasons why the proposed amicus brief is desirable.

(j) *Presiding Officer*. The Presiding Officer shall have the duty to conduct a fair and impartial hearing in accordance with 5 U.S.C. sections 554, 556 and 557 and to take all necessary action to avoid delay in the disposition of the proceedings and to maintain order. He shall have all power consistent with Agency rule and with the Administrative Procedure Act necessary to this end, including the following:

(1) To administer oaths and affirmations;

(2) To rule upon offers of proof and exclude irrelevant or repetitious material;

(3) To regulate the course of the hearings and the conduct of the parties and their counsel therein;

(4) To hold conferences for simplification of the issues or any other proper purpose;

(5) To consider and rule upon all procedural and other motions appropriate in such proceedings;

(6) To require the submission of direct testimony in written form with or without affidavit whenever, in the opinion of the Presiding Officer, oral testimony is not necessary for full and true disclosure of the facts;

(7) To enforce agreements and orders requiring access as authorized by law;

(8) To require the filing of briefs on any matter on which he is required to rule;

(9) To require any party or any witness, during the course of the hearing, to state his position on any issue;

(10) To take or cause depositions to be taken whenever the ends of justice would be served thereby;

(11) To make decisions or recommend decisions to resolve the disputed issues on the record of the hearing;

(12) To issue, upon good cause shown, protective orders as described in paragraph (n) of this section.

(k) *Conferences*. (1) At the discretion of the Presiding Officer, conferences may be held prior to or during any hearing. The Presiding Officer shall direct the Hearing Clerk to notify all parties of the time and location of any such conference. At the discretion of the Presiding Officer, persons other than parties may attend. At a conference the Presiding Officer may:

(i) Obtain stipulations and admissions, receive requests and order depositions to be taken, identify disputed issues of fact and law, and require or

allow the submission of written testimony from any witness or party;

(ii) Set a hearing schedule for as many of the following as are deemed necessary by the Presiding Officer;

(A) Oral and written statements;

(B) Submission of written direct testimony as required or authorized by the Presiding Officer;

(C) Oral direct and cross-examination of a witness where necessary as prescribed in paragraph (p) of this section; and

(D) Oral argument, if appropriate.

(iii) Identify matters of which official notice may be taken;

(iv) Consider limitation of the number of expert and other witnesses;

(v) Consider the procedure to be followed at the hearing; and

(vi) Consider any other matter that may expedite the hearing or aid in the disposition of the issue.

(2) The results of any conference including all stipulations shall, if not transcribed, be summarized in writing by the Presiding Officer and made part of the record.

(l) *Primary discovery (exchange of witness lists and documents)*.

(1) At a prehearing conference or within some reasonable time set by the Presiding Officer prior to the hearing, each party shall make available to the other parties the names of the expert and other witnesses the party expects to call, together with a brief summary of their expected testimony and a list of all documents and exhibits which the party expects to introduce into evidence. Thereafter, witnesses, documents, or exhibits may be added and summaries of expected testimony amended upon motion by a party.

(2) The Presiding Officer, may, upon motion by a party or other person, and for good cause shown, by order

(i) restrict or defer disclosure by a party of the name of a witness or a narrative summary of the expected testimony of a witness, and

(ii) prescribe other appropriate measures to protect a witness. Any party affected by any such action shall have an adequate opportunity, once he learns the name of a witness and obtains the narrative summary of his expected testimony, to prepare for the presentation of his case.

(m) *Other discovery*. (1) Except as so provided by paragraph (1) of this section, further discovery, under this paragraph, shall be permitted only upon determination by the Presiding Officer:

(i) That such discovery will not in any way unreasonably delay the proceeding;

(ii) That the information to be obtained is not obtainable voluntarily; and

(iii) That such information has significant probative value. The Presiding Officer shall be guided by the procedures set forth in the Federal Rules of Civil Procedure, where practicable, and the precedents thereunder, except that no discovery shall be undertaken except upon order of the Presiding Officer or upon agreement of the parties.

(2) The Presiding Officer shall order depositions upon oral questions only upon a showing of good cause and upon a finding that:

(i) The information sought cannot be obtained by alternative methods; or

(ii) There is a substantial reason to believe that relevant and probative evidence may otherwise not be preserved for presentation by a witness at the hearing.

(3) Any party to the proceeding desiring an order of discovery shall make a motion or motions therefor. Such a motion shall set forth:

(i) The circumstances warranting the taking of the discovery;

(ii) The nature of the information expected to be discovered; and

(iii) The proposed time and place where it will be taken. If the Presiding Officer determines the motion should be granted, he shall issue an order for the taking of such discovery together with the conditions and terms thereof.

(4) Failure to comply with an order issued pursuant to this paragraph may lead to the inference that the information to be discovered would be adverse to the person or party from whom the information was sought.

(n) *Protective orders, in camera proceedings*. (1) Upon motion by a party or by the person from whom discovery is sought, and upon a showing by the movant that the disclosure of the information to be discovered, or a particular part thereof, (other than emission data) would result in methods or processes entitled to protection as trade secrets of such person being divulged, the Presiding Officer may enter a protective order with respect to such material. Any protective order shall contain such terms governing the treatment of the information as may be appropriate under the circumstances to prevent disclosure outside the hearing. *Provided*, That the order shall state that the material shall be filed separately from other evidence and exhibits in the hearing. Disclosure shall be limited to parties to the hearing, their counsel and relevant technical consultants, and authorized representatives of the United States concerned with carrying out the Act. Except in the case of the government, disclosure may be limited to counsel for parties who shall not disclose such information to the parties themselves. Except in the case of the government, disclosure to a party or his counsel shall be conditioned on execution of a sworn

statement that no disclosure of the information will be made to persons not entitled to receive it under the terms of the protective order. (No such provision is necessary where government employees are concerned because disclosure by them is subject to the terms of 18 U.S.C. 1905.)

(2)(i) A party or persons seeking a protective order may be permitted to make all or part of the required showing in camera. A record shall be made of such in camera proceedings. If the Presiding Officer enters a protective order following a showing in camera, the record of such showing shall be sealed and preserved and made available to the agency or court in the event of appeal.

(ii) Attendance at any in camera proceeding may be limited to the Presiding Officer, the Agency, and the person or party seeking the protective order.

(3) Any party, subject to the terms and conditions of any protective order issued pursuant to paragraph (n)(1) of this section, desiring for the presentation of his case to make use of any in camera documents or testimony shall make application to the Presiding Officer by motion setting forth the justification therefor. The Presiding Officer, in granting any such motion, shall enter an order protecting the rights of the affected persons and parties and preventing unnecessary disclosure of such information, including the presentation of such information and oral testimony and cross-examination concerning it in executive session, as in his discretion is necessary and practicable.

(4) In the submittal of proposed findings, briefs, or other papers, counsel for all parties shall make a good faith attempt to refrain from disclosing the specific details of in camera documents and testimony. This shall not preclude references in such proposed findings, briefs, or other papers to such documents or testimony including generalized statements based on their contents. To the extent that counsel considers it necessary to include specific details in their presentations, such data shall be incorporated in separate proposed findings, briefs, or other papers marked "confidential," which shall become part of the in camera record.

(o) *Motions.* (1) All motions, except those made orally during the course of the hearing, shall be in writing and shall state with particularity the grounds therefor, shall set forth the relief or order sought, and shall be filed with the Hearing Clerk and served upon all parties.

(2) Within such time as may be fixed by the Administrator, the judicial officer, or the Presiding Officer, as appro-

priate, any party may serve and file an answer to the motion. The movant shall, if requested by the Administrator, the judicial officer, or the Presiding Officer, as appropriate, serve and file reply papers, within the time set by the request.

(3) The Presiding Officer shall rule upon all motions filed or made prior to the filing of his decision or accelerated decision, as appropriate. The Administrator or the judicial officer, as appropriate, shall rule upon all motions filed prior to the appointment of a Presiding Officer and all motions filed after the filing of the decision of the Presiding Officer or accelerated decision. Oral argument of motions will be permitted only if the Presiding Officer, the Administrator or the judicial officer, as appropriate, deems it necessary.

(p) *Evidence.* (1) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record. Immaterial or irrelevant parts of an admissible document shall be segregated and excluded so far as practicable. Documents or parts thereof subject to a protective order under paragraph (n) of this section shall be segregated. Evidence may be received at the hearing even though inadmissible under the rules of evidence applicable to judicial proceedings. The weight to be given evidence shall be determined by its reliability and probative value.

(2) The Presiding Officer shall allow the parties to examine and cross-examine a witness to the extent that such examination and cross-examination is necessary for a full and true disclosure of the facts.

(3) Rulings of the Presiding Officer on the admissibility of evidence, the propriety of examination and cross-examination and other procedural matters shall appear in the record.

(4) Parties shall automatically be presumed to have taken exception to an adverse ruling.

(q) *Record.* (1) Hearings shall be stenographically reported and transcribed and the original transcripts shall be part of the record and the sole official transcript. Copies of the record shall be filed with the Hearing Clerk and made available during Agency business hours for public inspection. Any person desiring a copy of the record of the hearing or any part thereof, except as provided in paragraph (n) of this section, shall be entitled to the same upon payment of the cost thereof.

(2) The official transcripts and exhibits, together with all papers and requests filed in the proceeding, shall constitute the record.

(r) *Proposed findings, conclusions.* (1) Within 4 days of the close of the reception of evidence, or within such

longer time as may be fixed by the Presiding Officer, any party may submit for the consideration of the Presiding Officer proposed findings of fact, conclusions of law, and proposed order, together with reasons therefor and briefs in support thereof. Such proposals shall be in writing, shall be served upon all parties, and shall contain adequate references to the record and authorities relied upon.

(2) The record shall show the Presiding Officer's ruling on the proposed findings and conclusions except when his order disposing of the proceeding otherwise informs the parties of the action taken by him thereon.

(s) *Decision of the Presiding Officer.*

(1) Unless extended by the Administrator, the Presiding Officer shall issue and file with the Hearing Clerk his decision within 14 days (or within 7 days in the case of a hearing requested under § 86.1012(i)) after the period for filing proposed findings as provided for in paragraph (r) of this section has expired.

(2) The Presiding Officer's decision shall become the decision of the Administrator.

(i) When no notice of intention as described in paragraphs (t) and (u) of this section is filed, 10 days after issuance thereof, unless in the interim the Administrator shall have taken action to review or stay the effective date of the decision; or

(ii) When a notice of intention to appeal is filed but the appeal is not perfected as required by paragraph (t) or (u) of this section, 5 days after the period allowed for perfection of an appeal has expired unless within that 5 day period, the Administrator shall have taken action to review or stay the effective date of the decision.

(3) The Presiding Officer's decision shall include a statement of findings and conclusions, as well as the reasons or basis therefor, upon all the material issues of fact or law presented on the record and an appropriate rule or order. Such decision shall be supported by substantial evidence and based upon a consideration of the whole record.

(4) At any time prior to the issuance of his decision, the Presiding Officer may reopen the proceeding for the reception of further evidence. Except for the correction of clerical errors, the jurisdiction of the Presiding Officer is terminated upon the issuance of his decision.

(t) *Appeal from the decision of the Presiding Officer.* (1) Any party to a proceeding may appeal the Presiding Officer's decision to the Administrator: *Provided*, That within 10 days after issuance of the Presiding Officer's decision such party files a notice of intention to appeal and an appeal brief within 20 days of such decision.

(2) When an appeal is taken from the decision of the Presiding Officer, any party may file a brief with respect to such appeal. The brief shall be filed within 15 days of the date of the filing of the appellant's brief.

(3) Any brief filed pursuant to this paragraph shall contain in the order indicated, the following:

(i) A subject index of the matter in the brief, with page references, and a table of cases (alphabetically arranged), textbooks, statutes, and other material cited, with page references thereto;

(ii) A specification of the issues intended to be urged: Provided, however, That in the case of a hearing requested under § 86.1012-83(1), the brief shall be restricted to the issues specified in paragraph (c)(2)(ii) of this section;

(iii) The argument presents clearly the points of fact and law relied upon in support of the position taken on each issue, with specific page references to the record and the legal or other material relied upon; and

(iv) A proposed order for the Administrator's consideration if different from the order contained in the Presiding Officer's decision.

(4) No brief in excess of 40 pages shall be filed without leave of the Administrator.

(5) Oral argument will be allowed only at the discretion of the Administrator.

(u) *Summary appeal.* (1) In the case of a hearing requested under § 86.1012-83(1), any appeal taken from the decision of the Presiding Officer shall be conducted under this paragraph.

(2) Any party to the proceeding may appeal the Presiding Officer's decision to the Administrator by filing a notice of appeal within 10 days.

(3) The notice of appeal shall be in the form of a brief, and shall conform to the requirements of paragraph (t)(3) of this section.

(4) Within 10 days after a notice of appeal from the decision of the Presiding Officer is filed under this paragraph, any party may file a brief with respect to such appeal.

(5) No brief in excess of 15 pages shall be filed without leave of the Administrator.

(v) *Review of the Presiding Officer's decision in the absence of appeal.* (1) If, after the expiration of the period for taking appeal as provided for by paragraph (t) or (u) of this section, no notice of intention to appeal the decision of the Presiding Officer has been filed, or if filed, not perfected, the Hearing Clerk shall so notify the Administrator.

(2) The Administrator, upon receipt of notice from the Hearing Clerk that no notice of intention to appeal has

been filed, or if filed, not perfected pursuant to paragraphs (t) or (u) of this section, may, on his own motion, within the time limits specified in paragraph (s)(2) of this section, review the decision of the Presiding Officer. Notice of the intention of the Administrator to review the decision of the Presiding Officer shall be given to all parties and shall set forth the scope of such review and the issues which shall be considered and shall make provision for filing of briefs.

(w) *Decision of appeal or review.* (1) Upon appeal from or review of the Presiding Officer's decision, the Administrator shall consider such parts of the record as are cited or as may be necessary to resolve the issues presented and in addition shall, to the extent necessary or desirable, exercise all the powers which he could have exercised if he had presided at the hearing.

(2) In rendering his decision, the Administrator shall adopt, modify or set aside the findings, conclusions, and order contained in the decision of the Presiding Officer and shall set forth in his decision a statement of the reasons or basis for his action.

(3) In those cases where the Administrator believes that he should have further information or additional views of the parties as to the form and content of the rule or order to be issued, the Administrator, in his discretion, may withhold final action pending the receipt of such additional information or views, or may remand the case to the Presiding Officer.

(4) Any decision rendered under this paragraph which completes disposition of a case shall be a final decision of the Administrator.

(x) *Reconsideration.* Within twenty (20) days after issuance of the Administrator's decision, any party may file with the Administrator a petition for reconsideration of such decision, setting forth the relief desired and the grounds in support thereof. Any petition filed under this subsection must be confined to new questions raised by the decision or final order and upon which the petitioner had no opportunity to argue before the Presiding Officer or the Administrator. *Provided*, however, that in the case of a hearing requested under § 86.1012-83(1) such new questions shall be limited to the issues specified in paragraph (c)(2)(ii) of this section.

Any party desiring to oppose such a petition shall file an answer thereto within ten (10) days after the filing of the petition. The filing of a petition for reconsideration shall not operate to stay the effective date of the decision or order or to toll the running of any statutory time period affecting such decision or order unless specifically so ordered by the Administrator.

(y) *Accelerated decision, dismissal.* (1) The Presiding Officer, upon motion of any party or sua sponte, may at any time render an accelerated decision in favor of the Agency or the manufacturer as to all or any part of the proceeding, without further hearing or upon such limited additional evidence such as affidavits as he may require, or dismiss any party with prejudice, for any of the following reasons:

(i) Failure to state a claim upon which relief can be granted, or direct or collateral estoppel;

(ii) The lack of any genuine issue of material fact, causing a party to be entitled to judgment as a matter of law; or

(iii) Such other and further reasons as are just, including specifically failure to obey a procedural order of the Presiding Officer.

(2) If under this paragraph an accelerated decision is issued as to all the issues and claims joined in the proceeding, the decision shall be treated for the purposes of these procedures as the decision of the Presiding Officer as provided in paragraph (s) of this section.

(3) If under this paragraph, judgment is rendered on less than all issues or claims in the proceeding, the Presiding Officer shall determine what material facts exist without substantial controversy and what material facts are actually and in good faith controverted. He shall thereupon issue an order specifying the facts which appear without substantial controversy, and the issues and claims upon which the hearing will proceed.

(z) *Conclusion of hearing.* (1) If, after the expiration of the period for taking an appeal as provided for by paragraphs (t) and (u) of this section, no appeal has been taken from the Presiding Officer's decision, and after the expiration of the period for review by the Administrator on his own motion as provided for by paragraph (v) of this section, the Administrator does not move to review such decision, the hearing will be deemed to have ended at the expiration of all periods allowed for such appeal and review.

(2) If an appeal of the Presiding Officer's decision is taken pursuant to paragraph (t) and (u) of this section, or if, in the absence of such appeal the Administrator moves to review the decision of the Presiding Officer pursuant to paragraph (v) of this section, the hearing will be deemed to have ended upon the rendering of a final decision by the Administrator.

(aa) *Judicial review.* (1) The Administrator hereby designates the General Counsel, Environmental Protection Agency as the officer upon whom copy of any petition for judicial review shall be served. Such officer shall be re-

sponsible for filing in the court the record on which the order of the Administrator is based.

(2) Before forwarding the record to the court, the Agency shall advise the petitioner of costs of preparing it and as soon as payment to cover fees is made, shall forward the record to the court.

APPENDIX X

SAMPLING PLANS FOR INITIAL SELECTIVE ENFORCEMENT AUDITING OF HEAVY-DUTY ENGINES

Table 1

Sampling Plan Code Letter

Annual Sales	Code Letter
50-99	A
100-199	B
200-399	C
400 or greater	D

Table 2

Sample Plan for Code Letter "A"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1.....	(¹)	(²)
2.....	(¹)	(²)
3.....	(¹)	3
4.....	(¹)	3
5.....	(¹)	3
6.....	(¹)	3
7.....	0	3
8.....	0	4
9.....	0	4
10.....	0	4
11.....	1	4
12.....	1	4
13.....	1	5
14.....	1	5
15.....	1	5
16.....	2	5
17.....	2	5
18.....	2	5
19.....	2	6
20.....	2	6
21.....	3	6
22.....	3	6
23.....	3	6
24.....	3	6
25.....	4	6
26.....	4	7
27.....	4	7
28.....	4	7
29.....	4	7
30.....	6	7

¹Test sample passing not permitted at this stage.

²Test sample failure not permitted at this stage.

Table 3

Sample Plan for Code Letter "B"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1.....	(¹)	(²)
2.....	(¹)	(²)
3.....	(¹)	3
4.....	(¹)	3
5.....	(¹)	3
6.....	(¹)	3
7.....	0	4

Stage	Pass No.	Fail No.
8.....	0	4
9.....	0	4
10.....	0	4
11.....	0	4
12.....	1	5
13.....	1	5
14.....	1	5
15.....	1	5
16.....	1	5
17.....	2	6
18.....	2	6
19.....	2	6
20.....	2	6
21.....	3	6
22.....	3	7
23.....	3	7
24.....	3	7
25.....	3	7
26.....	4	7
27.....	4	7
28.....	4	8
29.....	4	8
30.....	4	8
31.....	5	8
32.....	5	8
33.....	5	9
34.....	5	9
35.....	6	9
36.....	6	9
37.....	6	9
38.....	6	9
39.....	6	9
40.....	8	9

¹Test sample passing not permitted at this stage.

²Test sample failure not permitted at this stage.

Table 4

Sample Plan for Code Letter "C"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1.....	(¹)	(²)
2.....	(¹)	(²)
3.....	(¹)	3
4.....	(¹)	3
5.....	(¹)	3
6.....	(¹)	4
7.....	0	4
8.....	0	4
9.....	0	4
10.....	0	4
11.....	0	5
12.....	1	5
13.....	1	5
14.....	1	5
15.....	1	5
16.....	1	6
17.....	2	6
18.....	2	6
19.....	2	6
20.....	2	6
21.....	3	7
22.....	3	7
23.....	3	7
24.....	3	7
25.....	3	7
26.....	4	8
27.....	4	8
28.....	4	8
29.....	4	8
30.....	4	8
31.....	5	8
32.....	5	8
33.....	5	9
34.....	5	9
35.....	5	9
36.....	6	9
37.....	6	10
38.....	6	10
39.....	6	10
40.....	6	10
41.....	7	10
42.....	7	11
43.....	7	11
44.....	7	11

Stage	Pass No.	Fail No.
45.....	8	11
46.....	8	11
47.....	8	11
48.....	8	11
49.....	8	11
50.....	10	11

¹Test sample passing not permitted at this stage.

²Test sample failure not permitted at this stage.

Table 5

Sample Plan for Code Letter "D"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1.....	(¹)	(²)
2.....	(¹)	(²)
3.....	(¹)	3
4.....	(¹)	3
5.....	(¹)	3
6.....	(¹)	4
7.....	0	4
8.....	0	4
9.....	0	4
10.....	0	4
11.....	0	5
12.....	1	5
13.....	1	5
14.....	1	5
15.....	1	5
16.....	1	6
17.....	2	6
18.....	2	6
19.....	2	6
20.....	2	6
21.....	2	7
22.....	3	7
23.....	3	7
24.....	3	7
25.....	3	7
26.....	3	8
27.....	4	8
28.....	4	8
29.....	4	8
30.....	4	8
31.....	4	9
32.....	5	9
33.....	5	9
34.....	5	9
35.....	5	9
36.....	6	10
37.....	6	10
38.....	6	10
39.....	6	10
40.....	6	11
41.....	7	11
42.....	7	11
43.....	7	11
44.....	7	11
45.....	7	12
46.....	8	12
47.....	8	12
48.....	8	12
49.....	8	12
50.....	8	12
51.....	9	13
52.....	9	13
53.....	9	13
54.....	9	13
55.....	9	13
56.....	10	13
57.....	10	13
58.....	10	13
59.....	10	13
60.....	12	13

¹Test sample passing not permitted at this stage.

²Test sample failure not permitted at this stage.

APPENDIX XI

SAMPLING PLANS FOR FOLLOW-UP SELECTIVE
ENFORCEMENT AUDITING OF HEAVY-DUTY
ENGINES

Table 1

Sampling Plan Code Letter

Population Size	Code Letter
50-99	A
100-199	B
200-299	C
300-499	D
500-699	E
700 or greater	F

Table 2

Sample Plan for Code Letter "A"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1	(¹)	(¹)
2	(¹)	(¹)
3	(¹)	3
4	(¹)	3
5	(¹)	3
6	(¹)	4
7	(¹)	4
8	(¹)	4
9	(¹)	4
10	(¹)	4
11	0	4
12	0	4
13	0	5
14	0	5
15	0	5
16	1	5
17	1	5
18	1	5
19	1	5
20	1	5
21	2	6
22	2	6
23	2	6
24	2	6
25	2	6
26	2	6
27	3	6
28	3	6
29	3	6
30	5	6

¹Test sample passing not permitted at this stage.²Test sample failure not permitted at this stage.

Table 3

Sample Plan for Code Letter "B"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1	(¹)	(²)
2	(¹)	(²)
3	(¹)	3
4	(¹)	4
5	(¹)	4
6	(¹)	4
7	(¹)	4
8	(¹)	4
9	(¹)	4
10	(¹)	5
11	(¹)	5
12	0	5
13	0	5
14	0	5
15	0	5
16	0	5
17	1	6
18	1	6
19	1	6

Stage	Pass No.	Fail No.
20	1	6
21	1	6
22	1	6
23	1	6
24	2	7
25	2	7
26	2	7
27	2	7
28	3	7
29	3	7
30	3	8
31	3	8
32	3	8
33	3	8
34	4	8
35	4	8
36	4	8
37	4	8
38	4	8
39	5	8
40	7	8

¹Test sample passing not permitted at this stage.²Test sample failure not permitted at this stage.

Table 4

Sample Plan for Code Letter "C"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1	(¹)	(²)
2	(¹)	(²)
3	(¹)	(²)
4	(¹)	(²)
5	(¹)	4
6	(¹)	4
7	(¹)	4
8	(¹)	4
9	(¹)	4
10	(¹)	5
11	(¹)	5
12	0	5
13	0	5
14	0	5
15	0	5
16	0	5
17	0	6
18	1	6
19	1	6
20	1	6
21	1	6
22	1	7
23	1	7
24	2	7
25	2	7
26	2	7
27	2	7
28	2	7
29	3	8
30	3	8
31	3	8
32	3	8
33	3	8
34	3	8
35	4	9
36	4	9
37	4	9
38	4	9
39	4	9
40	4	9
41	5	9
42	5	9
43	5	9
44	5	9
45	5	9
46	6	9
47	6	9
48	6	9
49	6	9
50	8	9

¹Test sample passing not permitted at this stage.²Test sample failure not permitted at this stage.

Table 5

Sample Plan for Code Letter "D"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1	(¹)	(²)
2	(¹)	(²)
3	(¹)	(²)
4	(¹)	(²)
5	(¹)	4
6	(¹)	4
7	(¹)	4
8	(¹)	4
9	(¹)	5
10	(¹)	5
11	(¹)	5
12	(¹)	5
13	0	5
14	0	5
15	0	5
16	0	6
17	0	6
18	1	6
19	1	6
20	1	6
21	1	6
22	1	7
23	1	7
24	2	7
25	2	7
26	2	7
27	2	7
28	2	8
29	2	8
30	3	8
31	3	8
32	3	8
33	3	8
34	3	9
35	3	9
36	4	9
37	4	9
38	4	9
39	4	9
40	4	9
41	4	10
42	5	10
43	5	10
44	5	10
45	5	10
46	5	10
47	5	11
48	6	11
49	6	11
50	6	11
51	6	11
52	6	11
53	7	11
54	7	11
55	7	11
56	7	11
57	7	11
58	7	11
59	8	11
60	10	11

¹Test sample passing not permitted at this stage.²Test sample failure not permitted at this stage.

Table 6

Sample Plan for Code Letter "E"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1	(¹)	(²)
2	(¹)	(²)
3	(¹)	(²)
4	(¹)	4
5	(¹)	4
6	(¹)	4
7	(¹)	4
8	(¹)	4
9	(¹)	4
10	(¹)	4
11	(¹)	4
12	(¹)	4
13	0	5

Stage	Pass No.	Fail No.
14.....	0	5
15.....	0	6
16.....	0	6
17.....	0	6
18.....	0	6
19.....	1	6
20.....	1	6
21.....	1	7
22.....	1	7
23.....	1	7
24.....	2	7
25.....	2	7
26.....	2	7
27.....	2	7
28.....	2	8
29.....	2	8
30.....	3	8
31.....	3	8
32.....	3	8
33.....	3	8
34.....	3	9
35.....	3	9
36.....	4	9
37.....	4	9
38.....	4	9
39.....	4	9
40.....	4	10
41.....	4	10
42.....	5	10
43.....	5	10
44.....	5	10
45.....	5	10
46.....	5	11
47.....	5	11
48.....	6	11
49.....	6	11
50.....	6	11
51.....	6	11
52.....	6	12
53.....	6	12
54.....	7	12
55.....	7	12
56.....	7	12
57.....	7	12
58.....	7	12
59.....	7	12
60.....	8	12
61.....	8	12
62.....	8	12
63.....	8	12
64.....	8	12
65.....	8	12
66.....	9	12
67.....	9	12
68.....	9	12
69.....	9	12
70.....	11	12

¹Test sample passing not permitted at this stage.

²Test sample failure not permitted at this stage.

Table 7

Sample Plan for Code Letter "F"

Sample Inspection Criteria

Stage	Pass No.	Fail No.
1.....	(¹)	(²)
2.....	(¹)	(²)
3.....	(¹)	(²)
4.....	(¹)	4
5.....	(¹)	4
6.....	(¹)	4
7.....	(¹)	4
8.....	(¹)	4
9.....	(¹)	5
10.....	(¹)	5
11.....	(¹)	5
12.....	(¹)	5
13.....	0	5
14.....	0	5
15.....	0	6

Stage	Pass No.	Fail No.
16.....	0	6
17.....	0	6
18.....	0	6
19.....	1	6
20.....	1	6
21.....	1	7
22.....	1	7
23.....	1	7
24.....	1	7
25.....	2	7
26.....	2	7
27.....	2	8
28.....	2	8
29.....	2	8
30.....	2	8
31.....	3	8
32.....	3	8
33.....	3	9
34.....	3	9
35.....	3	9
36.....	3	9
37.....	4	9
38.....	4	9
39.....	4	10
40.....	4	10
41.....	4	10
42.....	5	10
43.....	5	10
44.....	5	10
45.....	5	11
46.....	5	11
47.....	5	11
48.....	5	11
49.....	6	11
50.....	6	11
51.....	6	12
52.....	6	12
53.....	6	12
54.....	6	12
55.....	7	12
56.....	7	12
57.....	7	13
58.....	7	13
59.....	7	13
60.....	7	13
61.....	8	13
62.....	8	13
63.....	8	14
64.....	8	14
65.....	8	14
66.....	8	14
67.....	9	14
68.....	9	14
69.....	9	14
70.....	9	14
71.....	9	14
72.....	9	14
73.....	10	14
74.....	10	14
75.....	10	14
76.....	10	14
77.....	10	14
78.....	10	14
79.....	11	14
80.....	13	14

¹Test sample passing not permitted at this stage.

²Test sample failure not permitted at this stage.

APPENDIX XII

SAMPLING PLANS FOR PRODUCTION COMPLIANCE
AUDITING OF HEAVY-DUTY ENGINES

Table 1

Sampling Plan Code Letter

Annual Sales	Code Letter
50-99	A
100-399	B
400-599	C
600 or greater	D

Table 2

Test Sample Passing and Failure Criteria;
Maximum Size

Code Letter	Fail No. With Respect to Upper Limits*	Maximum Test Sample Size
A.....	4	17
B.....	5	21
C.....	6	26
D.....	6	27

*Fail Number with respect to Standard for those pollutants for which no upper limits has been established.

24. A new Subpart N is proposed to be added to Part 86 and reads as follows:

Subpart N—Emission Regulations for New Gasoline-Fueled and Diesel Heavy-Duty Engines; Gaseous Exhaust Test Procedures

Sec.	
86.1301-83	Scope; applicability.
86.1302-83	Definitions.
86.1303-83	Abbreviations.
86.1304-83	Section numbering; construction.
86.1305-83	Introduction; structure of subpart.
86.1306-83	Equipment required and specifications; overview.
86.1307-83	[Reserved]
86.1308-83	Dynamometer and engine equipment specifications.
86.1309-83	Exhaust gas sampling system.
86.1310-83	[Reserved]
86.1311-83	Exhaust gas analytical system.
86.1312-83	[Reserved]
86.1313-83	Fuel specifications.
86.1314-83	Analytical gases.
86.1315-83	EPA heavy-duty transient engine cycles.
86.1316-83	Calibrations; frequency and overview.
86.1317-83	[Reserved]
86.1318-83	Engine dynamometer calibrations.
86.1319-83	CVS calibration.
86.1320-83	[Reserved]
86.1321-83	Hydrocarbon analyzer calibration.
86.1322-83	Carbon monoxide analyzer calibration.
86.1323-83	Oxides of nitrogen analyzer calibration.
86.1324-83	Carbon dioxide analyzer calibration.
86.1325-83	[Reserved]
86.1326-83	Calibration of other equipment.
86.1327-83	Engine dynamometer test procedures; overview.
86.1328-83	[Reserved]
86.1329-83	[Reserved]
86.1330-83	Test sequence; general requirements.
86.1331-83	[Reserved]
86.1332-83	Pre-test procedures.
86.1333-83	[Reserved]
86.1334-83	[Reserved]
86.1335-83	[Reserved]
86.1336-83	Engine starting and restarting.
86.1337-83	Engine dynamometer test run.
86.1338-83	[Reserved]
86.1339-83	[Reserved]
86.1340-83	Exhaust sample analysis.
86.1341-83	[Reserved]
86.1342-83	Information required.
86.1343-83	[Reserved]
86.1344-83	Calculations; exhaust emissions.

Subpart N—Emission Regulations for New Gasoline-Fueled and Diesel Heavy-Duty Engines; Gaseous Exhaust Test Procedures

§ 86.1301-83 Scope; applicability.

This subpart contains gaseous emission test procedures for gasoline-fueled and diesel heavy-duty engines. It applies to 1983 and later model years.

§ 86.1302-83 Definitions.

The definitions in § 86.083-2 apply to this subpart.

§ 86.1303-83 Abbreviations.

The abbreviations in § 86.083-3 apply to this subpart.

§ 86.1304-83 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designated the first model year for which a section is effective. A section remains effective until superseded.

EXAMPLE: Section § 86.1311-83 applies to the 1983 and subsequent model years until superseded. If § 86.1311-85 is promulgated it would take effect beginning with the 1985 model year; § 86.1311-83 would apply to model years 1983 and 1984.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to both gasoline-fueled and diesel heavy-duty engines.

§ 86.1305-83 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform exhaust emission tests on gasoline-fueled and diesel heavy-duty engines. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1306 through 86.1315 set forth specifications and

equipment requirements; §§ 86.1316 through 86.1326 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximately chronological order) in §§ 86.1327 through 86.1342; and calculation formulas are found in § 86.1344.

§ 86.1306-83 Equipment required and specifications; overview.

(a) This subpart contains procedures for exhaust emissions tests on diesel or gasoline-fueled heavy-duty engines. Equipment required and specifications are as follows:

(1) *Exhaust emission test.* All engines subject to this subpart are tested for exhaust emissions. Diesel and gasoline-fueled engines are tested identically with the exception of hydrocarbon measurements; diesel engines require a heated hydrocarbon detector, § 86.1309. Necessary equipment and specifications appear in sections 86.1308 through 86.1311.

(2) *Fuel, analytical gas, and engine cycle specifications.* Fuel specifications for exhaust emission testing and for service accumulation for gasoline-fueled and diesel engines are specified in § 86.1313. Analytical gases are specified in § 86.1314. The EPA Heavy-Duty Transient Engine Cycles for use in exhaust testing are specified in § 86.1315 and Appendix I.

§ 86.1307-83 [Reserved]

§ 86.1308-83 Dynamometer and engine equipment specifications.

(a) *Engine dynamometer.*

(1) The engine dynamometer system must be capable of transiently controlling engine torque and rpm, simultaneously on a transient cycle. The transient torque and rpm schedules listed in § 86.1315 and Appendix I (f and g) must be followed within the accuracy requirements specified in § 86.1315. In addition, to these general requirements, the dynamometer shall meet the following accuracy specifications:

- (i) Engine speed shall be accurate to within 2 percent of point at all speeds.
- (ii) Engine torque at the flywheel

shall be accurate to within 3 percent of point at all torque settings above 10 percent of full-scale. Below 10 percent of full-scale the accuracy shall be within 5 percent of point.

(2) *Dynamometer calibration weights.* A minimum of 6 calibration weights for each range used are required. The weights must be equally spaced and accurate to 0.5 percent of NBS weights. Laboratories located in foreign countries may certify calibration weights to local government bureau standards.

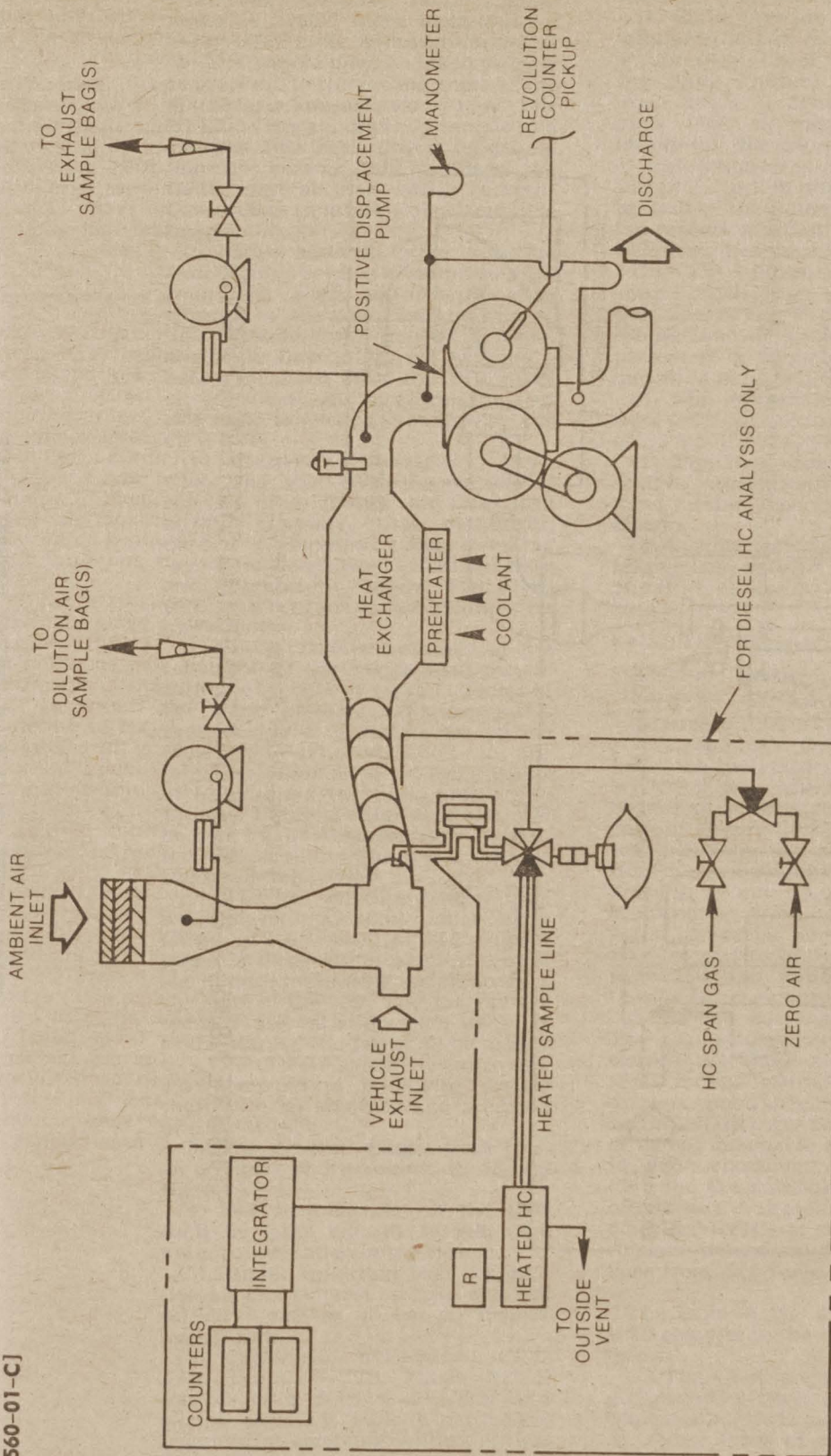
§ 86.1309-83 Exhaust gas sampling system.

(a)(1) *General.* The exhaust gas sampling system is designed to measure the true mass emissions of engine exhaust. In the CVS concept of measuring mass emissions, two conditions must be satisfied; the total volume of the mixture of exhaust and dilution air must be measured, and a continuously proportioned sample of volume must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

(2) *Positive displacement pump.* The positive displacement pump—constant volume sampler (PDP-CVS), Figure N83-1, satisfies the first condition by metering at a constant temperature and pressure through the pump. The total volume is measured by counting the revolutions made by the calibrated positive displacement pump. The proportional sample is achieved by sampling at a constant flow rate.

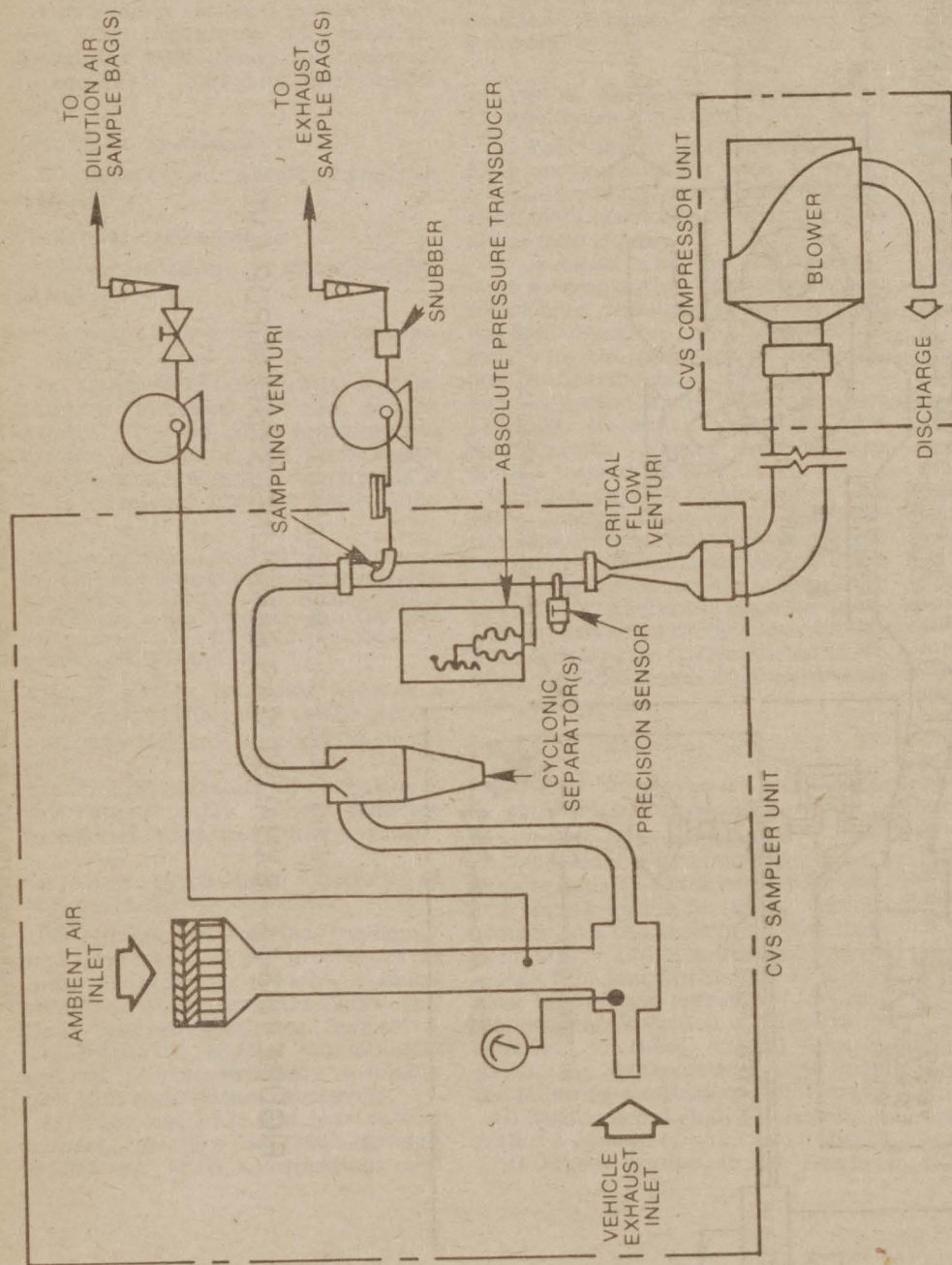
(3) *Critical flow venturi.* The operation of the critical flow venturi—constant volume sampler (CFV-CVS), Figure N83-2, is based upon the principles of fluid dynamics associated with critical flow. Proportional sampling throughout temperature excursions is maintained by use of a small CFV in the sample line. The variable mixture flow rate is maintained at sonic velocity, which is directly proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at both venturi inlets, the sample volume is proportional to the total volume.

[6560-01-C]



(SEE FIG. N83-3 FOR SYMBOL LEGEND)

FIGURE N83-1 — EXHAUST GAS SAMPLING SYSTEM PDP-CVS



(SEE FIG. N83-3 FOR SYMBOL LEGEND)

FIGURE N83-2 — EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

[6560-01-M]

(4) *Diesel sampling.* Diesel engines require a heated flame ionization detector (HFID) for hydrocarbon analysis. The sample must be taken as close as practical to the mixing point of the dilution air and exhaust sample. The HFID, by design, draws its sample at a constant flow rate. Unless compensation for varying flow is made the HFID must be used with a constant flow system to insure a representative sample.

(5) *Other systems.* Other sampling systems may be used if shown to yield equivalent results, and if approved in advance by the Administrator (e.g., a heat exchanger with the CFV-CVS; an electronic flow integrator without a heat exchanger, with the PDP-CVS; or, for diesel HC measurements, an electronic flow compensator with the CFV-CVS).

(b) *Component description, PDP-CVS.* The PDP-CVS, Figure D83-1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the engine shall remain within ± 5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer engine cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ± 1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within $\pm 10^\circ\text{F}$ (5.6°C) of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to $\pm 10^\circ\text{F}$ (5.6°C) during the entire test. The temperature measuring system shall have an accuracy and precision of $\pm 2^\circ\text{F}$ (1.1°C).

(3) The pressure gauges shall have an accuracy and precision of ± 3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to eliminate water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be sufficient size so as not to impede sample flow.

(c) *Component description, CFV-CVS.* The CFV-CVS, Figure N83-2, consists of a dilution air filter and mixing assembly, cyclone particulate separator(s), sampling venturi, critical flow venturi, sampling system, and assorted valves, pressure and temperature sensors.

The CFV-CVS shall conform to the following requirements:

(1) Static pressure variations at the tailpipe(s) of the vehicle shall remain within ± 5 inches of water (1.2 kPa) of the static pressure variations measured during a dynamometer engine cycle with no connection to the tailpipe(s). (Sampling systems capable of maintaining the static pressure to within ± 1 inch of water (0.25 kPa) will be used by the Administrator if a written request substantiates the need for this closer tolerance.)

(2) The temperature measuring system shall have an accuracy and precision of $\pm 2^\circ\text{F}$ (1.1°C) and a response time of 0.100 seconds to 62.5 percent of a temperature change (as measured in hot silicone oil).

(3) The pressure measuring system shall have an accuracy and precision of ± 3 mm Hg (0.4 kPa).

(4) The flow capacity of the CVS shall be large enough to virtually eliminate water condensation in the system.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow.

§ 86.1310-83 [Reserved]**§ 86.1311-83 Exhaust gas analytical system.**

(a) *Schematic drawings.* Figure N83-3 is a schematic drawing of the exhaust gas analytical system. The schematic of the hydrocarbon analysis train for diesel engines is shown as part of Figure N83-1. Since various configurations can produce accurate results, exact conformance with either drawing is not required. Additional components such as instruments, valves, solenoids, pumps and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) *Major component description.* The analytical system, Figure N83-3, consists of a flame ionization detector (FID) for the determination of hydrocarbons, nondispersive infrared analyzers (NDIR) for the determination of carbon monoxide and carbon dioxide and a chemiluminescence analyzer (CL) for the determination of oxides of nitrogen. A heated flame ionization detector (HFID) is used for the continuous determination of hydrocarbons from diesel engines, Figure N83-1.

The exhaust gas analytical system shall conform to the following requirements:

(1) The CL requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

[6560-01-C]

FOR DIESEL HC ANALYSIS
SEE FIG. N83-1

OPEN TO ATMOSPHERE

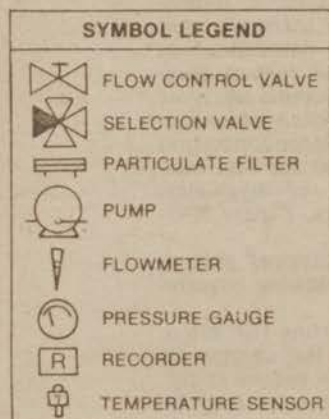
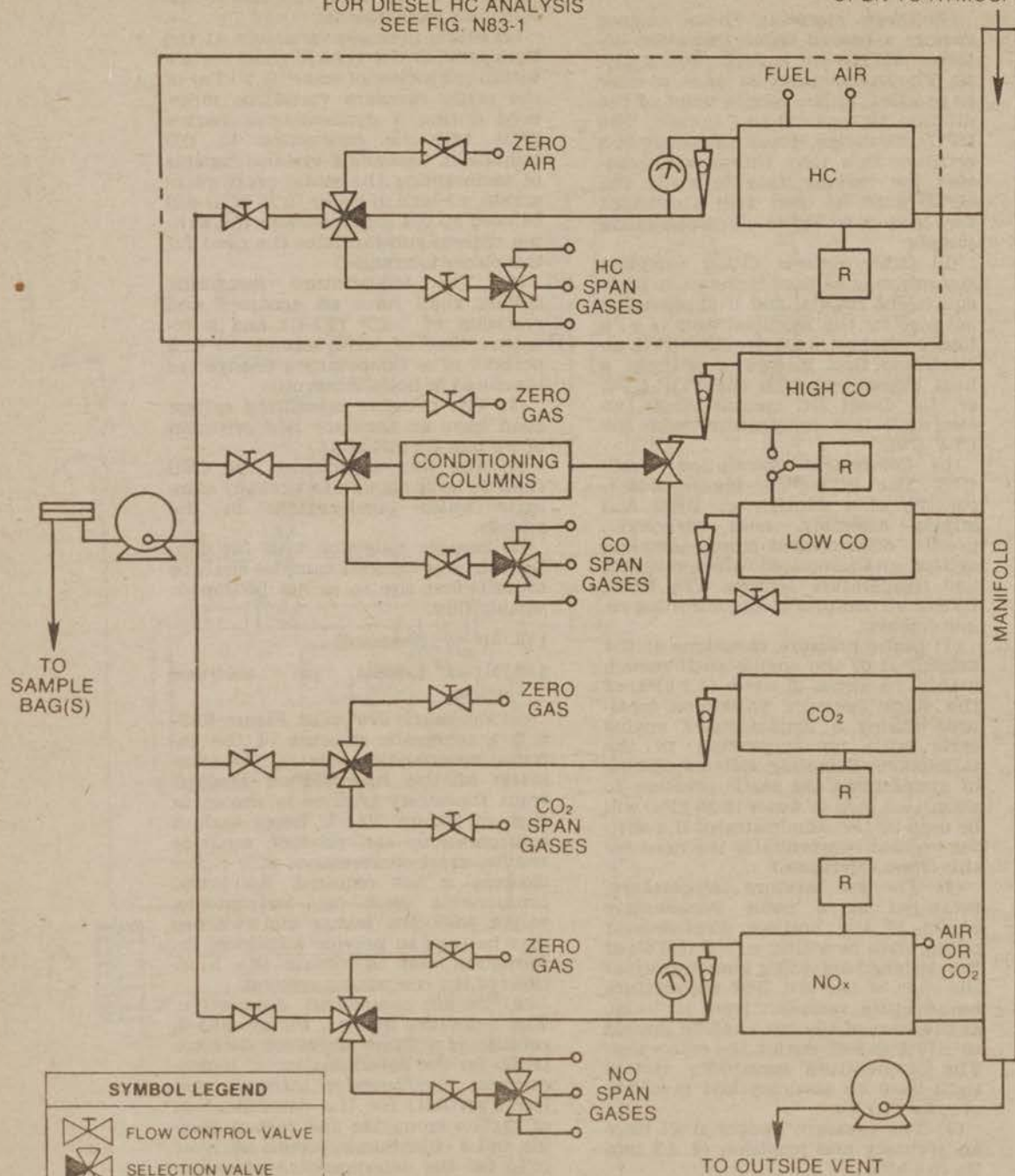


FIGURE N83-3 EXHAUST GAS ANALYTICAL SYSTEM

[6560-01-M]

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing CaSO_4 , or indicating silica gel to remove water vapor and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments which are essentially free of CO_2 and water vapor interference are used, the use of the conditioning column may be deleted, see § 86.1322 and § 86.1344.

(ii) A CO instrument will be considered to be essentially free of CO_2 and water vapor interference if its response to a mixture of 3 percent CO_2 in N_2 which has been bubbled through water at room temperature produces an equivalent CO response, as measured on the most sensitive CO range, which is less than 1 percent of full scale CO concentration on ranges above 300 ppm full scale or less than 3 ppm on ranges below 300 ppm full scale, see § 86.1322.

(3) For diesel engines a continuous sample shall be measured using a heated analyzer train as shown in Figure N83-1. The train shall include a heated continuous sampling line, a heated particulate filter, and a heated hydrocarbon instrument (HFID) complete with heated pump, filter and flow control system.

(i) The response time of this instrument shall be less than 1.5 seconds for 90 percent of full-scale response.

(ii) Sample transport time from sampling point to inlet of instrument shall be less than 4 seconds.

(iii) The sample line and filter shall be heated to a set point $\pm 10^\circ\text{F}$ ($\pm 5.6^\circ\text{C}$) between 300 and 390°F (149 and 199°C).

(c) Other analyzers and equipment. Other types of analyzers and equipment may be used if shown to yield equivalent results and if approved in advance by the Administrator.

§ 86.1312-83 [Reserved]

§ 86.1313-83 Fuel specifications.

(a) Gasoline. (1) Gasoline having the following specifications will be used by the Administrator in exhaust emission testing. Gasoline having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used by the manufacturer in exhaust testing, except that the lead and octane specifications do not apply.

Item	ASTM	Leaded	Unleaded
Octane, research, minimum	D2699	98	93
Pb. (organic), gm/U.S. gallon		1.4	0.00-0.05
Distillation range:			
IBP, °F	D86	75-95	75-95
10 percent point, °F	D86	120-135	120-135
50 percent point, °F	D86	200-230	200-230
90 percent point, °F	D86	300-325	300-325
EP, °F (maximum)	D86	415	415
Sulphur, weight percent (max)	D1266	0.10	0.10
Phosphorus, gm/US. Gallon (max)		0.01	0.005
RVP, psi	D323	8.7-9.2	8.7-9.2
Hydrocarbon composition:			
Olefins, percent (max)	D1319	10	10
Aeromatics, percent (max)	D1319	35	35
Saturates	D1319	(¹)	(²)

¹Minimum.

²Remainder.

(2) Gasoline representative of commercial gasoline which will be generally available through retail outlets shall be used in service accumulation. For leaded gasoline the minimum lead content shall be 1.4 grams per U.S. gallon, except that where the Administrator determines that vehicles represented by a test vehicle will be operated using gasoline of different lead content than that prescribed in this paragraph, he may consent in writing to use of a gasoline with a different lead content. The octane rating of the gasoline used shall be not higher than 1.0 Research octane number above the minimum recommended by the manufacturer and have a minimum sensitivity of 7.5 octane numbers, where sensitivity is defined as the Research octane number minus the Motor octane number. The Reid Vapor Pressure of the gasoline used shall be characteristic of the motor fuel used

during the season in which the service accumulation takes place.

(3) The specification range of the gasoline to be used under paragraph (a)(2) of this section shall be reported in accordance with § 86.083-21(b)(3).

(b) Diesel fuel. (1) The diesel fuels employed for testing shall be clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, and dispersant.

(2) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust emissions testing. The grade of diesel fuel recommended by the engine manufacturer commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used.

Item	ASTM	Type 1-D	Type 2-D
Cetane	D613	48-54	42-50
Distillation range:			
IBP, °F	D86	330-390	340-400
10 percent point, °F	D86	370-430	400-460
50 percent point, °F	D86	410-480	470-540
90 percent point, °F	D86	460-520	550-610
EP, °F	D86	500-560	580-660
Gravity, °API	D287	40-44	33-37
Total Sulfur, percent	D129 or D2622	0.05-0.20	0.2-0.5
Hydrocarbon composition:			
Aromatics, percent	D1319	8	27
Paraffins, Naphthenes, Olefins	D1319	(¹)	(²)
Flashpoint, °F (minimum)	D93	120	130
Viscosity, Centistokes	D445	1.6-2.0	2.0-3.2

¹Minimum.

²Remainder.

(3) Diesel fuel meeting the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in service accumulation. The grade of diesel fuel recommended by the engine manufacturer, commercially designated as "Type 1-D" or "Type 2-D" grade diesel fuel shall be used.

Item	ASTM	Type 1-D	Type 2-D
Cetane (minimum)	D613	42-56	30-58
Distillation range:			
90 percent point, °F	D86	440-530	540-630
Gravity °APM	D287	39-45	30-42
Total sulfur, percent (minimum)	D129 or D2622	0.05	0.2
Flashpoint, °F (minimum)	D93	120	130
Viscosity, centistokes	D455	1.2-2.2	1.5-4.5

¹Minimum.

(4) Other petroleum distillate fuels may be used for testing and service accumulation provided that are commercially available, and

(i) Information, acceptable to the Administrator, is provided to show that only the designated fuel would be used in customer service, and

(ii) Use of a fuel listed under paragraphs (b)(2) and (b)(3) of this section would have a detrimental effect on emissions or durability, and

(iii) Written approval from the Administrator of the fuel specifications must be provided prior to the start of testing.

(5) The specification range of the fuels to be used under paragraphs (b)(2), (b)(3), and (b)(4) of this section shall be reported in accordance with § 86.083-21(b)(3).

§ 86.1314-83 Analytical gases.

(a) Analyzer gases.

(1) Gases for the CO and CO₂ analyzers shall be single blends of CO and CO₂, respectively using nitrogen as the diluent.

(2) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(3) Gases for the NO_x analyzer shall be single blends of NO named as NO_x with a maximum NO_x concentration of 5 percent of the nominal value using nitrogen as the diluent.

(4) Fuel for the FID shall be a blend of 40±2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response. 98 to 100% hydrogen fuel may be used with advance

approval of the Administrator.

(5) The allowable zero gas (air or nitrogen) impurity concentrations shall not exceed 1 ppm equivalent carbon response, 1 ppm carbon monoxide, 0.04 percent (400 ppm) carbon dioxide and 0.1 ppm nitric oxide.

(6)(a) "Zero-grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(b) Calibration gases shall be traceable to within 1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(c) Span gases shall be accurate to within 2 percent of true concentration, where true concentration refers to NBS gas standards, or other gas standards which have been approved by the Administrator.

(7) The use of proportioning and precision blending devices to obtain the required gas concentrations is allowable provided their use has been approved in advance by the Administrator.

§ 86.1315-83 EPA heavy-duty transient engine cycles.

(a) The heavy-duty transient engine cycles for gasoline-fueled and diesel engines are listed in Appendix I (f and g). These second-by-second listings are designed to represent transient torque and rpm maneuvers characteristic of heavy-duty vehicles. Both rpm and torque are normalized in these listings. To unnormalize rpm use the following equation:

$$\text{Actual RPM} = \frac{\% \text{RPM} (\text{Measured Rated RPM} - \text{Curb Idle RPM})}{100} + \text{Curb Idle RPM}$$

Torque is normalized to the maximum torque at the rpm listed with it. Therefore, to unnormalize the torque values in the cycle, the maximum torque curve for the engine in question must be used. The generation of the maximum torque curve is described in § 86.1332.

(b) *Example of the unnormalization procedure.* The following test point shall be unnormalized:

% RPM	% Torque
43	82

The test engine has these values:

Measured Rated RPM=3800 (Does not appear on given torque curve)
Curb Idle RPM=600

Maximum torque curve as illustrated in Figure N83-4

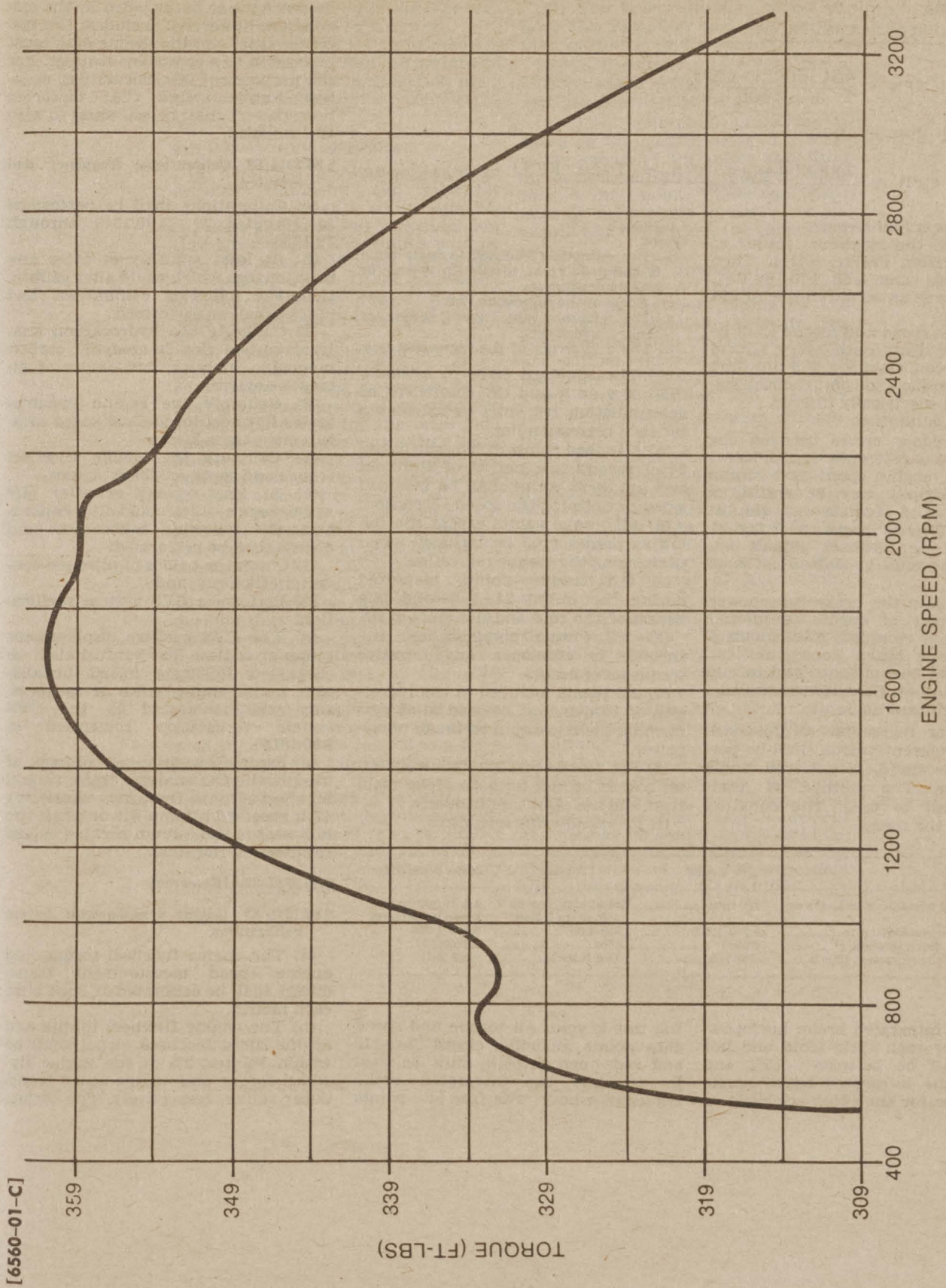


FIGURE N83-4 — SAMPLE MAXIMUM TORQUE CURVE FOR A GASOLINE-FUELED ENGINE.

[6560-01-M]

Calculate actual RPM:

$$\text{Actual RPM} = \frac{43(3800 - 600)}{100} + 600$$

$$\text{Actual RPM} = 1976$$

$$\text{Actual RPM} = \frac{\% \text{RPM}(\text{Rated RPM} - \text{Idle RPM})}{100} + \text{Idle RPM}$$

Determine actual torque:

Determine the maximum torque at 1976 rpm from Figure N83-4. Then multiply this value (358 ft-lb) by 0.82. This results in an actual torque of 294 ft-lbs.

(c) Engine speed and torque shall be recorded at least once every second during the cold start test and hot start test. The torque and rpm feedback signals may be electrically filtered.

(d) Cycle validation.

(1) To reduce errors between the feedback and reference (cycle trace) values the engine speed and torque feedback signals may be shifted a maximum of ± 5 seconds with respect to the reference speed and torque traces. If the feedback signals are shifted, both must be shifted the same amount.

(2) Calculate the brake horsepower for each pair of engine speed and torque values recorded. Also calculate the reference brake horsepower for each pair of engine speed and torque reference values. Calculations shall be to five significant digits.

(3) Linear regressions of feedback value on reference value shall be performed for speed, torque and brake horsepower. The method of least-square shall be used. The equation shall have the form:

$$y = mx + b$$

where:

y = The estimated feedback (actual) value of speed (in rpm), torque (in ft-lbs.), or brake horsepower.

m = Slope of the regression line.

x = The reference value (speed, torque, or brake horsepower).

b = The y intercept of the regression line.

(4) The standard error of estimate (SE) of y on x and the coefficient of determination (r^2) shall be calculated for each regression line.

(5) All speed points except the initial 24 ± 1 second idle period of the cold and hot start cycles shall be included when performing the speed regression.

(6) All torque points except the following points shall be included when performing the torque regression:

(i) All torque points measured during the initial 24 ± 1 second idle period of the cold and hot start cycle.

(ii) All torque points where the throttle is wide-open and negative torque error occurs.

(7) All points included in the regression on torque shall be used when performing the regression on brake horsepower.

(8) For a valid test the following criteria must be met for both cycles (cold start and hot start), individually:

(i) Regression line tolerances.

	Speed	Torque	Brake horsepower
Standard error of estimate (SE) of y on x	100 rpm	10% of max. engine torque (in ft-lbs.)	5% of maximum brake horsepower
Slope of the regression line, m	0.970-1.020	0.850-1.020	0.900-1.020
Coefficient of determination, r^2	0.9700 ¹	0.8800 ¹	0.9200(1)
y intercept of the regression line, b	± 50 rpm	± 10.0 ft-lbs	± 5.0 BHP

¹ Minimum.

(ii) The integrated brake horsepower-hour for each cycle (cold and hot start) shall be between -15% and +5% of the integrated brake horsepower-hour for the reference cycle or

the test is void. All torque and speed data points including closed throttle and wide-open throttle must be used to calculate the integrated brake horsepower-hour. The free idle points

do not have to be included in the calculation, however if included, the reference cycle and the engine data must be treated in a consistent manner. For the purposes of this calculation, negative torque values (i.e., motoring horsepower) shall be set equal to zero and included.

§ 86.1316-83 Calibrations; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1318 through 86.1326.

(b) At least monthly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Calibrate the hydrocarbon analyzer, carbon dioxide analyzer, carbon monoxide analyzer, and oxides of nitrogen analyzer.

(2) Calibrate the engine dynamometer flywheel torque and speed measurement transducers.

(3) Calibrate the engine flywheel torque and speed feedback signals.

(c) At least weekly or after any maintenance which could alter calibration, the following calibrations and checks shall be performed:

(1) Check the oxides of nitrogen converter efficiency, and

(2) Perform a CVS system verification.

(d) The CVS positive displacement pump or critical flow venturi shall be calibrated following initial installation, major maintenance or as necessary when indicated by the CVS system verification (described in § 86.1319).

(e) Sample conditioning columns, if used in the CO analyzer train, should be checked at a frequency consistent with observed column life or when the indicator of the column packing begins to show deterioration.

§ 86.1317-83 [Reserved]

§ 86.1318-83 Engine dynamometer system calibrations.

(a) The engine flywheel torque and engine speed measurement transducers shall be calibrated at least once each month.

(b) The engine flywheel torque and engine speed feedback signal shall be within 3% and 2% of the engine flywheel torque and engine speed transducer values, respectively. The torque

and speed feedback signal shall be calibrated at least once each month.

(c) Other engine dynamometer system calibrations shall be performed as dictated by good engineering practice and manufacturer's recommendations.

§ 86.1319-83 CVS calibration.

(a) The CVS is calibrated using an accurate flowmeter and restrictor valve. Measurements of various parameters are made and related to flow through the unit. Procedures used by EPA for both PDP- and CFV-CVS's are outlined below. Other procedures yielding equivalent results may be used if approved in advance by the Administrator.

(b) After the calibration curve has been obtained, verification of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system, e.g. analyzer calibration. A verification procedure is found in paragraph (c) of this section.

(c) PDP calibration.

(1) The following calibration procedure outlines the equipment, the test configuration, and the various parameters which must be measured to establish the flow rate of the CVS pump.

(i) All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump.

(ii) The calculated flow rate, $\text{ft}^3/\text{min.}$, (at pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters.

(iii) The linear equation which relates the pumpflow and the correlation function is then determined.

(iv) In the event that a CVS has a multiple speed drive, a calibration for each range used must be performed.

(2) This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve:

(i) The pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. (Pressure taps that are mounted at the top center and bottom center of the pump drive headplate are exposed to the actual pump cavity pressure, and therefore reflect the absolute pressure differentials.)

(ii) The temperature stability must be maintained during calibration. (The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes ($\pm 2^\circ\text{F}$ (1.1°C)) in temperature are acceptable as long as they occur over a period of several minutes.)

(iii) All connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

(3) During an exhaust emission test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

(4) Connect a system as shown in Figure N83-5. Although particular types of equipment are shown, other configurations that yield equivalent results may be used if approved in advance by the Administrator. For the system indicated, the following data with given accuracy are required:

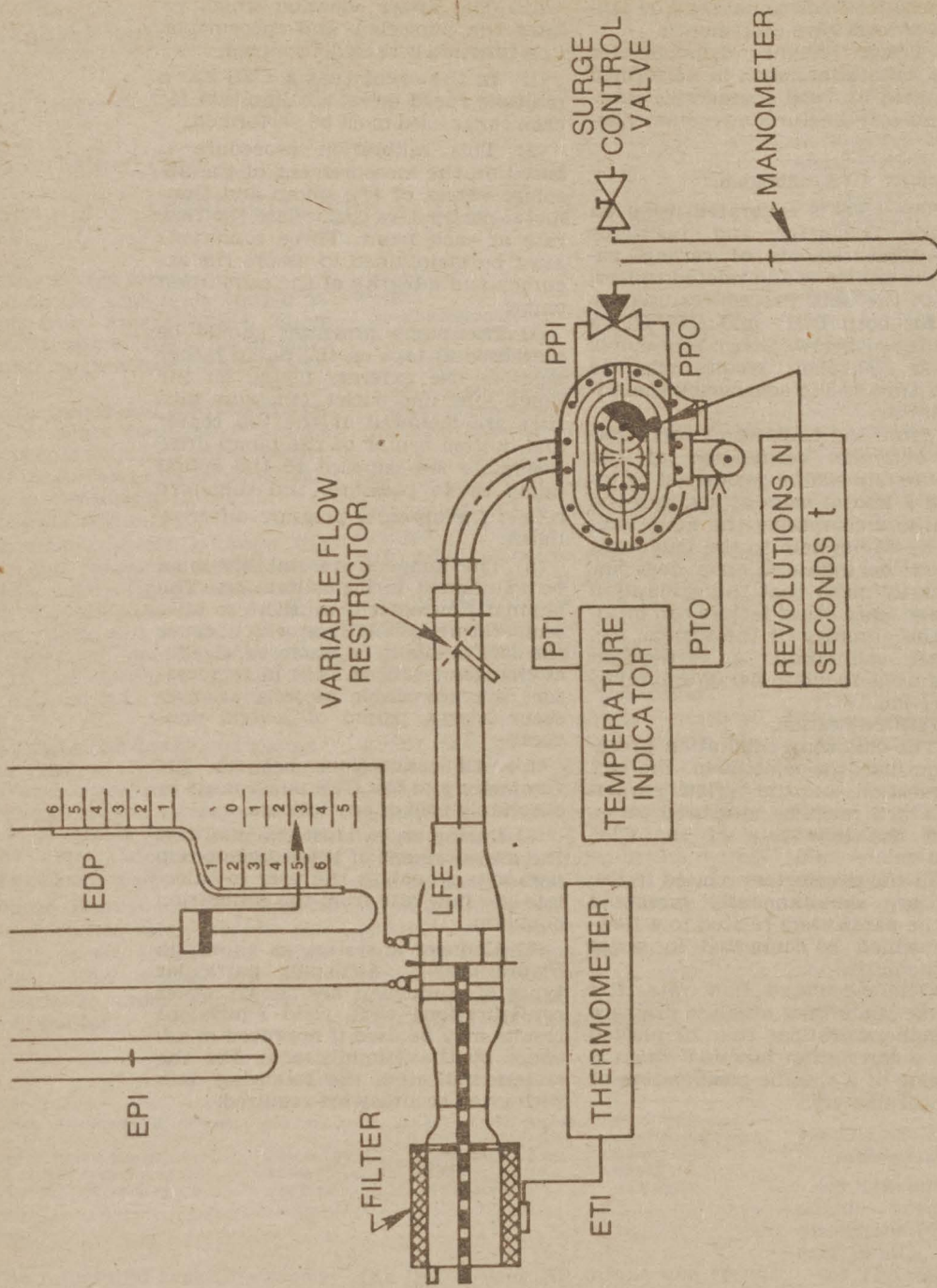


FIGURE N83-5 — PDP-CVS CALIBRATION CONFIGURATION

[6560-01-M]

CALIBRATION DATA MEASUREMENTS

Parameter	Sym	Units	Tolerances
Barometric pressure (corrected).....	P _B	in. Hg (kPa).....	±.01 in. Hg (±.034 kPa)
Ambient temperature.....	T _A	°F (°C).....	±.5° F (±.28° C)
Air temperature into LFE.....	ETI.....	°F (°C).....	±.25° F (±.14° C)
Pressure depression upstream of LFE.....	EPI.....	in. H ₂ O (kPa).....	±.05 in. H ₂ O (±.001 kPa)
Pressure drop across the LFE matrix.....	EDP.....	in. H ₂ O (kPa).....	±.005 in. H ₂ O (±.001 kPa)
Air temperature at CVS pump inlet.....	PTI.....	°F (°C).....	±.5° F (±.28° C)
Pressure depression at CVS pump inlet.....	PPI.....	in. Fluid (kPa).....	±.05 in. Fluid (±.022 kPa)
Specific gravity of manometer fluid (1.75 oil).....	Sp. G.....		
Pressure head at CVS pump outlet.....	PPO.....	in. Fluid (kPa).....	±.05 in. Fluid (±.022 kPa)
Air Temperature at CVS pump outlet (optional).....	PTO.....	°F (°C).....	±.5° F (±.28° C)
	N.....	Revs.....	±1 Rev.
Elapsed time for test period.....	t.....	s.....	±.05 s

(5) After the system has been connected as shown in Figure N83-4, set the variable restrictor in the wide open position and run the CVS pump for 20 minutes. Record the calibration data.

(6) Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (about 4" H₂O (1.1 kPa)) that will yield a minimum of six data points for the total calibration. Allow the system to stabilize for 3 minutes and repeat the data acquisition.

(7) Data analysis:

(i) The air flow rate, Q_s, at each test point is calculated in standard cubic feet per minute from the flow-meter data using the manufacturer's prescribed method.

(ii) The air flow rate is then converted to pump flow, V_p, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_p = \frac{Q_s}{n} \times \frac{T_p}{528} \times \frac{29.92}{P}$$

Where:

V_p = Pump flow, ft³/revolution (m³/revolution) at T_p, P_p.

Q_s = Meter air flow rate in standard cubic feet per minute, standard conditions are 68°F, 29.92 in. Hg (20°C, 101.3 kPa).

n = Pump speed in revolutions per minute.
T_p = Pump inlet temperature
R(K) = PTI + 460 for SI units,
T_p - PTI + 273
P_p = Absolute pump inlet pressure, in. Hg (kPa) = P_B - PPI (Sp. Gr./13.57) for SI units, P_p = P_B - PPI

Where:

P_B = barometric pressure, in. Hg (kPa).
PPI = Pump inlet depression, in. fluid (kPa).
Sp. Gr. = Specific gravity of manometer fluid relative to water.

(iii) The correlation function at each test point is then calculated from the calibration data.

$$x_o = \frac{1}{n} \sqrt{\frac{P_p}{P_e}}$$

Where:

x_o = correlation function.

ΔP_p = The pressure differential from pump inlet to pump outlet, in. Hg (kPa).

= P_p - P_p

P_e = Absolute pump outlet pressure, in. Hg (kPa) = P_B + PPO (Sp. Gr./13.57) for SI units, P_e = P_B + PPO

(b) CVF calibration

(1) Calibration of the CFV is based upon the flow equation for a critical venturi. Gas flow is a function of inlet pressure and temperature:

$$Q_s = \frac{K_v P}{\sqrt{T}}$$

Where:

Q_s = flow,

K_v = calibration coefficient,

P = absolute pressure,

T = absolute temperature.

The calibration procedure described below establishes the value of the calibration coefficient at measured values of pressure, temperature and air flow.

(2) The manufacturer's recommended procedure shall be followed for calibrating electronic portions or the CFV.

(3) Measurements necessary for flow calibration are as follows:

CALIBRATION DATA MEASUREMENTS

Parameter	Sym	Units	Tolerances
Barometric pressure (corrected).....	P _B	in. Hg (kPa).....	±.01 in. Hg (±.034 kPa)
Air temperature, flowmeter.....	ETI.....	°F (°C).....	±.25° F (±.14° C)
Pressure depression upstream of LFE.....	EPI.....	in. H ₂ O (kPa).....	±.05 in. H ₂ O (±.012 kPa)
Pressure drop across LFE matrix.....	EDP.....	in. H ₂ O (kPa).....	±.005 in. H ₂ O (±.001 kPa)
Air flow.....	Q _s	ft ³ /min. (m ³ /min.).....	±.5%
CFV inlet depression.....	PPI.....	in. fluid (kPa).....	±.05 in. fluid (±.022 kPa)
Temperature at venturi inlet.....	T _v	°F (°C).....	±.5° F (±.28° C)
*Specific gravity of manometer fluid (1.75 oil).....	*Sp. Gr.....		

(4) Set up equipment as shown in Figure N83-6 and check for leaks. Any leaks between the flow measuring devices and the critical flow venturi will seriously affect the accuracy of the calibration.

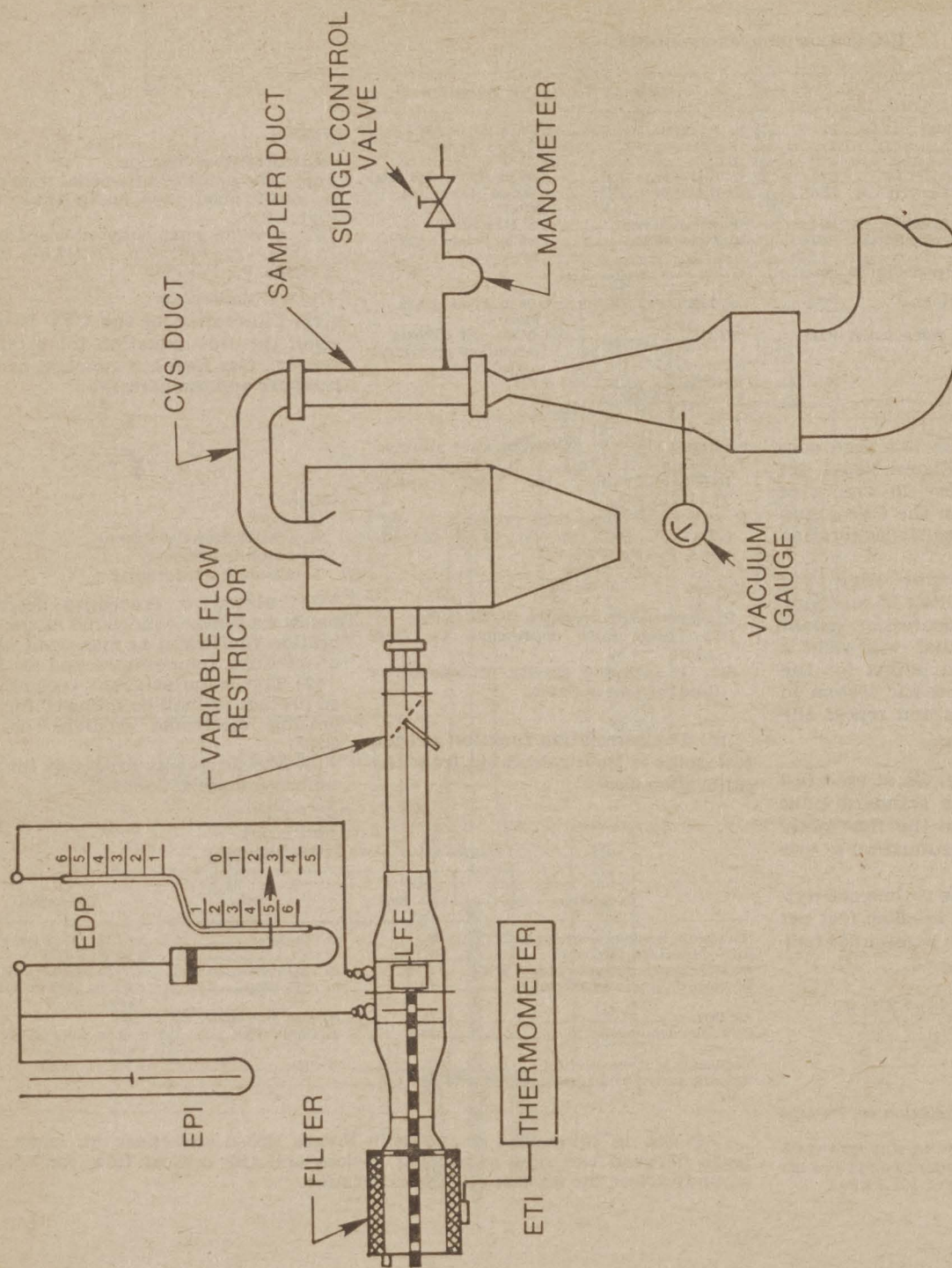


FIGURE N83-6 — CFV-CVS CALIBRATION CONFIGURATION

[6560-01-M]

(5) Set the variable flow restrictor to the open position, start the blower, and allow the system to stabilize. Record data from all instruments.

(6) Vary the flow restrictor and make at least 8 readings across the critical flow range of the venturi.

(7) *Data analysis.* The data recorded during the calibration are to be used in the following calculations:

(i) The air flow rate, Q_s , at each test point is calculated in standard cubic feet per minute from the flow meter data using the manufacturer's prescribed method.

(ii) Calculate values of the calibration coefficient for each test point:

$$K_v = \frac{Q_s \sqrt{T_v}}{P_v}$$

Where:

Q_s = Flow rate in standard cubic feet per minute, standard conditions are 68° F, 29.92 in. Hg (20° C, 101.3 kPa).

T_v = Temperature at venturi inlet, R(K).

P_v = Pressure at venturi inlet, mm Hg (kPa).

a = PPI (Sp. Gr./13.57).

for SI units: $P_v = a \cdot PPI$

Where:

PPI = Venturi inlet pressure depression, in. fluid (kPa).

Sp. Gr. = Specific gravity of manometer fluid, relative to water.

(iii) Plot K_v as a function of venturi inlet pressure. For sonic flow, K_v will have a relatively constant value. As pressure decreases (vacuum increases), the venturi becomes unchoked and K_v decreases. See Figure N83-7.

(iv) For a minimum of 8 points in the critical region calculate an average K_v and the standard deviation.

(v) If the standard deviation exceeds 0.3% of the average K_v , take corrective action.

(c) *CVS system verification.*

The following "gravimetric" technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system. (Verification can also be accomplished by constant flow metering using critical flow orifice devices.)

(1) Obtain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous).

[6560-01-C]

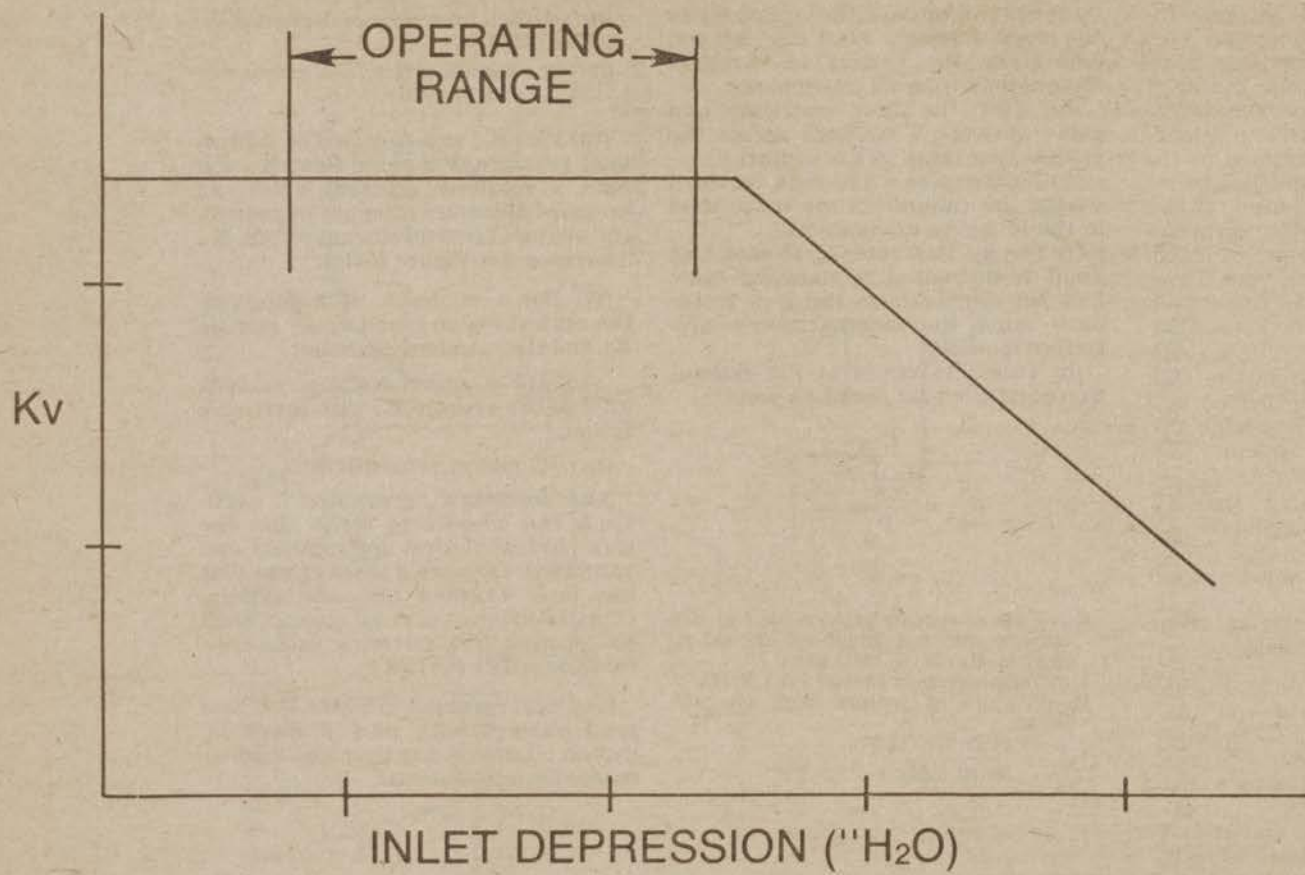


FIGURE N83-7 — SONIC FLOW CHOKING

(2) Determine a reference cylinder weight to the nearest 0.01 grams.

(3) Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period (approximately 5 minutes).

(4) The calculations of § 86.1344 are performed in the normal way except in the case of propane, the density of propane (17.30 g/ft³/carbon atom (0.6109 kg/m³/carbon atom)) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 g/ft³ (1.164 kg/m³) is used.

(5) The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

(6) The cause for any discrepancy greater than ±2 percent must be found and corrected.

§ 86.1320-83 [Reserved]

§ 86.1321-83 Hydrocarbon analyzer calibration.

The FID hydrocarbon analyzer shall receive the following initial and periodic calibration. The HFID shall be operated to a set point ±10° F (±5.5° C) between 300 and 390° F (149 and 199° C).

(a) Initial and periodic optimization of detector response. Prior to its introduction into service and at least annually thereafter the FID hydrocarbon analyzer shall be adjusted for optimum hydrocarbon response. Alternate methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow the manufacturer's instructions for instrument start-up and basic operating adjustment using the appropriate fuel (see § 86.1314) and zero-grade air.

(2) Optimize on the most common operating range. Introduce into the analyzer, a propane in air mixture with a propane concentration equal to approximately 90% of the most common operating range.

(3) Select an operating fuel flow rate that will give near maximum response and least variation in response with minor fuel flow variations.

(4) To determine the optimum air flow, use the fuel flow setting determined above and vary air flow.

(5) After the optimum flow rates have been determined, they are recorded for future reference.

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the FID hydrocarbon analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples.

(1) Adjust analyzer to optimize performance.

(2) Zero the hydrocarbon analyzer with zero-grade air.

(3) Calibrate on each used operating range with propane in air calibration gases having nominal concentrations of 15, 30, 45, 60, 75 and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2% or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2% at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

§ 86.1322-83 Carbon monoxide analyzer calibration.

The NDIR carbon monoxide analyzer shall receive the following initial and periodic calibrations:

(a) Initial and periodic interference check. Prior to its introduction into service and annually thereafter the NDIR carbon monoxide analyzer shall be checked for response to water vapor and CO₂.

(1) Follow the manufacturer's instructions for instrument start-up and operation. Adjust the analyzer to optimize performance on the most sensitive range to be used.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Bubble a mixture of 3 percent CO₂ in N₂ through water at room temperature and record analyzer response.

(4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or more than 3 ppm on ranges below 300 ppm full scale will require corrective action. (Use of conditioning columns is one

form of corrective action which may be taken.)

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the NDIR carbon monoxide analyzer shall be calibrated.

(1) Adjust the analyzer to optimize performance.

(2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

(3) Calibrate on each used operating range with carbon monoxide in N₂ calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

§ 86.1323-83 Oxides of nitrogen analyzer calibration.

The chemiluminescent oxides of nitrogen analyzer shall receive the following initial and periodic calibration.

(a) Prior to its introduction into service and weekly thereafter the chemiluminescent oxides of nitrogen analyzer shall be checked for NO₂ to NO converter efficiency. Figure N83-8 is a reference for the following steps:

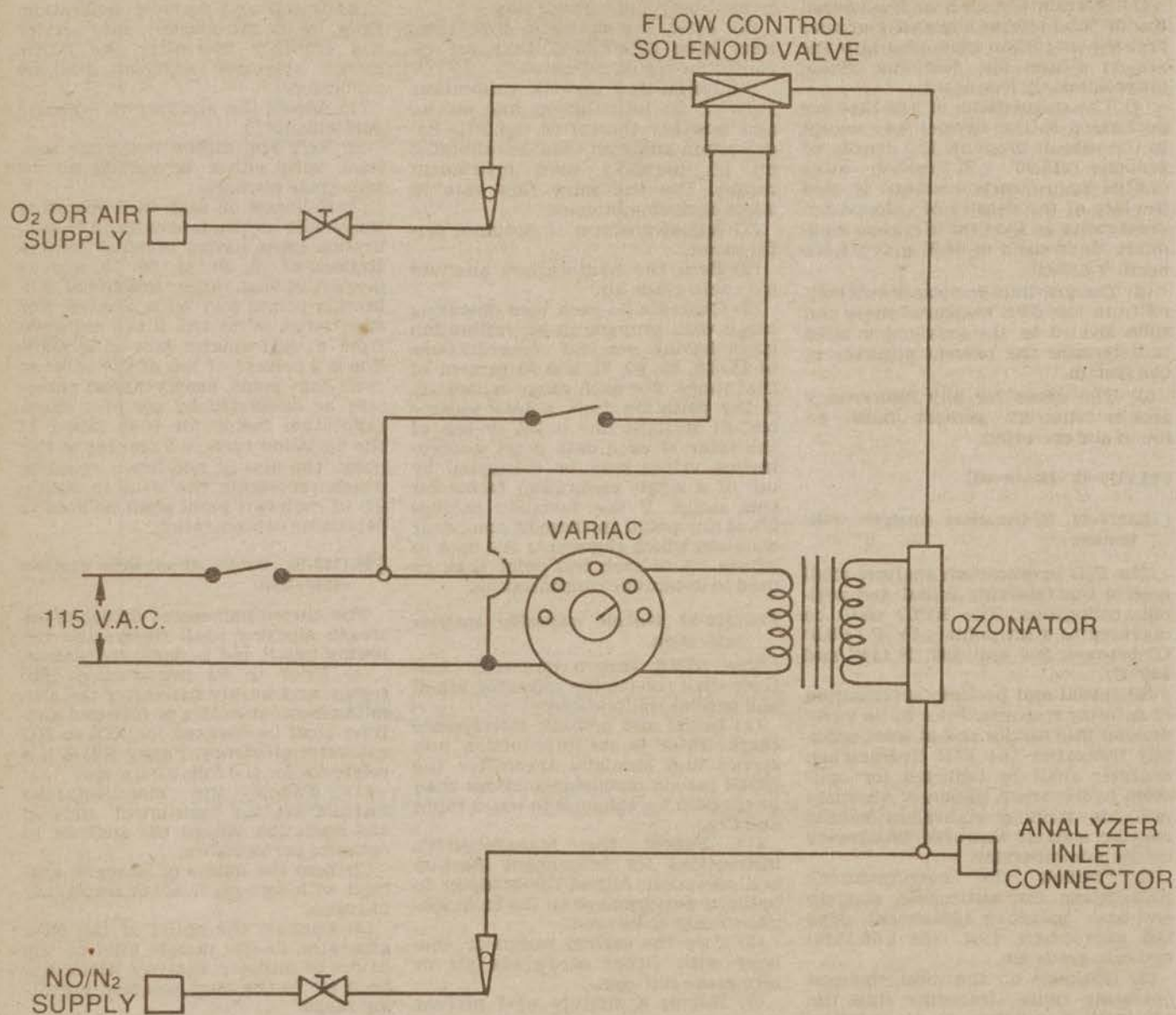
(1) Follow the manufacturer's instructions for instrument start-up and operation. Adjust the analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Connect the outlet of the NOx generator to the sample inlet of the oxides of nitrogen analyzer which has been set to the most common operating range.

(4) Introduce into the NOx generator analyzer-system an NO in nitrogen (N₂) mixture with a NO concentration equal to approximately 80 percent of the most common operating range. The NO₂ content of the gas mixture shall be less than 5 percent of the NO concentration.

[6560-01-C]



(SEE FIG. N83-3 FOR SYMBOL LEGEND)

FIGURE N83-8— NO_x CONVERTER EFFICIENCY DETECTOR

[6560-01-M]

(5) With oxides of nitrogen analyzer in the NO mode, record the concentration of NO indicated by the analyzer.

(6) Turn on the NOx generator O₂ (or air) supply and adjust the O₂ (or air) flow rate so that the NO indicated by the analyzer is about 10 percent less than indicated in step (5). Record the concentration of NO in this NO+O₂ mixture.

(7) Switch the NOx generator to the generation mode and adjust the generation rate so that the NO measured on the analyzer is 20 percent of that measured in step (5). There must be at least 10 percent unreacted NO at this point. Record the concentration of residual NO.

(8) Switch the oxides of nitrogen analyzer to the NOx mode and measure total NOx. Record this value.

(9) Switch off the NOx generator but maintain gas flow through the system. The oxides of nitrogen analyzer will indicate the NOx in the NO+O₂ mixture. Record this value.

(10) Turn off the NOx generator O₂ (or air) supply. The analyzer will now indicate the NOx in the original NO in N₂ mixture. This value should be no more than 5 percent above the value indicated in step (4).

(11) Calculate the efficiency of the NOx converter by substituting the concentrations obtained into the following equation:

$$\text{Percent Efficiency} = \left[1 + \left(\frac{a-b}{c-d} \right) \right] \times 100$$

where:

- a=concentration obtained in step (8),
- b=concentration obtained in step (9),
- c=concentration obtained in step (6),
- d=concentration obtained in step (7).

If converter efficiency is not greater than 90% corrective action will be required.

(b) Initial and periodic calibration. Prior to its introduction into service and monthly thereafter the chemiluminescent oxides of nitrogen analyzer shall be calibrated on all normally used instrument ranges. Use the same flow rate as when analyzing samples. Proceed as follows:

(1) Adjust analyzer to optimize performance.

(2) Zero the oxides of nitrogen analyzer with zero-grade air or zero-grade nitrogen.

(3) Calibrate on each normally used operating range with NO in N₂ calibration gases with nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2% or less of the value at each data point, concentration values may be

calculated by use of a single calibration factor for that range. If the deviation exceeds 2% at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

§ 86.1324-83 Carbon dioxide analyzer calibration.

Prior to its introduction into service and monthly thereafter the NDIR carbon dioxide analyzer shall be calibrated as follows:

(a) Follow the manufacturer's instructions for instrument start-up and operation. Adjust the analyzer to optimize performance.

(b) Zero the carbon dioxide analyzer with either zero-grade air or zero-grade nitrogen.

(c) Calibrate on each normally used operating range with carbon dioxide in N₂ calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2% of each test point shall be used to determine concentration.

§ 86.1325-83 [Reserved]

§ 86.1326-83 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.1327-83 Engine dynamometer test procedures; overview.

(a) The engine dynamometer test procedure is designed to determine the brake-specific emission of hydrocarbons, carbon monoxide, and oxides of nitrogen. The test procedure consists of a "cold" start test after a minimum 12-hour and a maximum 36-hour soak as described in § 86.1332. A "hot" start test follows the "cold" start test after a hot soak of 20 minutes. The idle test of subpart P may be run after the "hot" start test. The exhaust emissions are diluted with ambient air and a continuous proportional sample is collected for analysis during the cold and hot start tests. The composite samples collected in bags are analyzed for hydrocarbons (except diesel hydrocarbons which are analyzed continuously), carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly

analyzed for hydrocarbon, carbon monoxide, carbon dioxide, and oxides of nitrogen.

(b) Engine torque and rpm shall be recorded continuously during both the cold and hot start tests. Data points shall be recorded at least once every second.

(c) Using the torque and rpm feedback signals the brake horsepower is integrated with respect to time for the cold and hot cycles. This produces a brake horsepower-hour value that enables the brake-specific emissions to be determined (see § 86.1344, Calculations; exhaust emissions).

(d)(1) When an engine is tested for exhaust emissions or is operated for service accumulation on an engine dynamometer, the complete engine shall be tested, with all emission control devices installed and functioning.

(2) Evaporative emission controls need not be connected if data are provided to show that normal operating conditions are maintained in the engine induction system.

(3) On air cooled engines, the fan shall be installed.

(4) Additional accessories (e.g., oil cooler, alternators, air compressors, etc.) may be installed with advance approval by the Administrator.

(5) The engine must be equipped with a production type starter.

(e) *Engine cooling.* Means of engine cooling which will maintain the engine operating temperatures (e.g., intake air, oil, water, etc.) at approximately the same temperature as specified by the manufacturer shall be used. Auxiliary fan(s) may be used to maintain engine cooling during operation on the dynamometer.

(f) *Exhaust system.*

(1) A chassis-type exhaust system shall be used. The exhaust system shall meet the following requirements:

(i) For all catalyst systems, the distance from the exhaust manifold flange(s) to the catalyst shall be the same as in the vehicle configuration unless the manufacturer provides data showing equivalent performance at another location.

(ii) The exhaust back pressures shall typify those seen in the actual vehicle exhaust system configuration.

§ 86.1328-78 [Reserved]

§ 86.1329-83 [Reserved]

§ 86.1330-83 Test sequence, general requirements.

(a) The test sequence shown in Figure N83-9 shows the major steps encountered as the test engine undergoes the procedures subsequently described.

(b) The average ambient temperature of the test cell and engine intake air shall be maintained at 25° C ± 5° C

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(77° F $\pm$ 9° F) throughout the test sequence.

(c) During the generation of the maximum torque curve and the exhaust emission test runs, the humidity level shall be maintained at 75 ± 15 grains of water per pound of dry air and the barometer pressure shall not deviate more than 1 in. Hg from the value measured at the beginning of the test sequence.

(d) The idle test of Subpart P may be run after completion of the hot start exhaust emission test.

[6560-01-C]

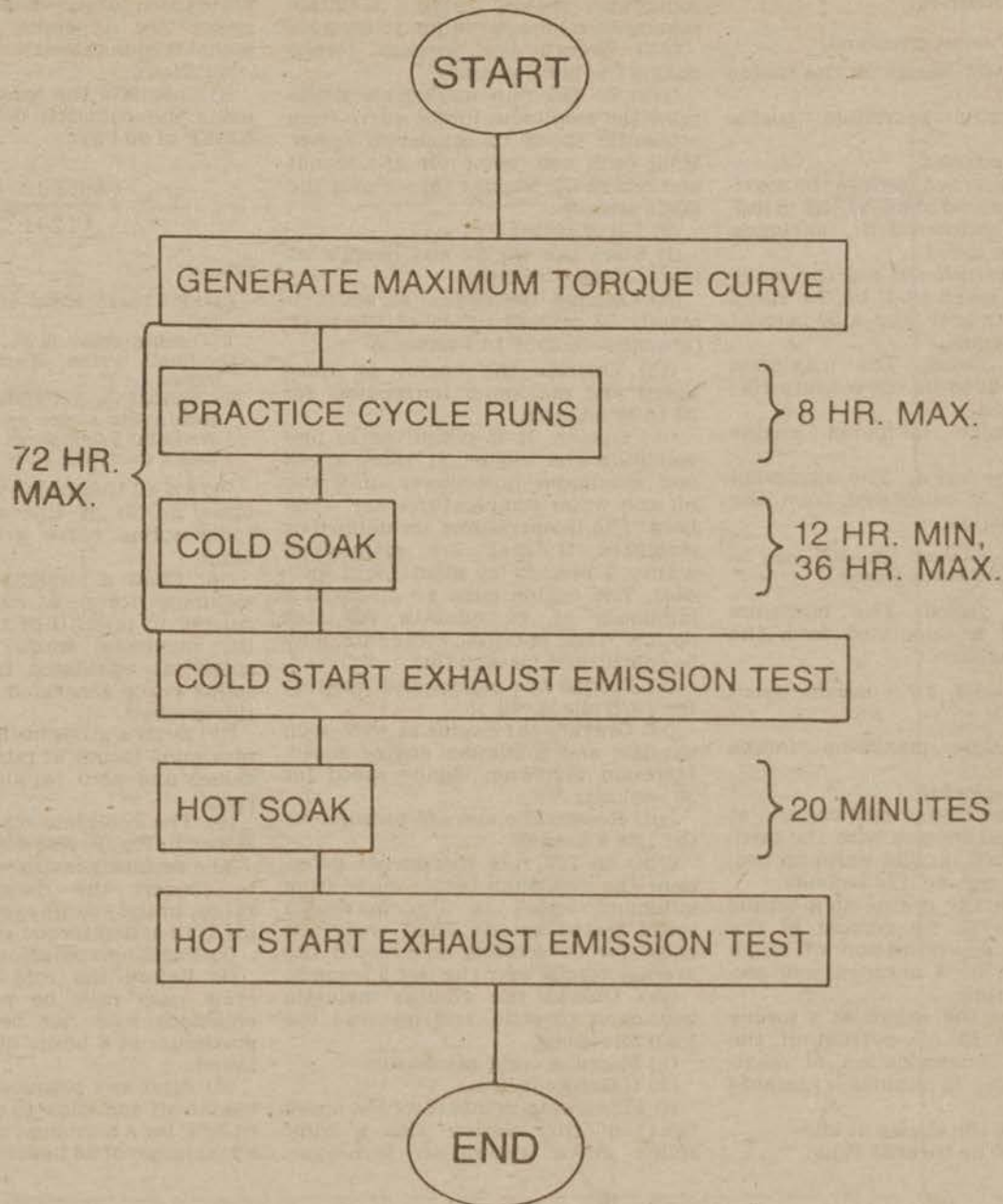


FIGURE N83-9 — TEST SEQUENCE

[6560-01-M]

§ 86.1331-83 [Reserved]

§ 86.1332-83 Pre-test procedures.

(a) Mount test engine on the engine dynamometer.

(b) Determine maximum engine speed.

(1) *Gasoline-fueled.*

(i) For ungoverned engines the maximum engine speed shall be the manufacturer's recommended maximum safe operating speed.

(ii) For governed engines the maximum engine speed shall be the speed at which there is at least a 50 percent drop-off in torque.

(2) *Diesel fueled.* The maximum engine speed shall be the manufacturer's rated speed.

(c) Determine minimum engine speed.

(1) *Gasoline-fueled.* The minimum engine speed is calculated from the following equation:
$$\text{minimum speed} = (\text{curb idle} - 200 \text{ rpm}) \text{ or } 400 \text{ rpm, whichever is greater.}$$
(2) *Diesel fueled.* The minimum engine speed is calculated from the following equation:
$$\text{minimum speed} = 0.6 \text{ (manufacturer's rated speed).}$$

(d) Determine maximum torque curve.

(1) *Gasoline-fueled.*(i) Start the engine and operate at zero load in accordance with the manufacturer's start-up and warm-up procedures for 1 minute $\pm$ 30 seconds.(ii) Operate the engine at a torque equivalent to 10 $\pm$ 3 percent of the most recent determination of maximum torque for 4 minutes $\pm$ 30 seconds at 2000 rpm.(iii) Operate the engine at a torque equivalent to 55 $\pm$ 5 percent of the most recent determination of maximum torque for 35 minutes $\pm$ 1 minute at 2000 rpm.

(iv) Operate the engine at idle.

(v) Operate the throttle fully.

(vi) While still maintaining wide-open throttle and full-load obtain minimum engine speed. Maintain minimum engine speed for 15 seconds.

(vii) Record the average torque during the last 5 seconds.

(viii) In 100 rpm increments determine the maximum torque curve from minimum speed to maximum speed. Hold each test point for 15 seconds and record the average torque over the last 5 seconds.

(2) *Diesel fueled.*

(i) Start the engine and operate at idle for 2 to 3 minutes.

(ii) Operate the engine at approximately 50 percent power at the peak torque speed for 5 to 7 minutes.

(iii) Operate the engine at rated speed and maximum horsepower for 25 to 30 minutes.

(iv) *Option.* It is permitted to precondition the engine at rated speed and maximum horsepower until the oil and water temperatures are stabilized. The temperatures are defined as stabilized if they are maintained within 2 percent of point for 2 minutes. The engine must be operated a minimum of 10 minutes for this option. This optional procedure may be substituted for step (iii).

(v) Unload the engine and measure the curb idle speed.

(vi) Operate the engine at wide-open throttle and minimum engine speed. Maintain minimum engine speed for 30 seconds.

(vii) Record the average torque over the last 5 seconds.

(viii) In 200 rpm increments determine the maximum torque curve from minimum speed to the maximum speed (rated speed). Hold each test point for 30 seconds and record the average torque over the last 5 seconds.

(ix) Unload the engine, maintain wide-open throttle, and measure the high idle speed.

(e) Mapping curve generation.

(1) *Gasoline-fueled.*

(i) Fit all data points recorded under (d)(1) of this section with a cubic spline curve generation technique.

The resulting curve is the mapping curve and will be used to convert the normalized torque values in the engine cycles (see Appendix I f and g) to actual torque values.

(2) *Diesel.*

(i) Calculate the torque at curb idle using the equation below. Assume a BMEP of 90 PSI.

$$T = \frac{(\text{BMEP})D (5252)}{(12)(33000)x}$$

Where:

BMEP = brake mean effective pressure, psi;

T = engine torque, lb.-ft.;

D = total piston displacement, cubic inches;

x = number of revolutions required for each power stroke delivered per cylinder—2 for a four-stroke cycle engine and 1 for a two-stroke cycle engine.

(ii) Fit all the torque values recorded under (d)(2) of this section with a cubic spline curve generation technique.

(iii) Draw a straight-line from the maximum torque at curb idle (as calculated in (e)(2)(i) of this section) to the maximum torque at minimum speed (as calculated from the cubic spline curve generated in (e)(2)(ii) of this section).

(iv) Draw a straight-line between the maximum torque at rated speed (curve value) and zero torque at high idle rpm.

(v) The complete mapping curve is shown in Figure N83-10.

The resulting mapping curve is used to convert the normalized torque values in the engine cycles (see Appendix I) to actual torque values.

(f) *Engine preparation.*

(i) Before the cold soak, practice cycle runs may be performed, but emissions may not be measured. A maximum of 8 hours of practice is allowed.

(ii) After any practice runs turn the engine off and allow to cold soak at 60° to 80°F for a minimum of 12 hours and a maximum of 36 hours.

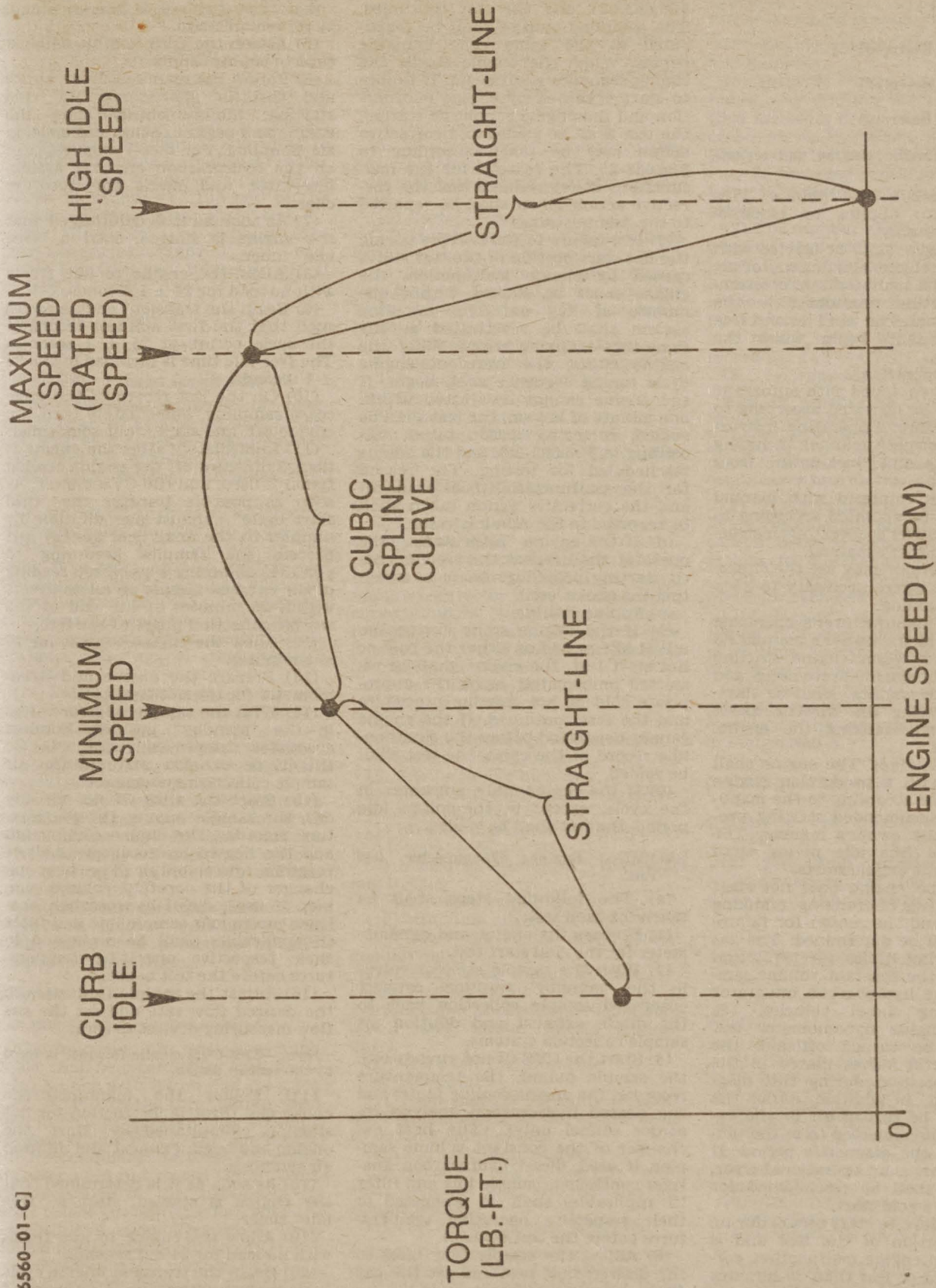


FIGURE N83-10 — MAPPING CURVE FOR DIESEL ENGINES

[6560-01-M]

§ 86.1333-83 [Reserved]

§ 86.1334-83 [Reserved]

§ 86.1335-83 [Reserved]

§ 86.1336-83 Engine starting and restarting.

(a) *Gasoline-fueled engines.* This paragraph (b) applies to gasoline-fueled engines only.

(1) The engine shall be started with a production engine starting-motor according to the manufacturer's recommended starting procedures in the owner's manual. The 24 ± 1 second free idle period shall begin when the engine starts.

(2) *Choke operation:*

(i) Engines equipped with automatic chokes shall be operated according to the manufacturer's operating instructions in the owner's manual, including choke setting and "kick-down" from cold fast idle.

(ii) Engines equipped with manual chokes shall be operated according to the manufacturer's operating instructions in the owner's manual.

(3) The operator may use the choke, throttle, etc. where necessary to keep the engine running.

(4) If the manufacturer's operating instructions in the owner's manual do not specify a warm engine starting procedure, the engine (automatic- and manual-choke engines) shall be started by depressing the throttle about half way and cranking the engine until it starts.

(b) *Diesel engines.* The engine shall be started with a production engine starting-motor according to the manufacturer's recommended starting procedures in the owner's manual. The 24 ± 1 second free idle period shall begin when the engine starts.

(c)(1) If the engine does not start after 15 seconds of cranking, cranking shall cease and the reason for failure to start shall be determined. The gas flow measuring device (or revolution counter) on the constant volume sampler (and the hydrocarbon integrator when testing diesel vehicles, see § 86.1337, Engine dynamometer test run) shall be turned off and the sample selector valves placed in the "standby" position during this diagnostic period. In addition, either the CVS should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the engine shall be rescheduled for testing from a cold start.

(2) If a failure to start occurs during the cold portion of the test and is caused by an engine malfunction, corrective action of less than 30 minutes duration may be taken (according to

§ 86.083-25), and the test continued. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the timing sequence shall begin. If failure to start is caused by engine malfunction and the engine cannot be started, the test shall be voided and corrective action may be taken according to § 86.083-25. The reasons for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(3) If a failure to start occurs during the hot start portion of the test and is caused by engine malfunction, the engine must be started within one minute of key on. The sampling system shall be reactivated at the same time cranking begins. When the engine starts, the transient engine cycle timing sequence shall begin. If the engine cannot be started within one minute of key on, the test shall be voided, corrective action taken, (according to § 86.083-25), and the engine rescheduled for testing. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(d) If the engine "false starts," the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

(e) *Engine stalling.*

(1) If the engine stalls during the initial idle period of either the cold or hot start test, the engine shall be restarted immediately using the appropriate cold or hot starting procedure and the test continued. If the engine cannot be started before the first non-idle record of the cycle, the test shall be voided.

(2) If the engine stalls anywhere in the cycle, except in the initial idle period, the test shall be voided.

§ 86.1337-83 Engine dynamometer test run.

(a) The following steps shall be taken for each test:

(1) Prepare the engine and dynamometer for the cold start test.

(2) With the sample selector valves in the "standby" position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(3) Start the CVS (if not already on), the sample pumps, the temperature recorder, the engine cooling fan(s) and the heated hydrocarbon analysis recorder (diesel only). (The heat exchanger of the constant volume sampler, if used, diesel hydrocarbon analyzer continuous sample line and filter (if applicable) shall be preheated to their respective operating temperatures before the test begins.)

(4) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

Note.—CFV-CVS sample flowrate is fixed by the venturi design.

(5) Attach the CVS flexible exhaust tube to engine tailpipe(s).

(6) Follow the manufacturer's choke and throttle instructions for cold starting. Simultaneously start the engine and begin exhaust and dilution air sampling. For diesel engines, turn on the hydrocarbon analyzer system integrator and mark the recorder chart.

(7) As soon as it is determined that the engine is started, start a "free idle" timer.

(8) Allow the engine to idle freely with no-load for 24 ± 1 seconds.

(9) Begin the transient engine cycles such that the first non-idle record of the cycle occurs at 25 ± 1 seconds. The free idle time is included in the 25 ± 1 seconds.

(10) On the last record of the cycle cease sampling, immediately turn the engine off, and start a hot soak timer.

(11) Immediately after the engine is turned off, turn off the engine cooling fan(s) if used, and the CVS blower. As soon as possible transfer the "cold start cycle" exhaust and dilution air samples to the analytical system and process the samples according to § 83.1340 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(12) Allow the engine to soak for 20 ± 1 minutes.

(13) Prepare the engine and dynamometer for the hot start test.

(14) With the sample selector valves in the "standby" position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

(15) Start the CVS (if not already on), the sample pumps, the temperature recorder, the engine cooling fan and the heated hydrocarbon analysis recorder (diesel only). (The heat exchanger of the constant volume sampler, if used, diesel hydrocarbon analyzer continuous sample line and filter (if applicable) shall be preheated to their respective operating temperatures before the test begins.)

(16) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

NOTE.—CFV-CVS sample flowrate is fixed by the venturi design.

(17) Follow the manufacturer's choke and throttle instruction for hot starting. Simultaneously start the engine and begin exhaust and dilution air sampling.

(18) As soon as it is determined that the engine is started, start a "free idle" timer.

(19) Allow the engine to idle freely with no-load for 24 ± 1 seconds.

(20) Begin the transient engine cycle such that the first non-idle record of

the cycle occurs at 25 ± 1 seconds. The free idle is included in the $25 \pm$ seconds.

(21) On the last record of the cycle cease sampling.

(22) As soon as possible transfer the "hot start cycle" exhaust and dilution air samples to the analytical system and process the samples according to § 86.1340 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(23) Disconnect the exhaust tube from the engine tailpipe(s).

(24) The CVS may be turned off, if desired.

§ 86.1338-83 [Reserved]

§ 86.1339-83 [Reserved]

§ 86.1340-83 Exhaust sample analysis.

The following sequence of operations shall be performed in conjunction with each series of measurements:

(a) Zero the analyzers and obtain a stable zero reading. Recheck after tests.

(b) Introduce span gases and set instrument gains. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test sample. Span gases shall have concentrations equal to 75 to 100 percent of full scale. If gain has shifted significantly on the analyzers, check the calibrations. Show actual concentrations on chart.

(c) Check zeros; repeat the procedure in paragraphs (a) and (b) of this section if required.

(d) Check flow rates and pressures.

(e) Measure HC, CO, CO₂ and NO_x concentrations of samples.

(f) For diesel engines, continuously record (integrate electronically if desired) dilute hydrocarbon emission levels during test. Background samples are collected in sample bags and analyzed as above.

(g) Check zero and span point. If difference is greater than 2% of full scale, repeat the procedure in paragraphs (a) through (f).

§ 86.1341-83 [Reserved]

§ 86.1342-83 Information required.

The following information, as applicable, shall be recorded for each test:

(a) *Engine description and specification.* A copy of the information specified in this paragraph must accompany each engine sent to the Administrator for compliance testing. The manufacturer need not record the information specified in this paragraph for each test if the information, with the exception of subparagraph (3) is included in the manufacturer's Part I.

(1) Engine-system combination.

(2) Engine identification numbers.

(3) Number of hours of operation accumulated on engine.

(4) Manufacturer's rated maximum horsepower and torque.

(5) Manufacturer's rated maximum horsepower and torque speeds.

(6) Engine displacement.

(7) Governed speed.

(8) Maximum safe engine speed (ungoverned engines).

(9) Manufacturer's start-up procedure.

(10) Curb-idle rpm.

(11) Maximum exhaust system back pressure (diesel engines only).

(b) *Test data, general.* This information may be recorded at any time between 4 hours prior to the test and 4 hours after the test.

(1) Engine-system combination.

(2) Engine identification number.

(3) Instrument operator(s).

(4) Engine operator(s).

(5) Number of hours of operation accumulated on the engine prior to beginning the test sequence (Figure N83-8).

(6) Fuel identification, including H/C ratio.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve numbers, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(c) *Test data, pre-test.*

(1) Date and time of day.

(2) Test number.

(3) Engine intake air temperature.

(4) Barometric pressure.

(5) Engine intake humidity.

(6) Maximum torque curve as determined in § 86.1332.

(7) Measured maximum horsepower and torque speeds.

(8) Measured maximum horsepower and torque.

(9) Maximum engine speed.

(10) Minimum engine speed.

(11) High idle engine speed (diesel engines only).

(12) Calculated torque at curb-idle (diesel engines only).

(13) Fuel consumption at maximum power and torque (diesel engines only).

(14) Curb-idle fuel flow rate.

(d) *Test data.*

(1) Total number of hours of operation accumulated on the engine prior to starting emission test.

(2) Cold soak time interval.

(3) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(4) Test cell barometric pressure.

NOTE.—A central laboratory barometer may be used: *Provided*, That individual test cell barometric pressure are shown to be

within ± 0.1 percent of the barometric pressure at the central barometer location.

(5) Engine intake air temperature and humidity.

(6) Pressure of the mixture of exhaust and dilution air entering the CVS metering device, the pressure increase across the device, and the temperature at the inlet. The temperature may be recorded continuously or digitally to determine temperature variations.

(7) The number of revolutions of the positive displacement pump accumulated during each test phase while exhaust samples are being collected. The number of standard cubic feet metered by a critical flow venturi during each test phase would be the equivalent record for a CFV-CVS.

(8) The humidity of the dilution air.

NOTE.—If conditioning columns are not used (see § 86.1322 and § 86.1344) this measurement can be deleted. If the conditioning columns are used and the dilution air is taken from the test cell, the ambient humidity can be used for this measurement.

(9) Temperature set point of the heated sample line and heated hydrocarbon detector temperature control system (for diesel engines only).

(10) Integrated brake horsepower-hours for each test phase.

(11) Record engine torque and engine rpm continuously. The maximum time interval between recorded data points is one second.

(12) Total number of hours of operation accumulated on the engine after completing the test sequence described in Figure N83-8.

§ 86.1343-83 [Reserved]

§ 86.1344-83 Calculations; exhaust emissions.

(a) The final reported transient emission test results shall be computed by use of the following formula:

$$A_{wm} = \frac{1/7(g_c)' + 6/7(g_h)'}{1/7(BHP-Hr_c) + 6/7(BHP-Hr_h)}$$

Where:

A_{wm} = Weighted mass emission level (HC, CO, CO₂, or NO_x) in grams per brake horsepower hour.

g_c = Mass emission level in grams, measured during the cold start test.

g_h = Mass emissions level in grams, measured during the hot start test.

BHP-HR_c = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the cold start test.

BHP-HR_h = Total brake horsepower-hour (brake horsepower integrated with respect to time) for the hot start test.

(b) The mass of each pollutant for the cold start test and the hot start

test is determined from the following equations:

(1) Hydrocarbon mass:

$$HC_{\text{mass}} = V_{\text{mix}} \times \text{Density}_{\text{HC}} \times (HC_{\text{conc}} / 1,000,000)$$

(2) Oxides of nitrogen mass:

$$NOx_{\text{mass}} = V_{\text{mix}} \times \text{Density}_{\text{NO}_2} \times K_H \times (NOx_{\text{conc}} / 1,000,000)$$

(3) Carbon monoxide mass:

$$CO_{\text{mass}} = V_{\text{mix}} \times \text{Density}_{\text{CO}} \times (CO_{\text{conc}} / 1,000,000)$$

(4) Carbon dioxide mass:

$$CO_2_{\text{mass}} = V_{\text{mix}} \times \text{Density}_{\text{CO}_2} \times (CO_2_{\text{conc}} / 100)$$

(c) Meaning of symbols:

(1)

HC_{mass} = Hydrocarbon emissions, in grams per test phase.

$\text{Density}_{\text{HC}}$ = Density of hydrocarbons is 16.33 g/ft³ (5767 kg/m³), assuming an average carbon to hydrogen ratio of 1:1.85, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

HC_{conc} = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, i.e., equivalent propane X 3.

$$HC_{\text{conc}} = HC_e - HC_d [1 - (1/DF)]$$

where:

HC_e = Hydrocarbon concentration of the dilute exhaust sample or, for diesel, average hydrocarbon concentration of the dilute exhaust sample as calculated from the integrated HC traces, in ppm carbon equivalent.

HC_d = Hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(2)

NOx_{mass} = Oxides of nitrogen emissions, in grams per test phase.

$\text{Density}_{\text{NO}_2}$ = Density of oxides of nitrogen is 54.16 g/ft³ (1.913 kg/m³), assuming they are in the form of nitrogen dioxide, at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

NOx_{conc} = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

$$NOx_{\text{conc}} = NOx_e - NOx_d [1 - (1/DF)]$$

where:

NOx_e = Oxides of nitrogen concentration of the dilute exhaust sample as measured, in ppm.

NOx_d = Oxides of nitrogen concentration of the dilution air as measured, in ppm.

(3)

CO_{mass} = Carbon monoxide emissions, in grams per test phase.

$\text{Density}_{\text{CO}}$ = Density of carbon monoxide is 32.97 g/ft³ (1.164 kg/m³), at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

CO_{conc} = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and CO_2 extraction, in ppm.

$$CO_{\text{conc}} = CO_e - CO_d [1 - (1/DF)]$$

where:

CO_e = Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in ppm. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$$CO_d = [1 - 0.01925 CO_{2e} - 0.000323 R] CO_{em}$$

Where:

CO_{em} = Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

CO_{2e} = Carbon dioxide concentration of the dilute exhaust sample, in percent.

R = Relative humidity of the dilution air, in percent (see § 86.1342).

CO_2 = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm.

$$CO_d = (1 - 0.000323 R) CO_{em}$$

Where:

CO_{em} = Carbon monoxide concentration of the dilution air sample as measured, in ppm.

NOTE.—If a CO instrument which meets the criteria specified in § 86.1311 is used and the conditioning column has been deleted, CO_{em} can be substituted directly for CO_e and CO_{em} can be substituted directly for CO_d .

(4)

CO_2_{mass} = Carbon dioxide emissions, in grams per test phase.

$\text{Density}_{\text{CO}_2}$ = Density of carbon dioxide is 51.85 g/ft³ (1.843 kg/m³), at 68° F (20° C) and 760 mm Hg (101.3 kPa) pressure.

CO_2_{conc} = Carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

$$CO_2_{\text{conc}} = CO_{2e} - CO_{2d} [1 - (1/DF)]$$

Where:

CO_{2e} = Carbon dioxide concentration of the dilution air as measured, in percent.

(5)

$$DF = 13.4 [CO_{2e} + (HC_e + CO_e) \times 10^{-4}]$$

$$K_H = \text{Humidity correction factor.}$$

$$K_H = 1 / [1 - 0.0047(H - 75)] \text{ for SI units} = 1 / [1 - 0.0329(H - 10.71)]$$

Where:

H = Absolute humidity in grains (grams) of water per pound (kilogram) of dry air.

$$H = [(43.478) R_a \times P_a] / [P_b - (P_a \times R_a / 100)]$$

for SI units, $H = [(6.211) R_a \times P_a] / [P_b - (P_a \times R_a / 100)]$

R_a = Relative humidity of the ambient air, in percent.

P_a = Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature.

P_b = Barometric pressure, in mm Hg (kPa).

V_{mix} = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528° R (293° K) and 760 mm Hg (101.3 kPa)).

For PDP-CVS, V_{mix} is:

$$V_{\text{mix}} = V_o \times \frac{N(P_b - P_d)(293.15 \text{ K})}{(760 \text{ mm Hg})(T_p)}$$

for SI units,

$$V_{\text{mix}} = V_o \times \frac{N(P_b - P_d)(293.15 \text{ K})}{(101.3 \text{ kPa})(T_p)}$$

Where:

V_o = Volume of gas pumped by the positive displacement pump, in cubic feet (cubic meters) per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

P_b = Barometric pressure, in mm Hg (kPa).

P_d = Pressure depressions below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).

T_p = Average temperature of dilute exhaust entering positive displacement pump during test, °R (°K).

(d) Sample calculation of mass values of exhaust emissions:

(1) Assume the following test results:

	Cold start cycle test results	Hot start cycle test results
V_{mix}	6924 ft ³	6873 ft ³
R_a	30.2%	30.2%
R_b	30.2%	30.2%
P_b	735 mm Hg	735 mm Hg
P_d	22.676 mm Hg	22.676 mm Hg
HC_e	132.07 ppm C	86.13 ppm C equiv.
NOx_e	7.86 ppm	10.98 ppm
CO_{em}	171.22 ppm	114.28 ppm
CO_{2e}	1.78%	3.81%
HC_d	3.60 ppm C equiv.	8.70 ppm C equiv.
NOx_d	0.0 ppm	0.10 ppm
CO_{em}	0.89 ppm	0.89 ppm
CO_{2d}	0.0%	0.038%
BHP-HR	0.259	0.347

Then:

Cold Start Test

$$H = [(43.478)(30.2)(22.676)] / [735 - (22.676)(30.2)/100] = 41 \text{ grains of water per pound of dry air.}$$

$$K_H = 1 / [1 - 0.0047(41 - 75)] = 0.862$$

$$CO_e = [1 - 0.01925(1.78) -$$

$$0.000323(30.2)] 171.22 = 169.0 \text{ ppm}$$

$$CO_d = [1 - 0.000323(30.2)] 0.89 = .881 \text{ ppm}$$

$$DF = 13.4 / [1.78 + (132.1 + 169.0) (10^{-4})] = 64.265$$

$$HC_{\text{conc}} = 132.1 - 3.6[1 - (1/64.265)] = 128.6$$

$$\text{ppm}$$

$$HC_{\text{mass}} = 6924(16.33)(128.6/1,000,000) = 14.53$$

$$\text{grams}$$

$$NOx_{\text{conc}} = 7.86 - 0.0[1 - (1/64.265)] = 7.86$$

$$\text{ppm}$$

$$NOx_{\text{mass}} = 6924(54.16)(.862)(7.86/$$

$$1,000,000) = 2.54 \text{ grams}$$

$$CO_{\text{conc}} = 169.0 - .881[1 - (1/64.265)] = 168.0$$

$$\text{ppm}$$

$$CO_{\text{mass}} = 6924(32.97)(168.0/1,000,000) = 38.35$$

$$\text{grams}$$

$$CO_{2\text{conc}} = 1.78 - 0[1 - (1/64.265)] = 1.78\%$$

$$CO_{2\text{mass}} = 6924(51.85)(1.78/100) = 639 \text{ grams}$$

Hot Start Test

Assume similar calculations result in the following:

$$HC_{\text{mass}} = 8.72 \text{ grams}$$

$$NOx_{\text{mass}} = 3.49 \text{ grams}$$

$$CO_{\text{mass}} = 25.70 \text{ grams}$$

$$CO_{2\text{mass}} = 1226 \text{ grams}$$

(2) Weighted mass emission results:

$$HC_{wm} = \frac{1/7(14.53) + 6/7(8.72)}{1/7(0.259) + 6/7(0.347)}$$

$$= 28.6 \text{ grams/BHP-HR}$$

$$NO_{xwm} = \frac{1/7(2.54) + 6/7(3.49)}{1/7(0.259) + 6/7(0.347)}$$

$$= 10.0 \text{ grams/BHP-HR}$$

$$CO_{wm} = \frac{1/7(38.35) + 6/7(25.70)}{1/7(0.259) + 6/7(0.347)}$$

$$= 82.2 \text{ grams/BHP-HR}$$

$$CO_{2wm} = \frac{1/7(639) + 6/7(1226)}{1/7(0.259) + 6/7(0.347)}$$

$$= 3415 \text{ grams/BHP-HR}$$

(e) The final reported brake-specific fuel consumption (BSFC) shall be computed by use of the following formula:

$$BSFC = \frac{1/7(M_C) + 6/7(M_H)}{1/7(BHP-HR_C) + 6/7(BHP-HR_H)}$$

Where:

BSFC=brake-specific fuel consumption in pounds of fuel per brake horsepower-hour (lbs/BHP-HR)

M_C =mass of fuel, in pounds, used by the engine during the cold start test.

M_H =mass of fuel, in pounds, used by the engine during the hot start test.

$BHP-HR_C$ =total brake horsepower-hours (brake horsepower integrated with respect to time) for the cold start test.

$BHP-HR_H$ =total brake horsepower-hours (brake horsepower integrated with respect to time) for the hot start test.

(f) The mass of fuel for the cold start and hot start test is determined from the following equation:

$$M = (G_s/R)(1/453.6)$$

(g) Meaning of symbols:

M =Mass of fuel, in pounds, used by the engine during the cold or hot start test.

G_s =Grams of carbon measured during the cold or hot start test.

$$G_s = [12.011/(12.011 + 1.85(1.008))]HC_{max} + 0.429CO_{max} + 0.273CO_{2max}$$

where:

HC_{max} =Hydrocarbon emissions, in grams for cold or hot start test.

CO_{max} =Carbon monoxide emissions, in grams for cold or hot start test.

CO_{2max} =Carbon dioxide emissions, in grams for cold or hot start test.

α =The measured hydrogen to carbon ratio of the fuel.

R =The grams of carbon in the fuel per gram of fuel.

$$R = 12.011/[12.011 + \alpha(1.008)]$$

(h) Sample calculation of brake-specific fuel consumption:

(1) Assume the following test results:

	Cold start cycle test results	Hot start cycle test results
BHP-HR.....	6.945	7.078
α	1.85	1.85
HC_{max}	37.08 grams	28.82 grams
CO_{max}	357.69 grams	350.33 grams
CO_{2max}	5419.62 grams	5361.32 grams

$$BSFC = \frac{1/7(4.24) + 6/7(4.17)}{1/7(6.945) + 6/7(7.078)} = .592 \text{ lbs. of fuel/BHP-HR}$$

25. A new Subpart P is proposed to be added to Part 86 and reads as follows:

Subpart P—Emission Regulations for New Gasoline-Fueled and Diesel Heavy-Duty Engines and Vehicles and New Light-Duty Trucks; Idle Test Procedures

NOTE.—This proposed subpart is concerned only with regulations for heavy-duty vehicles and engines. That the title mentions light-duty trucks means only that an independent Notice of Proposed Rulemaking, applicable to light-duty trucks, recently has been or shortly will be published; the procedures of this subpart were written to apply to that proposed rulemaking as well. As it is now proposed, however, this subpart applies only to heavy-duty vehicles and engines.

Sec.

86.1501-83	Scope; applicability.
86.1502-83	Definitions.
86.1503-83	Abbreviations.
86.1504-83	Section numbering; construction.
86.1505-83	Introduction; structure of subpart.
86.1506-83	Equipment required and specifications; overview.
86.1507-83	[Reserved]
86.1508-83	[Reserved]
86.1509-83	Exhaust gas sampling system.
86.1510-83	[Reserved]
86.1511-83	Exhaust gas analysis system.
86.1512-83	[Reserved]
86.1513-83	Fuel specifications.
86.1514-83	Analytical gases.
86.1515-83	[Reserved]
86.1516-83	Calibration; frequency and overview.
86.1517-83	[Reserved]
86.1518-83	[Reserved]
86.1519-83	CVS calibration.
86.1520-83	[Reserved]
86.1521-83	Hydrocarbon analyzer calibration.
86.1522-83	Carbon monoxide analyzer calibration.
86.1523-83	[Reserved]
86.1524-83	Carbon dioxide analyzer calibration.
86.1525-83	[Reserved]
86.1526-83	Calibration of other equipment.
86.1527-83	Idle test procedure; overview.
86.1528-83	[Reserved]
86.1529-83	[Reserved]
86.1530-83	Test sequence; general requirements.

Then:

$$G_s \text{ for cold start test} = [12.011/(12.011 + (1.85)(1.008))](37.08 + 0.429(357.69) + 0.273(5419.62)) = 1665.10 \text{ grams}$$

$$G_s \text{ for hot start test} = [12.011/(12.011 + (1.85)(1.008))](28.82 + 0.429(350.33) + 0.273(5361.32)) = 1638.8 \text{ grams}$$

$$R = 12.011/[12.011 + 1.85(1.008)] = .866$$

$$M_C = (1665.10/.866)(1/453.6) = 4.24 \text{ lbs.}$$

$$M_H = (1638.8/.866)(1/453.6) = 4.17 \text{ lbs.}$$

(2) Brake-specific fuel consumption results:

Sec.

86.1531-83	[Reserved]
86.1532-83	[Reserved]
86.1533-83	[Reserved]
86.1534-83	[Reserved]
86.1535-83	[Reserved]
86.1536-83	[Reserved]
86.1537-83	Idle test run.
86.1538-83	[Reserved]
86.1539-83	[Reserved]
86.1540-83	Idle exhaust sample analysis.
86.1541-83	[Reserved]
86.1542-83	Information required.
86.1543-83	[Reserved]
86.1544-83	Calculations; idle exhaust emissions.

Subpart P—Emission Regulations for New Gasoline-Fueled and Diesel Heavy-Duty Engines and Vehicles and New Light-Duty Trucks; Idle Test Procedures

§ 86.1501-83 Scope; applicability.

This subpart contains gaseous emission idle test procedures for heavy-duty gasoline-fueled engines and vehicles, heavy-duty diesel engines and vehicles, and light-duty trucks. It applies to 1983 and later model years.

§ 86.1502-83 Definitions.

The definitions in § 86.083-2 apply to this subpart.

§ 86.1503-83 Abbreviations.

The abbreviations in § 86.083-3 apply to this subpart.

§ 86.1504-83 Section numbering; construction.

(a) The model year of initial applicability is indicated by the section number. The two digits following the hyphen designate the first model year for which a section is effective. A section remains effective until superseded.

EXAMPLE: Section § 86.1511-83 applies to the 1983 and subsequent model years until superseded. If a section § 86.1511-85 is promulgated, it would take effect beginning with the 1985 model year; § 86.1511-83 would apply to model years 1983 and 1984.

(b) A section reference without a model year suffix refers to the section applicable for the appropriate model year.

(c) Unless indicated, all provisions in this subpart apply to gasoline-fueled and diesel heavy-duty engines and vehicles and light-duty trucks.

§ 86.1505-83 Introduction; structure of subpart.

(a) This subpart describes the equipment required and the procedures to follow in order to perform idle exhaust emission tests on gasoline-fueled and diesel heavy-duty engines and vehicles and light-duty trucks. Subpart A sets forth the testing requirements and test intervals necessary to comply with EPA certification procedures.

(b) Four topics are addressed in this subpart. Sections 86.1505 through 86.1515 set forth specifications and equipment requirements; §§ 86.1516 through 86.1526 discuss calibration methods and frequency; test procedures and data requirements are listed (in approximately chronological order) in §§ 86.1527 through 86.1542; and calculation formulas are found in § 86.1544.

§ 86.1506-83 Equipment required and specifications; overview.

(a) This subpart contains procedures for idle exhaust emission tests on diesel or gasoline-fueled heavy-duty vehicles and engines and light-duty trucks. Equipment required and specifications are as follows:

(1) *Exhaust emission tests.* All vehicles subject to this subpart are tested for exhaust emissions. Diesel and gasoline-fueled vehicles and engines are tested identically. Necessary equipment and specifications appear in §§ 86.1509 through 86.1511.

(2) *Fuel and analytical gas specifications.* Fuel requirements for idle exhaust emission testing are specified in § 86.1513. Analytical gases are specified in § 86.1514.

§ 86.1507-83 (Reserved)

§ 86.1508-83 (Reserved)

§ 86.1509-83 Exhaust gas sampling system.

(a) The exhaust gas sampling system shall transport the exhaust sample from the engine or vehicle tailpipe to the analysis system in such a manner as to maintain the integrity of the sample constituents that are to be analyzed.

(b) The sample system shall supply a dry sample (i.e., water removed) to the analysis system.

(c) A CVS sampling system with bag analysis as specified in Subpart N is permitted. The inclusion of an additional raw CO₂ analyzer as specified in Subpart D is required if the CVS

system is used in order to accurately determine the CVS dilution factor (D.F.). The heated sample line specified in Subpart D for raw emission measurements is not required for the raw CO₂ measurement.

(d) A raw exhaust sampling system as specified in Subpart D is permitted.

§ 86.1510-83 (Reserved)

§ 86.1511-83 Exhaust gas analysis system.

(a) Analyzers used for this subpart shall meet the following specifications.

(1) The analyzers used must have ranges such that

(i) the carbon monoxide (CO) idle standard specified in § 86.083-10 and § 86.083-11 for heavy-duty engines or vehicles and for light-duty trucks will provide an analyzer response between 45 and 90 percent of full scale deflection on the CO analyzer.

(ii) the hydrocarbon (HC) idle standard specified in § 86.083-10 and § 86.083-11 for heavy-duty engines or vehicles and for light-duty trucks will provide an analyzer response between 45 and 90 percent of full scale deflection on the HC analyzer. The standard in ppmC can be divided by 6.0 to obtain n-hexane values (ppmC-6).

(2) The resolution of the readout device for the ranges specified in (a)(1) of this section shall be equal to or less than the following:

(i) 0.05 percent for a carbon monoxide analyzer, and

(ii) 5 ppmC-6 (n-hexane) for a hydrocarbon analyzer.

(3) For the ranges specified in (a)(1) of this section the precision shall be less than ± 3 percent of full scale deflection. The precision is defined as 2 times the standard deviation of 5 repetitive responses to a given calibration gas.

(4) For the ranges specified in (a)(1) of this section, the mean response to a zero calibration gas shall not exceed ± 3 percent of full scale during a one hour period.

(5) For the ranges specified in (a)(1) of this section the mean calibration response shall be less than ± 3 percent of full scale during a one hour period. The calibration response is defined as the analyzer response to a calibration gas after the analyzer has been spanned by the electrical spanning network at the beginning of the one hour period.

(6) The analyzer must respond to an instantaneous step change at the entrance to the sampling system with a response equal to 90 percent of that step change within 15 seconds or less on the ranges specified in (a)(1) of this section. The step change shall be at least 60 percent of full scale deflection.

(7) The interference gases listed shall individually or collectively pro-

duce an analyzer reading less than ± 2 percent of full scale on the ranges specified in (a)(1) of this section.

Interference gas	Concentration	Applicable analyzer
CO ₂	14%	HC, CO
C ₂ H ₄	1%	CO
CO	7%	HC
H ₂ O	Saturated Vapor at 200° F.	HC, CO
NOx	1,000 ppm	HC, CO
O ₂	5%	HC, CO

(8) The analyzer shall be able to meet the specifications in paragraph (a) of this section.

(i) after a 30 minute warm-up from the prevailing ambient conditions,

(ii) between the ambient temperatures of -20° C and 45° C (-4° F to 113° F),

(iii) between 0 to 85 percent relative humidity, and

(iv) during flow variations of ± 50 percent.

(b) The following analysis systems are permitted when the analysis system is in a temperature controlled environment.

(1) A CVS sampling system with bag analysis as specified in Subpart N provided suitable corrections are used to convert dilute wet-basis results to raw dry-basis results. The inclusion of an additional raw CO₂ analyzer as specified in Subpart D is required if the CVS system is used in order to accurately determine the CVS dilution factor (D.F.).

(c) A raw exhaust analysis system as specified in Subpart D provided suitable corrections are used to convert raw wet-basis results to raw dry-basis results. Measurements made on a raw dry-basis do not need correction.

§ 86.1512-83 (Reserved)

§ 86.1513-83 Fuel specifications.

Fuel meeting the engine or vehicle manufacturer's recommendations to the ultimate purchaser shall be used. Fuels meeting the specifications in § 86.1313-83 for heavy-duty engines or vehicles, or § 86.113-79 for light-duty trucks as applicable are permitted.

§ 86.1514-83 Analytical gases.

(a) *Analyzer gases.*

(1) Calibration gases for the CO analyzer shall be single blends using nitrogen as the diluent.

(2) Calibration gases for the (n-hexane) HC analyzer shall be single blends of propane using nitrogen as the diluent. The conversion factor from propane (ppmC-3) to n-hexane (ppmC-6) shall be:

$$\text{ppm propane (0.50)} = \text{ppm n-hexane.}$$

(3) Ambient air may be used for zero gas provided it is treated to remove im-

purities or drawn from a source that would tend to minimize CO and HC background levels (e.g., a large room with no vehicles, ambient air, etc.).

(b) Calibration gases shall be traceable to within 3 percent of NBS gas standards, or other standards which have been approved by the Administrator.

(c) Calibration gases shall be equivalent in concentration ($\pm 10\%$) to the standards specified in § 86.083-10 and § 86.083-11 for heavy-duty engines or vehicles and for light-duty trucks.

(d) If the CVS sampling system is used, the analytical gases specified in Subpart N shall be used.

(e) If the raw sampling system (Subpart D) is used, the analytical gases specified in Subpart D shall be used.

§ 86.1515-83 (Reserved)

§ 86.1516-83 Calibration; frequency and overview.

(a) Calibrations shall be performed as specified in §§ 86.1518 through 86.1526.

(b) At least weekly or after any maintenance which could alter calibration, check the calibration of the HC and CO analyzers. Adjust or repair the analyzer as necessary.

(c) Water traps, filters, or conditioning columns should be checked at least daily.

(d) If the sampling and analysis procedures of Subpart D or N are used, the required calibrations and their frequencies are specified in their respective Subparts.

§ 86.1517-83 (Reserved)

§ 86.1518-83 (Reserved)

§ 86.1519-83 CVS calibration.

If the CVS system is used for sampling during the idle emission test, the calibration instructions are specified in § 86.1319-83 of Subpart N.

§ 86.1520-83 (Reserved)

§ 86.1521-83 Hydrocarbon analyzer calibration.

(a) Initial check.

(1) Follow the manufacturers instructions for instrument start-up and operation. Adjust the analyzer to optimize performance on the range specified in § 86.1511(a)(1).

(2) Calibrate the analyzer with the calibration gas specified in § 86.1514(c).

(3) Adjust the electrical span network such that the electrical span point is correct when the analyzer reads the calibration gas correctly.

(4) Determine that the analyzer complies with the specifications in § 86.1511.

(b) Periodic check. Follow steps (a)(1), (2), and (3) of this section as specified in § 86.1516(b). Adjust or repair the analyzer as necessary.

(c) If the analysis procedures of Subpart D or N are used, the required calibrations are specified in their respective Subparts.

§ 86.1522-83 Carbon monoxide analyzer calibration.

(a) Initial check.

(1) Follow the manufacturers instructions for instrument start-up and operation. Adjust the analyzer to optimize performance on the range specified in § 86.1511(a)(1).

(2) Calibrate the analyzer with the calibration gas specified in § 86.1514(c).

(3) Adjust the electrical span network such that the electrical span point is correct when the analyzer reads the calibration gas correctly.

(4) Determine that the analyzer complies with the specifications in § 86.1511.

(b) Periodic check. Follow steps (a)(1), (2), and (3) of this section as specified by § 86.1516(b). Adjust or repair the analyzer as necessary.

(c) If the analysis procedures of Subpart D or N are used, the required calibrations are specified in their respective Subparts.

§ 86.1523-83 (Reserved)

§ 86.1524-83 Carbon dioxide analyzer calibration.

(a) The calibration requirements for

the dilute-sample carbon dioxide analyzer are specified in Subpart N.

(b) The calibration requirements for the raw carbon dioxide analyzer are specified in Subpart D.

(c) If another sampling and analyzing system is used that does not require carbon dioxide (CO₂) analysis, this section may be disregarded.

§ 86.1525-83 (Reserved)

§ 86.1526-83 Calibration of other equipment.

Other test equipment used for testing shall be calibrated as often as required by the manufacturer or as necessary according to good practice.

§ 86.1527-83 Idle test procedure; overview.

(a) The idle emission test procedure is designed to determine the raw concentrations (in parts per million of carbon) of hydrocarbons and carbon monoxide in the exhaust flow at idle. The test procedure begins with a warm engine, required to be at the normal operating temperature. (For example, the warm-up for an engine may be a transient dynamometer test, or for a vehicle it may be any convenient operation).

(b) Vehicles.

(1) If the idle test is being performed on a vehicle, all emission control systems shall be intact and functioning.

(c) Engines.

(1) If the idle test is being performed on an engine, the required engine configuration is specified in Subpart N.

§ 86.1528-83 (Reserved)

§ 86.1529-83 (Reserved)

§ 86.1530-83 Test sequence; general requirements.

The test sequence shown in Figure P83-1 shows the major steps encountered during the idle test described by the subsequent procedures. The average ambient temperature of the engine test cell (in the case of an engine dynamometer test) or the vehicle environment (in the case of a vehicle test) shall be between -20°C and 45°C (-4°F to 113°F).

[6560-01-C]

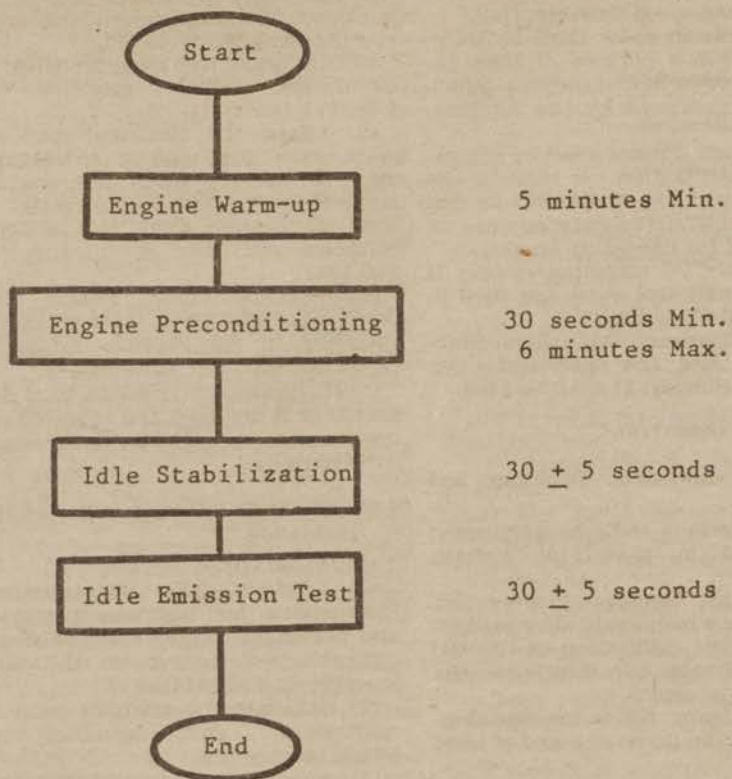


Figure P83-1 - Test Sequence

[6560-01-M]

§ 86.1531-83 (Reserved)

§ 86.1532-83 (Reserved)

§ 86.1533-83 (Reserved)

§ 86.1534-83 (Reserved)

§ 86.1535-83 (Reserved)

§ 86.1536-83 (Reserved)

§ 86.1537-83 Idle test run.

(a) *Test run.* The following steps shall be taken for each test:

(1) Achieve normal engine operating parameters. The transient emission dynamometer test is an acceptable technique to warm-up the engine to normal operating parameters for an engine test. If the transient emission test is not performed prior to the idle emission test, the engine may be warmed-up according to § 86.1332-83(d)(1) (i) through (iii) (applies to gasoline-fueled engines) or § 86.1332-83(d)(2) (i) through (iii) (applies to diesel engines). For a vehicle test, sufficient vehicle operation shall take place to achieve normal operating parameters.

(2) Check the device(s) for removing water from the exhaust sample and the sample filter(s). Remove any water from the water trap(s). Clean and replace the filter(s) as necessary.

(3) Set the zero and span points of the HC and CO analyzers with the electrical spanning network. It is permitted to set the analyzer span with calibration gases.

(4) Hook-up or attach the sampling system to the tailpipe of the engine or vehicle.

(5) Operate the engine at 2500 ± 50 rpm for gasoline-fueled engines (1200 ± 50 rpm for diesel) and zero load for a minimum of 30 seconds and a maximum of 6 minutes.

(6) Operate the engine at curb idle for 30 ± 5 seconds with the dynamometer off for the engine test, or the transmission in neutral (or park for automatic transmissions) for the vehicle tests.

(7) Sample the exhaust (after step 6) for an additional 30 ± 5 seconds for raw dry-basis HC in ppm C-6 (n-hexane) and raw dry-basis CO in percent. The highest value observed during this sample period shall be the value recorded.

(b) If the CVS sampling system is used, the following procedures apply:

(1) Warm-up the engine as specified in (a)(1) of this section.

(2) Precondition the engine as specified in (a)(5) of this section.

(3) With the sample selector valves in the "standby" position, connect evacuated sample collection bags to

the dilute exhaust and dilution air sample collection systems.

(4) Start the CVS (if not already on), the sample pumps, the temperature recorder, the engine cooling fan, the heated hydrocarbon analysis recorder (diesel only) and the raw CO₂ analyzer. (The heat exchanger of the constant volume sampler, if used, diesel hydrocarbon analyzer continuous sample line, and filter (if applicable) shall be preheated to their respective operating temperatures before the test begins).

(5) Adjust the sample flow rates to the desired flow rate and set the gas flow measuring devices to zero.

(6) Operate the engine at the conditions specified in (a)(6) of this section.

(7) Begin HC and CO bag sampling and raw CO₂ sampling.

(8) Sample idle emissions long enough to obtain a sufficient bag sample, but in no case shorter than 60 seconds nor longer than 6 minutes. Follow the sampling and exhaust measurements requirements of Subpart D for the conducting of the idle modes of the gasoline or diesel steady-state test for the raw CO₂ measurement.

(9) As soon as possible, transfer the idle test exhaust and dilution air samples to the analytical system and process the samples according to § 86.1540 obtaining a stabilized reading of the exhaust sample on all analyzers within 20 minutes of the end of the sample collection phase of the test.

(10) Disconnect the exhaust tube from the engine tail-pipe(s).

(11) The CVS may be turned off, if desired.

(c) If the raw exhaust sampling and analysis technique specified in Subpart D is used, the following procedures apply:

(1) Warm-up the engine as specified in (a)(1) of this section.

(2) Precondition the engine as specified in (a)(5) of this section.

(3) Operate the engine at the conditions specified in (a)(6) of this section.

(4) Follow the sampling and exhaust measurement requirements of Subpart D for conducting the idle modes. The respective mode lengths for gasoline-fueled and diesel engines apply.

(d) If the engine stalls at any time during the test run, the test is void.

§ 86.1538-83 [Reserved]

§ 86.1539-83 [Reserved]

§ 86.1540-83 Idle exhaust sample analysis.

(a) Record the idle concentrations in ppm C-6 (n-hexane) for HC and percent for CO.

(b) If the CVS sampling system is used, the analysis procedures for dilute HC, CO, and CO₂ specified in subpart N apply. Follow the raw CO₂ analysis procedure specified in Subpart D for the raw CO₂ analyzer. The

HC may be recorded as ppm propane (ppmC-3) or ppm carbon (ppmC).

(c) If the continuous raw exhaust sampling technique (Subpart D) is used, the analysis procedures for HC and CO specified in Subpart D apply. The HC may be recorded as ppm propane (ppmC-3) or ppm carbon (ppmC).

§ 86.1541-83 [Reserved]

§ 86.1542-83 Information required.

(a) *General data.* The following information shall be recorded for each idle emission test:

(1) Vehicle identification number for a vehicle test.

(2) Engine identification number for an engine test.

(3) Engine family.

(4) Engine displacement.

(5) Analyzer operator(s).

(6) Vehicle (engine) operator(s).

(7) Fuel identification.

(8) Date of purchase of analytical equipment.

(9) Date of most recent analytical assembly calibration.

(10) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve numbers, etc. As long as this information is traceable, it may be summarized by system number or analyzer identification numbers.

(11) *Pre-test data.*

(i) Date and time of day.

(ii) Test number.

(iii) Ambient temperature (vehicle test) or engine intake air temperature (engine test).

(iv) Vehicle mileage or engine hours as applicable.

(12) *Test data.*

(i) Curb idle speed during the test.

(ii) Idle exhaust HC concentration.

(iii) Idle exhaust CO concentration.

(b) If a CVS sampling system with bag analysis is used for the idle emission test, record the additional information specified in Subpart N as applicable. In addition, record the raw exhaust CO₂ concentration during the test.

(c) If the raw exhaust sampling and analysis system specified in Subpart D is used, record the additional information specified in Subpart D as applicable.

§ 86.1543-83 [Reserved]

§ 86.1544-83 Calculations; idle exhaust emissions.

(a) The final idle emission test results shall be reported as ppmC (equivalent carbon) for hydrocarbons and percent for carbon monoxide, both on a dry basis. The results shall be reported to the same number of significant digits as the idle standards specified in § 86.083-10 and § 86.083-11.

(b) Convert dry-basis ppmC-6 (n-hexane) to ppmC (equivalent carbon) by:

$$\text{ppmC} = (6.0) \text{ ppmC-6}$$

(c) If a CVS sampling system is used, the following procedure shall apply:

(1) Use the procedures, as applicable, in Subpart N to determine the dilute wet-basis HC in ppmC, and CO and CO₂ in percent.

(2) Use the procedure, as applicable, in Subpart D to determine the raw dry-basis CO₂ in percent.

(3) Convert the raw dry-basis CO₂ to raw wet-basis. An assumption that the percent of water by volume in the raw sample is equal to the percent of raw dry-basis CO₂ minus 0.5 percent is acceptable. For example:

$$10.0\% \text{ dry CO}_2 - 0.5\% = 9.5\% \text{ water } (1.00 - 0.095) (10.0\% \text{ dry CO}_2) = 9.05\% \text{ wet CO}_2$$

(4) Calculate the CVS dilution factor (DF) by:

$$\text{DF} = \frac{\text{Raw Wet CO}_2 - \text{Background CO}_2}{\text{Dilute Wet CO}_2 - \text{Background CO}_2}$$

(5) Convert the dilute wet-basis HC and CO to dilute dry-basis values. An assumption that the percent of water by volume in the sample bag is 2 percent is acceptable. For example:

$$\text{dilute dry HC} = (\text{dilute wet HC}) / (1.00 - 0.02)$$

(6) Calculate the raw dry-basis HC and CO values by:

$$\text{raw dry HC} = (\text{DF}) (\text{dilute dry HC})$$

$$\text{raw dry CO} = (\text{DF}) (\text{dilute dry CO})$$

(d) If the raw exhaust sampling and analysis system specified in Subpart D is used, the following procedure shall apply:

(1) Use the procedure, as applicable, in Subpart D to determine raw wet-basis HC and raw dry-basis CO and CO₂.

(2) Use calculations specified in Subpart D to determine raw dry-basis HC. 26. Appendix I of Part 86 is proposed to be amended as follows:

APPENDIX I—URBAN DYNAMOMETER SCHEDULES

- (a) * * *
- (b) * * *
- (c) * * *
- (d) * * *
- (e) * * *

(f) EPA Engine Dynamometer Schedule for Heavy-Duty Gasoline Engines.

PERCENT RPM AND PERCENT TORQUE VERSUS TIME SEQUENCE

Record (Sec.)	Percent RPM	Percent torque
0.....	0.0	0.0
1.....	0.0	0.0
2.....	0.0	0.0

PERCENT RPM AND PERCENT TORQUE VERSUS TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
3.....	0.0	0.0
4.....	0.0	0.0
5.....	0.0	0.0
6.....	0.0	0.0
7.....	0.0	0.0
8.....	0.0	0.0
9.....	0.0	0.0
10.....	0.0	0.0
11.....	0.0	0.0
12.....	0.0	0.0
13.....	0.0	0.0
14.....	0.0	0.0
15.....	0.0	0.0
16.....	0.0	0.0
17.....	0.0	0.0
18.....	0.0	0.0
19.....	0.0	0.0
20.....	0.0	0.0
21.....	0.0	0.0
22.....	0.0	0.0
23.....	0.0	0.0
24.....	0.0	0.0
25.....	-1.78	44.40
26.....	0.0	85.35
27.....	4.25	100.00
28.....	27.47	100.00
29.....	42.96	100.00
30.....	45.79	100.00
31.....	48.11	99.46
32.....	50.42	90.00
33.....	52.74	75.23
34.....	54.00	50.00
35.....	44.42	8.96
36.....	45.05	Motoring
37.....	46.00	9.99
38.....	37.69	Motoring
39.....	31.61	5.68
40.....	22.94	35.29
41.....	24.00	4.87
42.....	20.86	Motoring
43.....	12.45	Motoring
44.....	6.00	Motoring
45.....	6.52	Motoring
46.....	7.17	Motoring
47.....	2.56	Motoring
48.....	0.0	0.0
49.....	0.0	0.0
50.....	0.0	0.0
51.....	0.0	10.11
52.....	4.32	46.40
53.....	8.90	45.17
54.....	1.95	50.00
55.....	3.33	41.68
56.....	4.00	89.46
57.....	13.76	55.60
58.....	26.43	26.96
59.....	33.85	6.16
60.....	36.00	Motoring
61.....	34.45	Motoring
62.....	34.00	Motoring
63.....	35.64	Motoring
64.....	32.99	27.39
65.....	36.00	80.00
66.....	41.63	74.37
67.....	60.41	26.76
68.....	48.44	Motoring
69.....	43.86	Motoring
70.....	40.39	Motoring
71.....	38.50	4.01
72.....	35.05	30.00
73.....	40.66	16.70
74.....	43.64	26.45
75.....	45.96	Motoring
76.....	47.10	Motoring
77.....	49.29	Motoring
78.....	37.10	Motoring
79.....	36.00	Motoring
80.....	34.47	Motoring
81.....	32.15	Motoring
82.....	31.67	Motoring
83.....	28.48	13.89
84.....	32.38	90.00
85.....	36.00	90.00
86.....	41.69	90.00
87.....	45.74	90.00
88.....	49.95	80.00
89.....	49.10	80.00

PERCENT RPM AND PERCENT TORQUE VERSUS TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
90.....	50.59	62.97
91.....	45.99	34.98
92.....	42.76	7.23
93.....	35.12	Motoring
94.....	32.06	67.92
95.....	35.53	62.55
96.....	46.57	68.60
97.....	49.77	48.85
98.....	52.00	60.00
99.....	58.06	60.00
100.....	63.66	23.42
101.....	64.14	17.84
102.....	59.58	3.76
103.....	38.00	42.26
104.....	39.09	30.00
105.....	40.00	30.00
106.....	34.85	47.18
107.....	32.03	10.33
108.....	34.00	33.48
109.....	34.00	50.00
110.....	33.02	20.69
111.....	25.54	Motoring
112.....	15.57	Motoring
113.....	14.00	Motoring
114.....	14.47	27.64
115.....	18.00	4.49
116.....	17.13	Motoring
117.....	16.00	Motoring
118.....	10.02	Motoring
119.....	9.81	Motoring
120.....	5.88	Motoring
121.....	4.00	Motoring
122.....	4.00	Motoring
123.....	2.93	Motoring
124.....	0.62	Motoring
125.....	0.0	0.0
126.....	0.0	0.0
127.....	0.0	0.0
128.....	0.0	0.0
129.....	0.0	0.0
130.....	0.0	10.00
131.....	0.0	10.00
132.....	0.0	29.02
133.....	0.0	27.83
134.....	0.0	7.34
135.....	0.0	0.0
136.....	0.0	0.0
137.....	0.0	0.0
138.....	0.0	0.0
139.....	0.0	0.0
140.....	0.0	0.0
141.....	0.0	0.0
142.....	0.0	0.0
143.....	0.0	0.0
144.....	0.0	0.0
145.....	0.0	0.0
146.....	2.00	0.0
147.....	1.38	0.0
148.....	0.0	0.0
149.....	0.0	6.27
150.....	0.0	2.16
151.....	0.0	0.0
152.....	0.0	0.0
153.....	0.0	0.0
154.....	0.83	Motoring
155.....	2.00	Motoring
156.....	0.54	Motoring
157.....	0.0	0.0
158.....	0.0	0.0
159.....	0.0	0.0
160.....	0.0	0.0
161.....	0.0	0.0
162.....	0.0	0.0
163.....	0.0	0.0
164.....	0.0	0.0
165.....	0.0	0.0
166.....	0.0	0.0
167.....	0.0	22.01
168.....	1.23	72.29
169.....	6.63	80.00
170.....	17.29	89.29
171.....	22.17	90.00
172.....	24.00	82.70
173.....	24.00	31.96
174.....	24.00	Motoring
175.....	22.57	Motoring
176.....	22.00	Motoring

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
177.....	13.88	Motoring
178.....	10.00	Motoring
179.....	9.31	Motoring
180.....	3.99	Motoring
181.....	0.0	0.0
182.....	0.0	0.0
183.....	0.0	0.0
184.....	0.0	0.0
185.....	0.0	0.0
186.....	0.0	0.0
187.....	0.0	0.0
188.....	0.0	0.0
189.....	0.0	0.0
190.....	0.0	0.0
191.....	0.0	0.0
192.....	0.0	0.0
193.....	0.0	0.0
194.....	0.0	0.0
195.....	0.0	0.0
196.....	0.0	0.0
197.....	0.0	0.0
198.....	0.0	0.0
199.....	0.0	0.0
200.....	0.0	0.0
201.....	0.0	0.0
202.....	0.0	0.0
203.....	0.0	0.0
204.....	-2.52	6.30
205.....	-4.22	15.28
206.....	0.0	10.00
207.....	0.0	10.00
208.....	0.0	10.00
209.....	0.0	75.93
210.....	0.0	32.22
211.....	1.67	35.00
212.....	15.48	29.82
213.....	25.46	Motoring
214.....	24.22	Motoring
215.....	23.44	Motoring
216.....	12.41	80.00
217.....	8.94	83.61
218.....	7.26	84.82
219.....	16.70	80.00
220.....	24.87	63.33
221.....	0.24	79.81
222.....	0.0	8.52
223.....	0.0	0.0
224.....	0.0	0.0
225.....	0.0	0.0
226.....	0.0	0.0
227.....	0.0	0.0
228.....	0.0	0.0
229.....	0.0	0.0
230.....	0.0	0.0
231.....	0.0	0.0
232.....	0.0	0.0
233.....	0.0	17.59
234.....	0.0	19.63
235.....	0.0	10.00
236.....	0.0	10.00
237.....	0.0	10.00
238.....	0.0	3.34
239.....	0.0	0.0
240.....	0.0	0.0
241.....	0.0	0.0
242.....	0.0	0.0
243.....	0.0	0.0
244.....	0.0	0.0
245.....	0.0	0.0
246.....	0.0	0.0
247.....	0.0	0.0
248.....	0.0	0.0
249.....	0.0	0.0
250.....	0.0	0.0
251.....	0.0	0.0
252.....	0.0	0.0
253.....	0.0	0.0
254.....	0.0	0.0
255.....	0.0	0.0
256.....	0.0	0.0
257.....	0.0	0.0
258.....	0.0	0.0
259.....	0.0	0.0
260.....	0.0	0.0
261.....	0.0	0.0
262.....	0.0	0.0
263.....	0.0	0.0

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
264.....	0.0	0.0
265.....	0.0	0.0
266.....	0.0	0.0
267.....	0.0	0.0
268.....	0.0	0.0
269.....	0.0	0.0
270.....	0.0	0.0
271.....	0.0	0.0
272.....	0.0	0.0
273.....	0.0	0.0
274.....	0.0	0.0
275.....	0.0	0.0
276.....	0.0	0.0
277.....	0.0	0.0
278.....	0.0	0.0
279.....	0.0	0.0
280.....	0.0	0.0
281.....	0.0	4.17
282.....	1.15	10.00
283.....	2.00	10.00
284.....	0.22	10.00
285.....	0.0	0.0
286.....	0.0	0.0
287.....	0.0	0.0
288.....	0.0	0.0
289.....	0.0	0.0
290.....	0.0	0.0
291.....	0.0	0.0
292.....	0.0	0.0
293.....	0.0	0.0
294.....	0.0	0.0
295.....	0.0	0.0
296.....	0.0	0.0
297.....	0.0	0.0
298.....	0.0	0.0
299.....	0.0	0.0
300.....	0.0	4.07
301.....	0.0	10.00
302.....	0.0	17.22
303.....	0.0	20.00
304.....	0.0	20.37
305.....	2.33	31.94
306.....	16.22	36.48
307.....	24.00	24.91
308.....	24.00	13.34
309.....	19.06	10.00
310.....	18.00	Motoring
311.....	17.17	Motoring
312.....	9.04	Motoring
313.....	1.09	Motoring
314.....	0.0	0.0
315.....	0.0	0.0
316.....	0.0	0.0
317.....	0.0	0.0
318.....	0.0	0.0
319.....	0.0	0.0
320.....	0.0	0.0
321.....	0.0	0.0
322.....	0.0	0.0
323.....	0.0	0.82
324.....	0.37	41.08
325.....	2.68	90.00
326.....	6.00	94.99
327.....	11.94	100.00
328.....	15.63	100.00
329.....	41.26	90.28
330.....	46.26	90.00
331.....	44.56	67.08
332.....	36.00	1.12
333.....	27.58	50.12
334.....	23.52	90.00
335.....	24.00	90.00
336.....	26.29	70.00
337.....	30.00	65.38
338.....	30.00	34.47
339.....	30.00	10.00
340.....	30.00	10.00
341.....	30.00	10.00
342.....	30.18	60.00
343.....	40.00	58.25
344.....	40.67	50.00
345.....	41.02	50.00
346.....	40.00	50.00
347.....	41.61	50.00
348.....	42.00	50.00
349.....	46.00	50.00
350.....	48.22	50.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
351.....	59.21	58.69
352.....	67.18	70.00
353.....	71.00	70.00
354.....	72.00	70.00
355.....	72.13	68.08
356.....	74.89	28.94
357.....	68.91	Motoring
358.....	49.71	Motoring
359.....	41.84	Motoring
360.....	38.30	Motoring
361.....	35.93	Motoring
362.....	28.00	Motoring
363.....	23.48	Motoring
364.....	10.16	Motoring
365.....	4.72	Motoring
366.....	0.82	5.90
367.....	9.53	19.53
368.....	2.20	45.60
369.....	20.53	7.33
370.....	21.15	0.0
371.....	17.67	Motoring
372.....	13.04	Motoring
373.....	8.41	79.70
374.....	10.33	100.00
375.....	17.27	100.00
376.....	22.00	100.00
377.....	25.16	100.00
378.....	29.37	100.00
379.....	36.73	66.35
380.....	40.00	Motoring
381.....	23.50	Motoring
382.....	9.37	Motoring
383.....	8.00	Motoring
384.....	6.74	Motoring
385.....	2.86	Motoring
386.....	0.11	Motoring
387.....	0.0	0.0
388.....	0.0	0.0
389.....	0.0	0.0
390.....	0.0	0.0
391.....	0.0	0.0
392.....	0.0	0.0
393.....	0.0	0.0
394.....	0.0	0.0
395.....	0.0	0.0
396.....	0.0	0.0
397.....	0.0	0.0
398.....	0.0	0.0
399.....	0.0	0.0
400.....	0.0	0.0
401.....	0.0	0.0
402.....	0.0	0.0
403.....	0.0	0.0
404.....	0.0	0.0
405.....	0.0	0.0
406.....	0.0	0.0
407.....	0.0	0.0
408.....	0.0	0.0
409.....	0.0	0.0
410.....	0.0	0.0
411.....	0.0	0.0
412.....	0.0	0.0
413.....	0.0	0.0
414.....	0.0	0.0
415.....	0.0	0.0
416.....	0.0	0.0
417.....	0.0	0.0
418.....	0.0	0.0
419.....	2.27	20.00
420.....	2.82	14.11
421.....	0.0	0.0
422.....	0.0	0.0
423.....	0.0	0.0
424.....	0.0	0.0
425.....	0.0	0.0
426.....	0.0	0.0
427.....	0.0	0.0
428.....	0.0	0.0
429.....	0.0	0.0
430.....	0.0	0.0
431.....	0.26	0.78
432.....	16.60	31.83
433.....	45.32	29.78
434.....	43.00	10.00
435.....	40.69	10.00
436.....	35.12	10.00
437.....	28.18	19.70

PROPOSED RULES

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
438.....	28.26	47.45
439.....	30.00	30.00
440.....	30.00	30.00
441.....	30.00	30.00
442.....	34.54	30.00
443.....	36.00	30.00
444.....	36.43	30.00
445.....	43.84	30.00
446.....	50.00	30.00
447.....	50.00	24.56
448.....	50.00	20.00
449.....	50.00	Motoring
450.....	37.97	Motoring
451.....	35.30	Motoring
452.....	30.68	Motoring
453.....	27.02	Motoring
454.....	26.00	Motoring
455.....	26.00	Motoring
456.....	20.24	Motoring
457.....	14.00	Motoring
458.....	13.45	18.27
459.....	9.40	52.99
460.....	10.72	81.81
461.....	15.50	97.48
462.....	19.62	100.00
463.....	20.25	100.00
464.....	25.76	100.00
465.....	35.02	100.00
466.....	42.14	94.65
467.....	44.00	90.00
468.....	45.70	90.00
469.....	51.99	60.00
470.....	50.00	60.00
471.....	51.29	63.22
472.....	54.96	70.00
473.....	56.00	70.00
474.....	62.35	38.25
475.....	71.61	30.00
476.....	76.22	50.00
477.....	78.00	50.00
478.....	78.00	41.53
479.....	55.93	12.58
480.....	38.52	0.0
481.....	34.42	71.35
482.....	36.11	79.47
483.....	38.84	67.90
484.....	42.74	60.00
485.....	44.00	54.75
486.....	49.46	36.35
487.....	52.00	30.00
488.....	32.05	Motoring
489.....	25.69	0.0
490.....	24.00	0.0
491.....	24.00	Motoring
492.....	20.24	Motoring
493.....	10.16	68.43
494.....	8.00	80.58
495.....	10.20	80.99
496.....	13.54	90.00
497.....	18.00	94.13
498.....	20.28	100.00
499.....	22.00	100.00
500.....	23.77	91.15
501.....	28.08	90.00
502.....	30.00	86.01
503.....	32.85	80.70
504.....	32.86	100.00
505.....	33.37	100.00
506.....	36.00	100.00
507.....	51.77	100.00
508.....	60.57	95.72
509.....	64.00	70.00
510.....	64.91	70.00
511.....	75.83	70.00
512.....	82.00	70.00
513.....	85.72	51.42
514.....	86.17	49.14
515.....	88.49	35.13
516.....	90.00	15.99
517.....	91.12	26.74
518.....	92.00	32.85
519.....	93.74	30.00
520.....	89.29	Motoring
521.....	66.00	41.87
522.....	67.38	56.88
523.....	80.02	54.96
524.....	93.95	66.34

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
525.....	97.63	63.69
526.....	94.11	60.00
527.....	85.66	Motoring
528.....	70.00	Motoring
529.....	69.11	Motoring
530.....	66.80	Motoring
531.....	64.48	Motoring
532.....	53.00	44.98
533.....	52.73	49.27
534.....	62.00	40.00
535.....	62.00	43.88
536.....	64.18	44.55
537.....	53.36	4.88
538.....	46.28	15.79
539.....	46.00	19.83
540.....	45.65	10.00
541.....	45.99	10.00
542.....	48.05	10.00
543.....	44.71	3.54
544.....	48.82	Motoring
545.....	51.92	66.82
546.....	47.53	Motoring
547.....	36.31	9.23
548.....	17.73	55.68
549.....	29.43	38.22
550.....	36.00	37.46
551.....	36.00	40.00
552.....	34.00	40.00
553.....	34.00	40.00
554.....	34.00	36.25
555.....	38.26	24.68
556.....	43.38	61.38
557.....	50.78	46.12
558.....	52.00	19.92
559.....	52.32	0.0
560.....	52.09	3.19
561.....	48.00	10.00
562.....	48.00	10.00
563.....	48.00	10.00
564.....	30.94	19.48
565.....	28.00	20.00
566.....	28.00	20.00
567.....	28.00	15.81
568.....	28.00	10.00
569.....	26.53	10.00
570.....	26.00	10.00
571.....	23.71	Motoring
572.....	17.59	Motoring
573.....	11.85	Motoring
574.....	1.92	Motoring
575.....	0.0	0.0
576.....	0.0	0.0
577.....	0.0	0.0
578.....	0.0	0.0
579.....	0.0	0.0
580.....	0.0	0.0
581.....	0.0	0.0
582.....	0.0	0.0
583.....	1.26	25.19
584.....	6.72	47.87
585.....	13.67	40.56
586.....	16.20	80.00
587.....	18.52	80.00
588.....	25.83	75.83
589.....	35.15	70.00
590.....	38.93	77.31
591.....	41.78	80.00
592.....	40.00	10.00
593.....	40.00	20.18
594.....	40.00	52.78
595.....	40.00	34.82
596.....	40.00	30.00
597.....	40.00	38.33
598.....	40.00	30.09
599.....	38.30	100.00
600.....	40.61	100.00
601.....	42.00	100.00
602.....	42.00	100.00
603.....	42.00	100.00
604.....	42.00	100.00
605.....	42.00	100.00
606.....	42.00	97.50
607.....	43.19	85.93
608.....	43.13	85.65
609.....	44.00	90.00
610.....	44.00	90.00
611.....	44.00	80.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
612.....	44.00	80.00
613.....	44.70	80.00
614.....	46.00	74.91
615.....	46.00	63.34
616.....	46.00	60.00
617.....	46.00	60.00
618.....	44.00	10.00
619.....	44.00	10.00
620.....	43.09	10.00
621.....	42.00	10.00
622.....	42.00	10.00
623.....	43.65	19.28
624.....	50.00	90.00
625.....	50.00	90.00
626.....	50.00	90.00
627.....	50.00	90.00
628.....	50.00	90.00
629.....	48.26	90.00
630.....	48.00	89.73
631.....	48.37	80.00
632.....	49.32	80.00
633.....	48.00	80.00
634.....	48.00	80.00
635.....	48.00	80.00
636.....	48.00	70.28
637.....	48.00	70.00
638.....	48.00	70.00
639.....	48.00	74.44
640.....	48.00	61.96
641.....	49.52	50.00
642.....	50.00	50.00
643.....	50.00	40.00
644.....	50.00	44.62
645.....	50.78	60.00
646.....	52.00	49.09
647.....	52.00	40.00
648.....	52.00	40.00
649.....	52.04	40.89
650.....	54.00	90.00
651.....	54.00	90.00
652.....	54.00	85.10
653.....	55.29	73.53
654.....	56.00	70.00
655.....	56.00	70.00
656.....	56.00	60.00
657.....	56.00	57.23
658.....	56.00	50.00
659.....	56.00	38.17
660.....	56.00	30.00
661.....	56.00	30.00
662.....	54.00	39.36
663.....	54.00	27.79
664.....	54.00	20.00
665.....	54.00	20.00
666.....	54.00	20.00
667.....	54.00	11.49
668.....	54.00	0.08
669.....	54.00	13.31
670.....	54.00	30.00
671.....	54.95	30.00
672.....	57.28	30.00
673.....	56.41	30.00
674.....	57.91	30.00
675.....	58.22	36.60
676.....	60.00	90.00
677.....	60.00	90.00
678.....	60.00	95.82
679.....	60.00	92.60
680.....	60.00	90.00
681.....	60.00	90.00
682.....	60.42	90.00
683.....	62.74	90.00
684.....	65.05	90.00
685.....	66.00	83.16
686.....	66.00	71.59
687.....	66.00	70.00
688.....	66.00	70.00
689.....	66.00	73.14
690.....	66.00	80.00
691.....	66.00	86.28
692.....	66.00	90.00
693.....	66.00	90.00
694.....	68.20	100.00
695.....	70.00	100.00
696.....	70.00	100.00
697.....	70.00	100.00
698.....	74.38	100.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
699.....	76.00	100.00
700.....	72.09	100.00
701.....	73.60	100.00
702.....	72.00	100.00
703.....	72.00	100.00
704.....	72.00	100.00
705.....	72.00	100.00
706.....	72.00	100.00
707.....	72.29	100.00
708.....	73.39	100.00
709.....	72.92	100.00
710.....	74.00	100.00
711.....	74.00	100.00
712.....	77.73	100.00
713.....	78.00	100.00
714.....	77.50	100.00
715.....	76.00	100.00
716.....	76.00	100.00
717.....	76.00	100.00
718.....	72.49	100.00
719.....	71.79	100.00
720.....	67.16	100.00
721.....	72.70	100.00
722.....	75.02	100.00
723.....	73.34	100.00
724.....	73.64	91.78
725.....	74.00	31.21
726.....	78.27	28.63
727.....	80.00	17.05
728.....	80.00	5.48
729.....	80.00	Motoring
730.....	80.00	Motoring
731.....	80.00	63.93
732.....	84.00	80.00
733.....	85.43	82.39
734.....	87.62	93.96
735.....	84.00	100.00
736.....	84.00	100.00
737.....	84.00	91.32
738.....	86.00	100.00
739.....	86.73	100.00
740.....	90.00	96.59
741.....	91.99	90.00
742.....	94.00	90.00
743.....	95.63	81.87
744.....	96.00	89.70
745.....	100.00	98.72
746.....	100.57	78.60
747.....	102.88	50.00
748.....	104.00	73.99
749.....	104.00	90.00
750.....	104.00	25.98
751.....	103.71	20.00
752.....	99.54	20.00
753.....	98.00	20.00
754.....	99.09	25.44
755.....	98.60	65.08
756.....	103.15	80.00
757.....	100.03	80.00
758.....	102.35	80.00
759.....	104.00	73.38
760.....	104.00	55.11
761.....	101.42	30.62
762.....	98.39	11.97
763.....	57.65	Motoring
764.....	58.00	Motoring
765.....	57.45	Motoring
766.....	56.00	Motoring
767.....	56.00	Motoring
768.....	56.00	27.39
769.....	56.00	40.00
770.....	56.00	50.00
771.....	56.00	45.60
772.....	56.00	33.77
773.....	56.00	40.00
774.....	60.15	5.40
775.....	62.00	Motoring
776.....	62.00	Motoring
777.....	62.00	41.64
778.....	62.00	59.65
779.....	62.00	75.21
780.....	62.00	76.36
781.....	62.00	80.00
782.....	62.00	80.00
783.....	62.00	80.00
784.....	62.00	80.00
785.....	61.15	80.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
786.....	80.00	80.00
787.....	80.00	87.38
788.....	80.00	90.00
789.....	80.00	90.00
790.....	80.00	90.00
791.....	80.00	90.00
792.....	80.00	90.00
793.....	80.00	83.17
794.....	80.00	80.00
795.....	80.00	89.97
796.....	82.31	90.00
797.....	84.00	86.88
798.....	84.00	80.00
799.....	84.00	80.00
800.....	84.00	80.00
801.....	84.00	80.00
802.....	86.00	70.00
803.....	86.51	70.00
804.....	88.00	65.87
805.....	88.00	60.00
806.....	88.00	60.00
807.....	73.31	86.55
808.....	74.00	90.00
809.....	74.00	90.00
810.....	73.29	90.00
811.....	72.00	84.86
812.....	73.34	73.29
813.....	74.00	70.00
814.....	72.03	70.00
815.....	71.71	50.00
816.....	70.00	50.00
817.....	70.00	50.00
818.....	68.77	56.15
819.....	68.00	60.00
820.....	68.00	60.00
821.....	68.00	58.28
822.....	68.00	40.00
823.....	68.00	48.01
824.....	68.00	60.00
825.....	68.00	60.00
826.....	68.00	60.00
827.....	68.00	60.00
828.....	68.00	61.87
829.....	68.00	70.00
830.....	69.00	70.00
831.....	70.00	70.00
832.....	70.00	70.00
833.....	70.00	70.00
834.....	70.00	70.00
835.....	70.00	70.00
836.....	70.00	70.00
837.....	73.61	70.00
838.....	76.00	62.41
839.....	76.00	60.00
840.....	76.00	100.00
841.....	76.92	100.00
842.....	80.78	100.00
843.....	82.00	100.00
844.....	83.40	100.00
845.....	84.00	100.00
846.....	83.97	90.00
847.....	82.35	90.00
848.....	85.33	93.31
849.....	89.95	100.00
850.....	88.13	100.00
851.....	89.21	100.00
852.....	95.76	100.00
853.....	100.23	100.00
854.....	102.00	100.00
855.....	104.59	100.00
856.....	112.71	100.00
857.....	113.01	100.00
858.....	112.00	100.00
859.....	104.00	Motoring
860.....	103.56	Motoring
861.....	102.75	Motoring
862.....	102.94	Motoring
863.....	99.24	Motoring
864.....	94.61	Motoring
865.....	93.99	Motoring
866.....	92.32	Motoring
867.....	93.36	Motoring
868.....	92.00	Motoring
869.....	90.73	Motoring
870.....	88.42	Motoring
871.....	84.21	Motoring
872.....	82.00	10.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
873.....	82.00	7.38
874.....	82.00	Motoring
875.....	82.00	Motoring
876.....	68.79	48.69
877.....	64.00	70.00
878.....	64.00	70.00
879.....	58.66	67.95
880.....	37.27	60.00
881.....	34.96	60.00
882.....	32.65	73.54
883.....	30.33	80.00
884.....	28.02	80.00
885.....	25.70	50.00
886.....	23.39	37.76
887.....	21.07	10.00
888.....	18.76	10.00
889.....	14.89	Motoring
890.....	12.13	Motoring
891.....	50.45	Motoring
892.....	0.0	0.0
893.....	0.0	0.0
894.....	0.0	0.0
895.....	0.0	0.0
896.....	0.0	0.0
897.....	0.0	0.0
898.....	0.0	0.0
899.....	0.0	0.0
900.....	0.0	0.0
901.....	0.0	0.0
902.....	0.0	0.0
903.....	0.0	0.0
904.....	0.0	0.0
905.....	0.0	0.0
906.....	0.0	0.0
907.....	0.0	0.0
908.....	0.0	0.0
909.....	0.0	0.0
910.....	0.0	0.0
911.....	0.0	0.0
912.....	0.0	0.0
913.....	0.0	0.0
914.....	0.0	0.0
915.....	0.0	0.0
916.....	0.0	0.0
917.....	0.0	0.0
918.....	0.0	0.0
919.....	0.0	0.0
920.....	-1.78	44.40
921.....	0.0	85.35
922.....	4.25	100.00
923.....	27.47	100.00
924.....	42.96	100.00
925.....	45.79	100.00
926.....	48.11	99.46
927.....	50.42	80.00
928.....	52.74	75.23
929.....	54.00	50.00
930.....	44.42	8.96
931.....	45.05	Motoring
932.....	46.00	9.99
933.....	37.69	Motoring
934.....	31.61	5.68
935.....	22.94	35.29
936.....	24.00	4.87
937.....	20.86	Motoring
938.....	12.45	Motoring
939.....	6.00	Motoring
940.....	6.52	Motoring
941.....	7.17	Motoring
942.....	2.56	Motoring
943.....	0.0	0.0
944.....	0.0	0.0
945.....	0.0	0.0
946.....	0.0	10.11
947.....	4.32	46.40
948.....	8.90	45.17
949.....	1.95	50.00
950.....	3.33	41.68
951.....	4.00	89.46
952.....	13.76	55.60
953.....	26.43	26.96
954.....	33.85	6.16
955.....	36.00	Motoring
956.....	34.45	Motoring
957.....	34.00	Motoring
958.....	35.64	Motoring
959.....	32.99	27.39

PROPOSED RULES

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
960.....	36.00	80.00
961.....	41.63	74.37
962.....	60.41	26.76
963.....	48.44	Motoring
964.....	43.88	Motoring
965.....	40.39	Motoring
966.....	38.50	4.01
967.....	35.05	30.00
968.....	40.66	16.70
969.....	43.64	26.45
970.....	45.96	Motoring
971.....	47.10	Motoring
972.....	49.29	Motoring
973.....	37.10	Motoring
974.....	36.00	Motoring
975.....	34.47	Motoring
976.....	32.15	Motoring
977.....	31.67	Motoring
978.....	28.48	13.89
979.....	32.38	90.00
980.....	36.00	90.00
981.....	41.69	90.00
982.....	45.74	90.00
983.....	49.95	80.00
984.....	49.10	80.00
985.....	50.59	62.97
986.....	45.99	34.98
987.....	42.76	7.23
988.....	35.12	Motoring
989.....	32.06	67.92
990.....	35.53	62.55
991.....	48.57	68.60
992.....	49.77	48.85
993.....	52.00	60.00
994.....	58.06	60.00
995.....	63.66	23.42
996.....	64.14	17.84
997.....	59.58	3.76
998.....	38.00	42.26
999.....	39.09	30.00
1000.....	40.00	30.00
1001.....	34.85	47.18
1002.....	32.03	10.33
1003.....	34.00	33.48
1004.....	34.00	50.00
1005.....	33.02	20.69
1006.....	25.54	Motoring
1007.....	15.57	Motoring
1008.....	14.00	Motoring
1009.....	14.47	27.64
1010.....	18.00	4.49
1011.....	17.13	Motoring
1012.....	16.00	Motoring
1013.....	10.02	Motoring
1014.....	9.81	Motoring
1015.....	5.88	Motoring
1016.....	4.00	Motoring
1017.....	4.00	Motoring
1018.....	2.93	Motoring
1019.....	0.62	Motoring
1020.....	0.0	0.0
1021.....	0.0	0.0
1022.....	0.0	0.0
1023.....	0.0	0.0
1024.....	0.0	0.0
1025.....	0.0	10.00
1026.....	0.0	10.00
1027.....	0.0	29.02
1028.....	0.0	27.83
1029.....	0.0	7.34
1030.....	0.0	0.0
1031.....	0.0	0.0
1032.....	0.0	0.0
1033.....	0.0	0.0
1034.....	0.0	0.0
1035.....	0.0	0.0
1036.....	0.0	0.0
1037.....	0.0	0.0
1038.....	0.0	0.0
1039.....	0.0	0.0
1040.....	0.0	0.0
1041.....	2.00	0.0
1042.....	1.38	0.0
1043.....	0.00	0.0
1044.....	0.00	6.27
1045.....	0.00	2.16
1046.....	0.00	0.0

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
1047.....	0.00	0.0
1048.....	0.00	0.0
1049.....	0.83	Motoring
1050.....	2.00	Motoring
1051.....	0.54	Motoring
1052.....	0.0	0.0
1053.....	0.0	0.0
1054.....	0.0	0.0
1055.....	0.0	0.0
1056.....	0.0	0.0
1057.....	0.0	0.0
1058.....	0.0	0.0
1059.....	0.0	0.0
1060.....	0.0	0.0
1061.....	0.0	0.0
1062.....	0.0	22.01
1063.....	1.23	72.29
1064.....	6.63	80.00
1065.....	17.29	89.29
1066.....	22.17	90.00
1067.....	24.00	82.70
1068.....	24.00	31.96
1069.....	24.00	Motoring
1070.....	22.57	Motoring
1071.....	22.00	Motoring
1072.....	13.88	Motoring
1073.....	10.00	Motoring
1074.....	9.31	Motoring
1075.....	3.99	Motoring
1076.....	0.0	0.0
1077.....	0.0	0.0
1078.....	0.0	0.0
1079.....	0.0	0.0
1080.....	0.0	0.0
1081.....	0.0	0.0
1082.....	0.0	0.0
1083.....	0.0	0.0
1084.....	0.0	0.0
1085.....	0.0	0.0
1086.....	0.0	0.0
1087.....	0.0	0.0
1088.....	0.0	0.0
1089.....	0.0	0.0
1090.....	0.0	0.0
1091.....	0.0	0.0
1092.....	0.0	0.0
1093.....	0.0	0.0
1094.....	0.0	0.0
1095.....	0.0	0.0
1096.....	0.0	0.0
1097.....	0.0	0.0
1098.....	0.0	0.0
1099.....	-2.52	6.30
1100.....	-4.22	15.28
1101.....	0.0	10.00
1102.....	0.0	10.00
1103.....	0.0	10.00
1104.....	0.0	75.93
1105.....	0.0	32.22
1106.....	1.67	35.00
1107.....	15.48	29.82
1108.....	25.46	Motoring
1109.....	24.22	Motoring
1110.....	23.44	Motoring
1111.....	12.41	80.00
1112.....	8.94	83.61
1113.....	7.26	84.82
1114.....	16.70	80.00
1115.....	24.67	63.33
1116.....	0.24	79.81
1117.....	0.0	8.52
1118.....	0.0	0.0
1119.....	0.0	0.0
1120.....	0.0	0.0
1121.....	0.0	0.0
1122.....	0.0	0.0
1123.....	0.0	0.0
1124.....	0.0	0.0
1125.....	0.0	0.0
1126.....	0.0	0.0
1127.....	0.0	0.0
1128.....	0.0	17.59
1129.....	0.0	19.63
1130.....	0.0	10.00
1131.....	0.0	10.00
1132.....	0.0	10.00
1133.....	0.0	3.34

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SEQUENCE—Continued

Record (Sec.)	Percent RPM	Percent torque
1134.....	0.0	0.0
1135.....	0.0	0.0
1136.....	0.0	0.0
1137.....	0.0	0.0
1138.....	0.0	0.0
1139.....	0.0	0.0
1140.....	0.0	0.0
1141.....	0.0	0.0
1142.....	0.0	0.0
1143.....	0.0	0.0
1144.....	0.0	0.0
1145.....	0.0	0.0
1146.....	0.0	0.0
1147.....	0.0	0.0
1148.....	0.0	0.0
1149.....	0.0	0.0
1150.....	0.0	0.0
1151.....	0.0	0.0
1152.....	0.0	0.0
1153.....	0.0	0.0
1154.....	0.0	0.0
1155.....	0.0	0.0
1156.....	0.0	0.0
1157.....	0.0	0.0
1158.....	0.0	0.0
1159.....	0.0	0.0
1160.....	0.0	0.0
1161.....	0.0	0.0
1162.....	0.0	0.0
1163.....	0.0	0.0
1164.....	0.0	0.0
1165.....	0.0	0.0
1166.....	0.0	0.0
1167.....	0.0	0.0

(g) EPA Engine Dynamometer Schedule
for Heavy-Duty Diesel Engines.PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE

Record (Sec.)	Percent RPM	Percent torque
0.....	0.0	0.0
1.....	0.0	0.0
2.....	0.0	0.0
3.....	0.0	0.0
4.....	0.0	0.0
5.....	0.0	0.0
6.....	0.0	0.0
7.....	0.0	0.0
8.....	0.0	0.0
9.....	0.0	0.0
10.....	0.0	0.0
11.....	0.0	0.0
12.....	0.0	0.0
13.....	0.0	0.0
14.....	0.0	0.0
15.....	0.0	0.0
16.....	0.0	0.0
17.....	0.0	0.0
18.....	0.0	0.0
19.....	0.0	0.0
20.....	0.0	0.0
21.....	0.0	0.0
22.....	0.0	0.0
23.....	0.0	0.0
24.....	0.0	0.0
25.....	0.0	3.87
26.....	0.0	47.69
27.....	3.11	59.41
28.....	9.09	84.54
29.....	15.62	80.00
30.....	33.49	80.00
31.....	37.93	79.29
32.....	31.20	38.25
33.....	21.99	26.87
34.....	30.00	15.10
35.....	22.23	16.47
36.....	19.61	28.05
37.....	20.00	30.38
38.....	18.33	Motoring
39.....	6.55	Motoring
40.....	15.82	Motoring
41.....	23.63	Motoring

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
42.....	17.51	Motoring
43.....	14.19	62.52
44.....	16.64	69.36
45.....	27.77	60.00
46.....	37.03	63.79
47.....	47.36	75.36
48.....	54.77	80.00
49.....	57.70	80.00
50.....	54.03	79.92
51.....	58.00	65.03
52.....	58.65	43.23
53.....	62.88	50.00
54.....	69.83	50.00
55.....	72.00	42.05
56.....	75.81	40.00
57.....	84.22	42.20
58.....	83.86	41.28
59.....	80.55	Motoring
60.....	80.51	Motoring
61.....	78.00	Motoring
62.....	79.79	Motoring
63.....	80.33	30.54
64.....	85.58	42.12
65.....	81.78	50.00
66.....	78.00	50.00
67.....	80.74	43.16
68.....	92.10	73.65
69.....	88.01	Motoring
70.....	84.00	Motoring
71.....	84.00	Motoring
72.....	81.17	Motoring
73.....	70.46	Motoring
74.....	66.00	13.57
75.....	62.23	29.43
76.....	64.00	20.00
77.....	63.48	17.42
78.....	60.34	10.00
79.....	56.85	10.00
80.....	56.00	Motoring
81.....	52.45	Motoring
82.....	39.91	10.00
83.....	36.38	10.00
84.....	30.00	10.00
85.....	27.93	10.00
86.....	26.00	16.74
87.....	27.66	3.36
88.....	28.00	Motoring
89.....	27.41	Motoring
90.....	20.96	Motoring
91.....	12.15	Motoring
92.....	3.81	Motoring
93.....	0.0	0.0
94.....	0.0	0.0
95.....	0.0	0.91
96.....	0.0	7.52
97.....	0.0	0.0
98.....	0.0	0.0
99.....	0.0	0.0
100.....	0.0	0.0
101.....	0.0	0.0
102.....	0.0	0.0
103.....	0.0	0.0
104.....	0.0	0.0
105.....	0.0	0.0
106.....	0.0	0.0
107.....	0.0	0.0
108.....	0.0	0.0
109.....	0.0	0.0
110.....	0.0	0.0
111.....	0.0	0.0
112.....	0.0	0.0
113.....	0.0	0.0
114.....	0.0	0.0
115.....	0.0	0.0
116.....	0.0	0.0
117.....	0.0	0.0
118.....	0.0	0.0
119.....	0.0	0.0
120.....	0.0	0.0
121.....	0.0	0.0
122.....	0.0	0.0
123.....	0.0	0.0
124.....	0.0	0.0
125.....	0.0	0.0
126.....	0.0	0.0
127.....	0.0	0.0
128.....	0.0	0.0

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
129.....	1.77	Motoring
130.....	1.60	Motoring
131.....	0.0	0.0
132.....	0.0	0.0
133.....	2.14	9.28
134.....	3.08	0.0
135.....	0.0	0.0
136.....	0.0	0.0
137.....	0.0	0.0
138.....	0.0	0.0
139.....	0.0	0.0
140.....	0.0	0.0
141.....	0.0	0.0
142.....	0.0	0.0
143.....	0.0	0.0
144.....	0.0	0.0
145.....	0.0	0.0
146.....	0.0	0.0
147.....	0.0	5.51
148.....	0.0	11.34
149.....	0.0	0.0
150.....	0.0	0.0
151.....	0.0	0.0
152.....	0.0	0.0
153.....	0.0	0.0
154.....	0.0	0.0
155.....	0.0	0.0
156.....	0.0	0.0
157.....	0.0	0.0
158.....	0.0	0.21
159.....	0.0	30.00
160.....	0.0	26.78
161.....	0.0	20.00
162.....	0.0	20.00
163.....	0.0	4.12
164.....	0.0	0.0
165.....	0.0	0.0
166.....	0.0	0.0
167.....	0.0	0.0
168.....	0.0	0.0
169.....	0.0	0.0
170.....	0.0	0.0
171.....	0.0	0.0
172.....	0.0	0.0
173.....	0.0	0.0
174.....	0.0	0.0
175.....	0.0	0.0
176.....	0.0	0.0
177.....	0.0	0.0
178.....	0.0	0.0
179.....	0.0	0.0
180.....	0.0	0.0
181.....	0.0	0.0
182.....	0.0	0.0
183.....	0.0	0.0
184.....	0.0	20.00
185.....	0.0	20.00
186.....	0.0	11.73
187.....	0.0	0.0
188.....	0.0	0.0
189.....	0.0	0.0
190.....	0.0	0.0
191.....	0.0	0.0
192.....	0.0	0.0
193.....	0.0	0.0
194.....	0.0	0.0
195.....	0.0	0.0
196.....	0.0	0.0
197.....	0.0	0.0
198.....	0.0	0.0
199.....	0.0	0.0
200.....	0.0	0.0
201.....	0.0	0.0
202.....	0.0	0.0
203.....	0.0	0.0
204.....	0.0	0.0
205.....	0.0	0.0
206.....	0.0	0.0
207.....	0.0	0.0
208.....	0.0	0.0
209.....	0.0	0.0
210.....	0.0	0.0
211.....	0.0	0.0
212.....	0.0	0.0
213.....	0.0	0.0
214.....	0.0	73.41
215.....	0.0	90.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
216.....	31.30	81.30
217.....	41.15	90.00
218.....	44.00	90.00
219.....	46.41	90.00
220.....	51.04	82.41
221.....	66.66	80.00
222.....	75.03	90.00
223.....	89.85	90.00
224.....	96.78	93.88
225.....	96.91	50.94
226.....	84.60	17.02
227.....	99.16	28.60
228.....	100.00	39.83
229.....	100.00	30.00
230.....	100.00	26.69
231.....	100.98	20.00
232.....	100.71	20.00
233.....	100.00	36.06
234.....	96.16	40.00
235.....	95.77	30.00
236.....	94.55	32.75
237.....	96.86	35.68
238.....	99.18	30.00
239.....	100.00	44.93
240.....	101.81	50.00
241.....	86.54	Motoring
242.....	63.56	Motoring
243.....	56.00	Motoring
244.....	46.00	Motoring
245.....	41.86	45.18
246.....	38.31	78.47
247.....	35.98	80.00
248.....	31.03	80.00
249.....	25.36	80.00
250.....	23.05	60.97
251.....	18.20	27.34
252.....	12.84	43.71
253.....	10.10	68.95
254.....	3.79	68.95
255.....	1.48	44.28
256.....	0.0	0.0
257.....	0.0	0.0
258.....	0.0	0.0
259.....	0.0	0.0
260.....	0.0	0.0
261.....	0.0	0.0
262.....	0.0	0.0
263.....	0.0	24.97
264.....	0.0	17.16
265.....	0.0	6.20
266.....	0.0	10.00
267.....	0.0	10.00
268.....	0.0	0.0
269.....	0.0	0.0
270.....	0.0	0.0
271.....	0.0	0.0
272.....	0.0	0.0
273.....	0.0	0.0
274.....	0.0	0.0
275.....	0.0	0.0
276.....	0.0	0.0
277.....	0.0	0.0
278.....	0.0	0.0
279.....	0.0	0.0
280.....	0.0	0.0
281.....	0.0	0.0
282.....	0.0	0.0
283.....	0.0	0.0
284.....	0.0	0.0
285.....	0.0	0.0
286.....	0.0	0.0
287.....	0.0	0.0
288.....	0.0	0.0
289.....	0.0	0.0
290.....	0.0	0.0
291.....	0.0	0.0
292.....	0.0	0.0
293.....	0.0	0.0
294.....	0.0	0.0
295.....	0.0	0.0
296.....	0.0	0.0
297.....	0.0	0.0
298.....	0.0	0.0
299.....	0.0	0.0
300.....	0.0	0.0
301.....	0.0	0.0
302.....	0.0	0.0

PROPOSED RULES

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
303.....	0.0	0.0
304.....	0.0	0.0
305.....	0.0	0.0
306.....	0.0	0.0
307.....	0.0	0.0
308.....	0.0	0.0
309.....	0.0	0.0
310.....	0.0	0.0
311.....	0.0	0.0
312.....	0.0	0.0
313.....	0.0	0.0
314.....	0.0	0.0
315.....	0.0	0.0
316.....	0.0	0.0
317.....	0.0	0.0
318.....	0.0	0.0
319.....	0.0	0.0
320.....	0.0	0.0
321.....	0.0	15.55
322.....	0.0	20.00
323.....	24.18	19.08
324.....	23.00	10.00
325.....	11.56	1.86
326.....	6.87	Motoring
327.....	6.00	Motoring
328.....	0.72	Motoring
329.....	0.0	0.0
330.....	0.0	0.0
331.....	0.0	0.0
332.....	0.0	0.0
333.....	0.0	0.0
334.....	0.0	0.0
335.....	0.0	0.0
336.....	0.0	0.0
337.....	0.0	0.0
338.....	0.0	0.0
339.....	0.0	0.0
340.....	0.0	0.0
341.....	0.0	0.0
342.....	0.0	0.0
343.....	0.0	0.0
344.....	0.0	0.0
345.....	0.0	0.0
346.....	0.0	0.0
347.....	0.0	0.0
348.....	0.0	0.0
349.....	0.0	0.0
350.....	0.0	0.0
351.....	0.0	0.0
352.....	0.0	0.0
353.....	0.0	0.0
354.....	0.0	0.0
355.....	0.0	0.0
356.....	0.0	0.0
357.....	0.0	0.0
358.....	0.0	0.0
359.....	0.0	0.0
360.....	0.0	0.0
361.....	0.0	0.0
362.....	0.0	0.0
363.....	0.0	0.0
364.....	0.0	0.0
365.....	0.0	0.0
366.....	0.0	0.0
367.....	0.0	0.0
368.....	0.0	0.0
369.....	0.0	0.0
370.....	0.0	0.0
371.....	0.0	0.0
372.....	0.0	0.0
373.....	0.0	0.0
374.....	0.0	0.0
375.....	0.0	0.0
376.....	0.0	0.0
377.....	0.0	29.59
378.....	-1.50	87.46
379.....	8.88	100.00
380.....	46.04	100.00
381.....	76.89	100.00
382.....	80.00	100.00
383.....	82.14	94.64
384.....	85.39	83.07
385.....	87.70	88.51
386.....	92.00	79.83
387.....	92.00	61.66
388.....	94.58	66.77
389.....	102.88	60.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
390.....	106.00	72.76
391.....	109.18	8.43
392.....	111.91	Motoring
393.....	82.00	Motoring
394.....	79.33	Motoring
395.....	71.15	Motoring
396.....	68.84	Motoring
397.....	78.35	49.17
398.....	82.00	70.00
399.....	80.65	69.46
400.....	92.85	60.00
401.....	97.48	60.00
402.....	98.95	60.00
403.....	100.74	60.00
404.....	103.68	43.17
405.....	104.00	10.04
406.....	80.62	20.00
407.....	83.37	20.00
408.....	81.06	15.29
409.....	80.00	10.00
410.....	76.86	Motoring
411.....	74.11	Motoring
412.....	71.60	Motoring
413.....	70.58	Motoring
414.....	78.00	Motoring
415.....	80.29	1.45
416.....	80.54	17.30
417.....	78.23	11.13
418.....	78.45	19.55
419.....	84.36	24.16
420.....	72.16	80.00
421.....	79.10	74.83
422.....	90.09	16.04
423.....	74.04	Motoring
424.....	68.02	Motoring
425.....	68.53	Motoring
426.....	59.39	Motoring
427.....	63.54	Motoring
428.....	70.00	2.38
429.....	73.10	17.76
430.....	72.13	Motoring
431.....	67.27	Motoring
432.....	36.03	Motoring
433.....	20.75	Motoring
434.....	11.49	Motoring
435.....	-2.09	0.0
436.....	-0.73	0.0
437.....	8.57	60.00
438.....	30.55	61.93
439.....	67.10	63.00
440.....	86.03	39.85
441.....	89.33	30.00
442.....	91.64	30.00
443.....	97.88	10.40
444.....	97.73	1.37
445.....	96.00	10.00
446.....	96.00	0.96
447.....	96.00	Motoring
448.....	85.27	28.34
449.....	87.54	30.76
450.....	86.16	29.18
451.....	88.00	20.00
452.....	87.21	20.00
453.....	86.00	20.00
454.....	87.42	20.00
455.....	88.00	11.32
456.....	77.84	Motoring
457.....	72.00	Motoring
458.....	71.32	Motoring
459.....	70.00	0.04
460.....	70.00	Motoring
461.....	74.88	Motoring
462.....	74.06	Motoring
463.....	67.74	Motoring
464.....	66.00	Motoring
465.....	64.23	Motoring
466.....	62.00	Motoring
467.....	55.94	Motoring
468.....	54.00	Motoring
469.....	66.43	Motoring
470.....	75.21	70.00
471.....	86.00	54.53
472.....	86.00	24.56
473.....	88.81	Motoring
474.....	90.00	Motoring
475.....	105.48	Motoring
476.....	74.00	Motoring

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
477.....	73.34	Motoring
478.....	71.02	10.00
479.....	76.46	29.38
480.....	81.61	40.00
481.....	78.16	30.39
482.....	74.13	26.46
483.....	90.00	0.0
484.....	90.87	0.0
485.....	92.00	Motoring
486.....	93.50	Motoring
487.....	94.00	Motoring
488.....	94.13	Motoring
489.....	88.96	Motoring
490.....	63.25	Motoring
491.....	62.00	Motoring
492.....	49.54	45.37
493.....	52.49	86.99
494.....	64.00	90.00
495.....	64.99	90.00
496.....	71.93	93.22
497.....	78.87	95.21
498.....	82.00	83.64
499.....	86.76	80.00
500.....	93.71	80.00
501.....	94.87	80.00
502.....	103.60	80.00
503.....	101.23	41.89
504.....	95.48	24.85
505.....	98.00	50.00
506.....	99.79	50.00
507.....	106.21	46.82
508.....	110.84	Motoring
509.....	98.55	Motoring
510.....	70.95	Motoring
511.....	67.27	Motoring
512.....	60.96	Motoring
513.....	48.03	Motoring
514.....	52.31	Motoring
515.....	54.00	Motoring
516.....	65.27	Motoring
517.....	78.00	Motoring
518.....	57.61	Motoring
519.....	42.58	Motoring
520.....	38.81	Motoring
521.....	22.37	Motoring
522.....	3.52	Motoring
523.....	0.0	0.0
524.....	-1.46	36.39
525.....	-0.23	5.75
526.....	0.0	0.0
527.....	0.0	0.0
528.....	0.0	0.0
529.....	0.0	0.0
530.....	0.0	0.0
531.....	0.0	0.0
532.....	0.0	0.0
533.....	0.0	0.0
534.....	0.0	0.0
535.....	0.0	0.0
536.....	0.0	0.0
537.....	0.0	0.0
538.....	0.0	0.0
539.....	0.0	0.0
540.....	0.0	0.0
541.....	0.0	0.0
542.....	0.0	0.0
543.....	0.0	0.0
544.....	0.0	Motoring
545.....	0.0	0.0
546.....	-0.75	0.0
547.....	-0.56	0.0
548.....	4.00	Motoring
549.....	0.68	Motoring
550.....	0.0	0.0
551.....	0.0	0.0
552.....	0.0	2.60
553.....	0.0	20.00
554.....	0.0	20.00
555.....	0.0	7.96
556.....	0.0	0.0
557.....	0.0	0.0
558.....	0.0	78.53
559.....	1.85	60.00
560.....	11.10	63.88
561.....	16.00	70.00
562.....	30.05	70.00
563.....	42.88	70.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
564.....	56.10	70.00
565.....	63.39	66.52
566.....	70.66	59.94
567.....	72.98	80.00
568.....	77.87	86.46
569.....	88.03	90.00
570.....	90.00	90.00
571.....	92.23	100.00
572.....	94.00	100.00
573.....	94.86	100.00
574.....	96.00	100.00
575.....	97.49	100.00
576.....	108.84	100.00
577.....	110.00	83.92
578.....	104.77	Motoring
579.....	87.50	Motoring
580.....	90.00	0.0
581.....	91.38	Motoring
582.....	81.84	Motoring
583.....	65.99	Motoring
584.....	63.68	Motoring
585.....	60.73	Motoring
586.....	57.05	Motoring
587.....	53.47	Motoring
588.....	50.42	Motoring
589.....	44.31	Motoring
590.....	37.58	37.91
591.....	33.48	20.00
592.....	31.16	20.00
593.....	28.85	20.00
594.....	22.13	20.00
595.....	9.31	Motoring
596.....	0.0	0.0
597.....	0.0	0.0
598.....	0.0	0.0
599.....	0.0	0.0
600.....	0.0	0.0
601.....	0.0	0.0
602.....	0.0	0.0
603.....	0.0	0.0
604.....	0.0	0.0
605.....	0.0	0.0
606.....	2.52	6.30
607.....	10.30	17.87
608.....	13.89	20.00
609.....	20.20	20.00
610.....	24.07	22.59
611.....	33.33	17.50
612.....	40.30	Motoring
613.....	47.85	Motoring
614.....	66.00	7.78
615.....	68.00	10.93
616.....	67.59	32.04
617.....	66.00	40.00
618.....	67.04	40.00
619.....	68.00	40.00
620.....	68.00	48.33
621.....	75.93	99.53
622.....	78.00	100.00
623.....	78.00	100.00
624.....	77.07	100.00
625.....	76.00	100.00
626.....	76.00	100.00
627.....	76.00	100.00
628.....	75.63	100.00
629.....	73.00	97.50
630.....	76.81	90.00
631.....	80.26	90.00
632.....	83.44	90.00
633.....	84.00	98.79
634.....	84.00	100.00
635.....	83.61	100.00
636.....	82.00	100.00
637.....	83.02	94.91
638.....	86.67	90.00
639.....	89.65	90.00
640.....	90.00	99.81
641.....	89.45	100.00
642.....	86.00	100.00
643.....	86.00	95.47
644.....	87.22	90.00
645.....	88.00	90.00
646.....	88.00	80.74
647.....	88.00	79.17
648.....	88.00	77.21
649.....	88.00	100.00
650.....	88.00	94.45

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
651.....	88.00	90.00
652.....	88.00	90.00
653.....	90.00	90.00
654.....	89.63	90.00
655.....	88.68	90.00
656.....	90.00	90.00
657.....	90.00	90.00
658.....	91.63	81.86
659.....	92.00	80.00
660.....	90.00	81.29
661.....	89.43	92.86
662.....	87.11	100.00
663.....	86.00	100.00
664.....	86.00	100.00
665.....	89.66	100.00
666.....	90.00	99.27
667.....	90.46	90.00
668.....	92.78	90.00
669.....	95.09	90.00
670.....	100.22	82.97
671.....	102.00	80.00
672.....	102.00	70.18
673.....	102.00	80.00
674.....	97.34	50.07
675.....	87.02	Motoring
676.....	86.00	Motoring
677.....	73.12	22.19
678.....	75.77	39.62
679.....	75.76	48.80
680.....	75.11	37.23
681.....	78.00	34.34
682.....	80.37	40.00
683.....	77.51	47.49
684.....	81.44	50.00
685.....	82.13	39.38
686.....	84.00	27.79
687.....	84.00	16.21
688.....	84.00	15.36
689.....	85.39	26.93
690.....	86.00	30.00
691.....	86.00	30.08
692.....	85.67	40.00
693.....	84.65	40.00
694.....	86.00	35.20
695.....	87.28	30.00
696.....	88.00	22.05
697.....	86.09	Motoring
698.....	83.78	Motoring
699.....	81.47	Motoring
700.....	81.70	Motoring
701.....	85.16	Motoring
702.....	84.52	Motoring
703.....	82.21	Motoring
704.....	79.89	Motoring
705.....	77.58	Motoring
706.....	76.00	6.31
707.....	79.16	0.0
708.....	75.16	27.36
709.....	72.00	40.00
710.....	72.00	40.00
711.....	74.00	38.44
712.....	74.00	30.00
713.....	74.00	30.00
714.....	74.00	36.28
715.....	72.43	47.66
716.....	68.23	59.43
717.....	73.80	50.00
718.....	72.52	50.00
719.....	74.00	45.85
720.....	72.85	57.18
721.....	76.38	62.70
722.....	81.55	60.00
723.....	80.18	60.00
724.....	83.60	60.00
725.....	83.44	56.40
726.....	86.00	50.00
727.....	87.35	50.00
728.....	86.34	50.00
729.....	86.00	40.11
730.....	88.29	61.47
731.....	88.78	63.92
732.....	86.92	50.00
733.....	86.76	50.00
734.....	87.55	42.24
735.....	88.00	49.34
736.....	86.00	50.91
737.....	86.00	67.45

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
738.....	86.00	81.88
739.....	87.13	70.00
740.....	89.44	77.21
741.....	91.76	88.78
742.....	90.07	89.65
743.....	92.00	80.00
744.....	92.70	80.00
745.....	94.00	80.00
746.....	94.00	80.00
747.....	94.00	80.00
748.....	94.00	80.00
749.....	94.00	81.37
750.....	94.59	87.05
751.....	96.00	57.40
752.....	96.00	42.19
753.....	96.00	42.33
754.....	96.00	40.00
755.....	96.00	38.37
756.....	96.00	12.83
757.....	96.00	Motoring
758.....	96.00	Motoring
759.....	96.00	Motoring
760.....	97.74	7.37
761.....	100.05	19.74
762.....	102.00	11.83
763.....	102.00	26.81
764.....	103.00	49.96
765.....	104.00	60.00
766.....	102.37	60.00
767.....	103.94	60.00
768.....	104.00	40.00
769.....	104.00	25.75
770.....	103.12	Motoring
771.....	100.80	Motoring
772.....	100.00	Motoring
773.....	101.83	44.88
774.....	102.00	36.40
775.....	102.00	Motoring
776.....	102.00	Motoring
777.....	100.91	Motoring
778.....	101.40	Motoring
779.....	100.28	Motoring
780.....	97.97	Motoring
781.....	96.00	Motoring
782.....	96.00	10.00
783.....	96.00	0.23
784.....	96.00	Motoring
785.....	96.00	Motoring
786.....	94.08	Motoring
787.....	78.00	Motoring
788.....	77.45	Motoring
789.....	71.67	28.96
790.....	67.18	80.00
791.....	66.50	87.48
792.....	71.43	90.00
793.....	74.13	90.00
794.....	75.56	92.20
795.....	74.75	100.00
796.....	77.07	94.65
797.....	79.38	83.08
798.....	80.00	71.51
799.....	80.01	69.93
800.....	82.33	58.36
801.....	84.00	50.00
802.....	84.00	59.58
803.....	84.00	76.36
804.....	84.00	80.00
805.....	84.00	70.49
806.....	82.00	80.00
807.....	81.47	82.66
808.....	80.00	90.00
809.....	77.68	90.00
810.....	74.52	75.24
811.....	77.58	78.96
812.....	81.89	80.00
813.....	80.42	80.00
814.....	82.00	83.68
815.....	83.05	79.50
816.....	84.00	70.00
817.....	84.00	61.60
818.....	84.00	50.03
819.....	86.00	60.00
820.....	86.00	60.00
821.....	86.00	69.39
822.....	88.51	73.73
823.....	88.43	70.00
824.....	88.00	70.00

PROPOSED RULES

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
825.....	94.00	70.99
826.....	94.51	80.00
827.....	95.17	80.00
828.....	95.14	80.00
829.....	94.54	80.00
830.....	94.00	80.00
831.....	94.00	77.89
832.....	94.00	31.99
833.....	94.00	43.57
834.....	94.00	60.28
835.....	94.00	63.29
836.....	94.00	76.57
837.....	94.00	89.86
838.....	94.29	90.00
839.....	97.80	87.00
840.....	102.91	80.00
841.....	104.00	73.85
842.....	104.00	62.28
843.....	104.00	69.29
844.....	106.00	70.00
845.....	106.00	62.70
846.....	106.00	40.00
847.....	104.88	40.00
848.....	104.00	32.85
849.....	104.00	30.00
850.....	104.00	0.30
851.....	103.63	11.87
852.....	100.62	13.12
853.....	98.00	5.01
854.....	96.68	10.00
855.....	96.00	Motoring
856.....	96.00	Motoring
857.....	96.00	Motoring
858.....	95.43	Motoring
859.....	94.00	Motoring
860.....	94.00	Motoring
861.....	95.52	5.18
862.....	97.83	Motoring
863.....	98.00	Motoring
864.....	98.00	Motoring
865.....	97.22	Motoring
866.....	96.00	6.35
867.....	96.00	12.98
868.....	96.00	10.00
869.....	95.93	10.00
870.....	92.00	10.00
871.....	92.00	10.00
872.....	92.98	14.89
873.....	94.00	13.54
874.....	90.79	42.12
875.....	88.08	40.40
876.....	86.23	30.00
877.....	88.00	32.75
878.....	87.14	44.32
879.....	84.82	50.00
880.....	82.51	50.00
881.....	82.00	50.00
882.....	82.12	40.00
883.....	83.13	35.64
884.....	80.00	20.00
885.....	84.26	51.95
886.....	86.62	66.21
887.....	84.31	60.00
888.....	81.99	9.96
889.....	79.35	1.61
890.....	75.36	19.56
891.....	73.05	40.00
892.....	70.73	8.35
893.....	68.42	Motoring
894.....	47.15	8.95
895.....	35.79	10.00
896.....	32.95	7.38
897.....	29.16	Motoring
898.....	16.47	Motoring
899.....	2.13	Motoring
900.....	0.0	0.0
901.....	0.0	0.0
902.....	0.0	0.0
903.....	0.0	0.0
904.....	0.0	0.0
905.....	0.0	0.0
906.....	0.0	0.0
907.....	0.0	0.0
908.....	0.0	0.0
909.....	0.0	0.0
910.....	0.0	0.0
911.....	0.0	0.0

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
912.....	0.0	0.0
913.....	0.0	0.0
914.....	0.0	0.0
915.....	0.0	0.0
916.....	0.0	0.0
917.....	0.0	0.0
918.....	0.0	0.0
919.....	0.0	0.0
920.....	0.0	0.0
921.....	0.0	0.0
922.....	0.0	0.0
923.....	0.0	0.0
924.....	0.0	0.0
925.....	0.0	0.0
926.....	0.0	0.0
927.....	0.0	3.67
928.....	0.0	47.69
929.....	3.11	59.41
930.....	9.09	84.54
931.....	15.62	80.00
932.....	33.49	80.00
933.....	37.93	79.29
934.....	31.20	38.25
935.....	21.99	26.67
936.....	30.00	15.10
937.....	22.23	16.47
938.....	19.61	28.05
939.....	20.00	20.38
940.....	18.33	Motoring
941.....	6.55	Motoring
942.....	15.82	Motoring
943.....	23.63	Motoring
944.....	17.51	Motoring
945.....	14.19	62.52
946.....	16.64	69.36
947.....	27.77	60.00
948.....	37.03	63.79
949.....	47.36	75.36
950.....	54.77	80.00
951.....	57.70	80.00
952.....	54.03	79.92
953.....	58.00	65.03
954.....	58.65	43.23
955.....	62.88	50.00
956.....	69.83	50.00
957.....	72.00	42.05
958.....	75.81	40.00
959.....	84.22	42.20
960.....	83.86	41.28
961.....	80.55	Motoring
962.....	80.51	Motoring
963.....	78.00	Motoring
964.....	79.79	Motoring
965.....	80.33	30.54
966.....	85.58	42.12
967.....	81.78	50.00
968.....	78.00	50.00
969.....	80.74	43.16
970.....	92.10	73.65
971.....	88.01	Motoring
972.....	84.00	Motoring
973.....	84.00	Motoring
974.....	81.17	Motoring
975.....	70.46	Motoring
976.....	66.00	13.57
977.....	62.23	29.43
978.....	64.00	20.00
979.....	63.48	17.42
980.....	60.34	10.00
981.....	56.85	10.00
982.....	56.00	Motoring
983.....	52.45	Motoring
984.....	39.91	10.00
985.....	36.38	10.00
986.....	30.00	10.00
987.....	27.93	10.00
988.....	26.00	16.74
989.....	27.66	3.36
990.....	28.00	Motoring
991.....	27.41	Motoring
992.....	20.96	Motoring
993.....	12.15	Motoring
994.....	3.81	Motoring
995.....	0.0	0.0
996.....	0.0	0.0
997.....	0.0	0.91
998.....	0.0	7.52

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
999.....	0.0	0.0
1000.....	0.0	0.0
1001.....	0.0	0.0
1002.....	0.0	0.0
1003.....	0.0	0.0
1004.....	0.0	0.0
1005.....	0.0	0.0
1006.....	0.0	0.0
1007.....	0.0	0.0
1008.....	0.0	0.0
1009.....	0.0	0.0
1010.....	0.0	0.0
1011.....	0.0	0.0
1012.....	0.0	0.0
1013.....	0.0	0.0
1014.....	0.0	0.0
1015.....	0.0	0.0
1016.....	0.0	0.0
1017.....	0.0	0.0
1018.....	0.0	0.0
1019.....	0.0	0.0
1020.....	0.0	0.0
1021.....	0.0	0.0
1022.....	0.0	0.0
1023.....	0.0	0.0
1024.....	0.0	0.0
1025.....	0.0	0.0
1026.....	0.0	0.0
1027.....	0.0	0.0
1028.....	0.0	0.0
1029.....	0.0	0.0
1030.....	0.0	0.0
1031.....	1.77	Motoring
1032.....	1.80	Motoring
1033.....	0.0	0.0
1034.....	0.0	0.0
1035.....	2.14	9.28
1036.....	3.08	0.0
1037.....	0.0	0.0
1038.....	0.0	0.0
1039.....	0.0	0.0
1040.....	0.0	0.0
1041.....	0.0	0.0
1042.....	0.0	0.0
1043.....	0.0	0.0
1044.....	0.0	0.0
1045.....	0.0	0.0
1046.....	0.0	0.0
1047.....	0.0	0.0
1048.....	0.0	0.0
1049.....	0.0	5.51
1050.....	0.0	11.34
1051.....	0.0	0.0
1052.....	0.0	0.0
1053.....	0.0	0.0
1054.....	0.0	0.0
1055.....	0.0	0.0
1056.....	0.0	0.0
1057.....	0.0	0.0
1058.....	0.0	0.0
1059.....	0.0	0.0
1060.....	0.0	0.21
1061.....	0.0	30.00
1062.....	0.0	26.78
1063.....	0.0	20.00
1064.....	0.0	20.00
1065.....	0.0	4.12
1066.....	0.0	0.0
1067.....	0.0	0.0
1068.....	0.0	0.0
1069.....	0.0	0.0
1070.....	0.0	0.0
1071.....	0.0	0.0
1072.....	0.0	0.0
1073.....	0.0	0.0
1074.....	0.0	0.0
1075.....	0.0	0.0
1076.....	0.0	0.0
1077.....	0.0	0.0
1078.....	0.0	0.0
1079.....	0.0	0.0
1080.....	0.0	0.0
1081.....	0.0	0.0
1082.....	0.0	0.0
1083.....	0.0	0.0
1084.....	0.0	0.0
1085.....	0.0	0.0

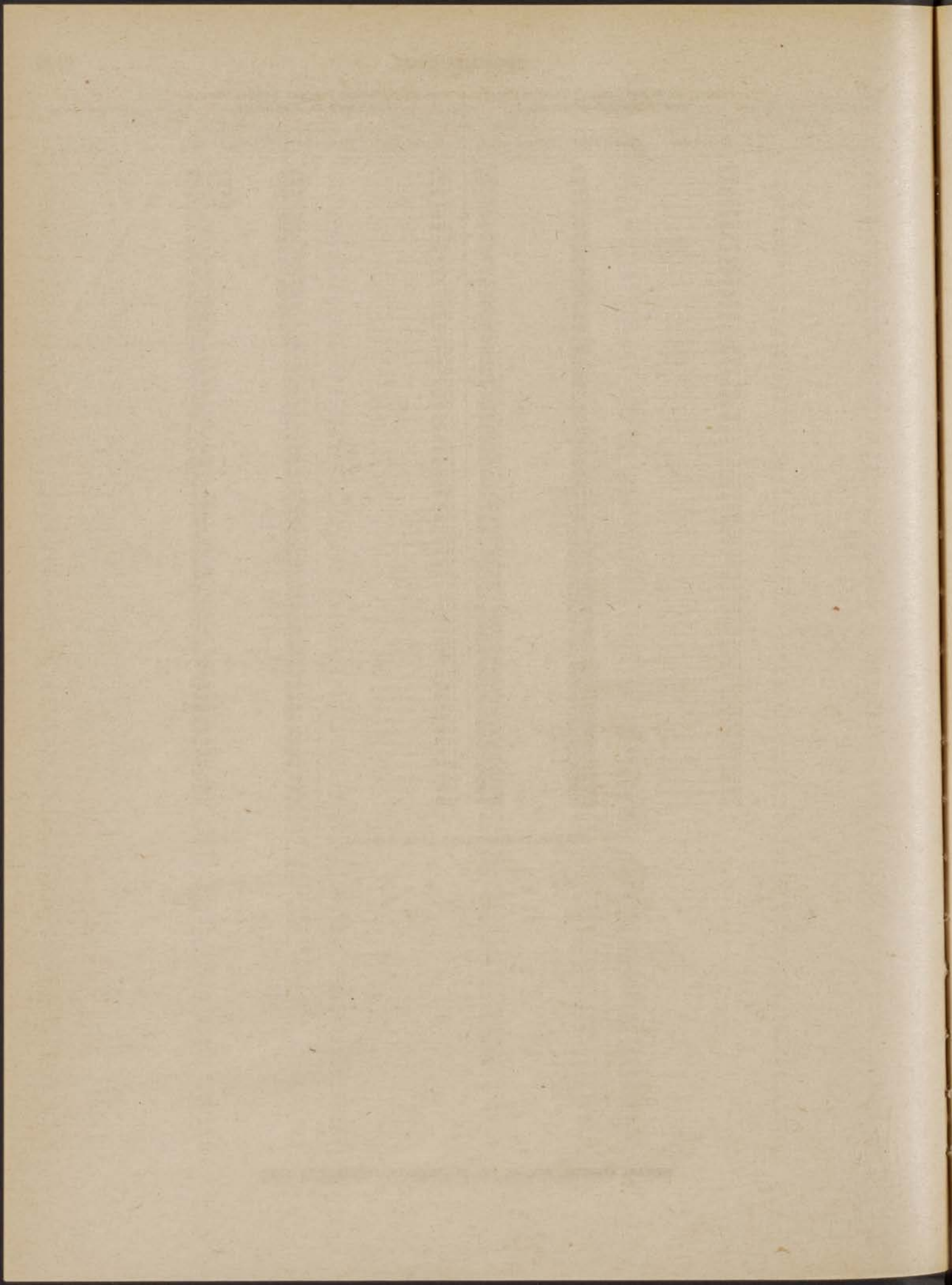
PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
1086.....	0.0	20.00
1087.....	0.0	20.00
1088.....	0.0	11.73
1089.....	0.0	0.0
1090.....	0.0	0.0
1091.....	0.0	0.0
1092.....	0.0	0.0
1093.....	0.0	0.0
1094.....	0.0	0.0
1095.....	0.0	0.0
1096.....	0.0	0.0
1097.....	0.0	0.0
1098.....	0.0	0.0
1099.....	0.0	0.0
1100.....	0.0	0.0
1101.....	0.0	0.0
1102.....	0.0	0.0
1103.....	0.0	0.0
1104.....	0.0	0.0
1105.....	0.0	0.0
1106.....	0.0	0.0
1107.....	0.0	0.0
1108.....	0.0	0.0
1109.....	0.0	0.0
1110.....	0.0	0.0
1111.....	0.0	0.0
1112.....	0.0	0.0
1113.....	0.0	0.0
1114.....	0.0	0.0
1115.....	0.0	0.0
1116.....	0.0	73.41
1117.....	0.0	90.00
1118.....	31.30	81.30
1119.....	41.15	90.00
1120.....	44.00	90.00
1121.....	46.41	90.00
1122.....	51.04	82.41
1123.....	66.66	80.00
1124.....	75.03	90.00
1125.....	89.85	90.00
1126.....	96.78	93.88
1127.....	96.91	50.94
1128.....	94.60	17.02
1129.....	99.16	28.60
1130.....	100.00	39.83
1131.....	100.00	30.00
1132.....	100.00	26.69
1133.....	100.98	20.00
1134.....	100.71	20.00
1135.....	100.00	36.06
1136.....	96.16	40.00
1137.....	95.77	30.00
1138.....	94.55	32.75
1139.....	96.86	35.68
1140.....	99.18	30.00
1141.....	100.00	44.93
1142.....	101.81	50.00

PERCENT RPM AND PERCENT TORQUE VERSUS
TIME SCHEDULE—Continued

Record (Sec.)	Percent RPM	Percent torque
1143.....	86.54	Motoring
1144.....	63.56	Motoring
1145.....	56.00	Motoring
1146.....	46.00	Motoring
1147.....	41.86	45.18
1148.....	38.31	78.47
1149.....	35.98	80.00
1150.....	31.03	80.00
1151.....	25.36	80.00
1152.....	23.05	60.97
1153.....	18.20	27.34
1154.....	12.84	43.71
1155.....	10.10	68.95
1156.....	3.79	68.95
1157.....	1.48	44.28
1158.....	0.0	0.0
1159.....	0.0	0.0
1160.....	0.0	0.0
1161.....	0.0	0.0
1162.....	0.0	0.0
1163.....	0.0	0.0
1164.....	0.0	0.0
1165.....	0.0	24.97
1166.....	0.0	17.16
1167.....	0.0	6.20
1168.....	0.0	10.00
1169.....	0.0	10.00
1170.....	0.0	0.0
1171.....	0.0	0.0
1172.....	0.0	0.0
1173.....	0.0	0.0
1174.....	0.0	0.0
1175.....	0.0	0.0
1176.....	0.0	0.0
1177.....	0.0	0.0
1178.....	0.0	0.0
1179.....	0.0	0.0
1180.....	0.0	0.0
1181.....	0.0	0.0
1182.....	0.0	0.0
1183.....	0.0	0.0
1184.....	0.0	0.0
1185.....	0.0	0.0
1186.....	0.0	0.0
1187.....	0.0	0.0
1188.....	0.0	0.0
1189.....	0.0	0.0
1190.....	0.0	0.0
1191.....	0.0	0.0
1192.....	0.0	0.0
1193.....	0.0	0.0
1194.....	0.0	0.0
1195.....	0.0	0.0
1196.....	0.0	0.0
1197.....	0.0	0.0
1198.....	0.0	0.0
1199.....	0.0	0.0

[FR Doc. 79-4389 Filed 2-12-79; 8:45 am]



TUESDAY, FEBRUARY 13, 1979

PART III



DEPARTMENT OF
HEALTH,
EDUCATION, AND
WELFARE

Food and Drug
Administration



DIAGNOSTIC
ULTRASOUND
EQUIPMENT

Development of Action Program

Testis
proph

[4110-03-M]

DEPARTMENT OF HEALTH,
EDUCATION, AND WELFARE

Food and Drug Administration

[21 CFR Subchapter J]

[Docket No. 78N-0288]

DIAGNOSTIC ULTRASOUND EQUIPMENT

Intent to Propose Rules and Develop
Recommendations

AGENCY: Food and Drug Administration.

ACTION: Notice of intent.

SUMMARY: The Food and Drug Administration (FDA) is considering an action program for diagnostic ultrasound equipment, including that used to visualize and monitor the fetus during pregnancy and labor. The agency may develop recommendations or mandatory performance standards related to diagnostic ultrasound equipment or may require manufacturers to supply purchasers with performance data and other information related to safety. One or more actions could follow, including recommended user procedures, recommended training criteria for users, recommendations covering equipment performance, manufacture and test procedures, regulatory product performance standards, and/or informational requirements. Before beginning this program, the agency is requesting further information and is inviting comments on conceptual criteria for users and for manufacturers of diagnostic ultrasound equipment.

DATES: Comments and data by August 13, 1979.

ADDRESS: Written comments to the Hearing Clerk (HFA-305), Food and Drug Administration, Rm. 4-65, 5600 Fishers Lane, Rockville, MD 20857.

FOR FURTHER INFORMATION
CONTACT:

Melvyn R. Altman, Bureau of Radiological Health (HFX-460), Food and Drug Administration, Department of Health, Education, and Welfare, 5600 Fishers Lane, Rockville, MD 20857, 301-443-3426.

SUPPLEMENTARY INFORMATION: The Food and Drug Administration, through the Bureau of Radiological Health (BRH) and under the authority of the Radiation Control for Health and Safety Act of 1968 (Pub. L. 90-602, 42 U.S.C. 263b et seq.), administers and electronic product radiation control program. This authority provides for the protection of the public health and safety through development and administration of radiation safety performance standards and development of recommendations for controlling

electronic product radiation. The Food and Drug Administration also has authority under the Federal Food, Drug, and Cosmetic Act, as amended by the Medical Device Amendments of 1976 (Pub. L. 94-295; 90 Stat. 539-583 (21 U.S.C. 360c et seq.)) regarding safety and effectiveness of medical diagnostic ultrasound equipment.

The Commissioner recognizes the demonstrated benefit of the use of diagnostic ultrasound in neurology, cardiology, obstetrics and gynecology, ophthalmology, and other fields of clinical medicine. Although ultrasound is now widely accepted as an indispensable diagnostic tool, the possible risks associated with diagnostic ultrasound are not fully understood. To date there have been no reports of adverse effects associated with the clinical use of diagnostic ultrasound, but clinical impressions, although valuable, do not establish conclusively that the use of diagnostic ultrasound involves no risks. Past human epidemiological studies have yielded inconclusive evidence, and it will probably be several years before definitive data will be available from current and future epidemiological studies. Thus, laboratory studies on animals must be used as indicators of possible adverse biological effects in humans.

Many of the early animal studies utilized ultrasound intensities that were well above diagnostic intensities and examined endpoints which were often representative of only gross pathological damage. However, recent reports of biological effects in animals exposed to ultrasound have involved levels of ultrasound representative of current diagnostic ultrasound applications (Ref. 1). It may be argued that many of the studies do not represent the exact exposure conditions of the clinical situations, or that the dosimetry is imperfect, or that the data have not been verified by other investigators, or that most of the data involve continuous wave exposure. However, the Commissioner believes that not all such studies can be dismissed as irrelevant, particularly because some of the studies involve the use of clinical devices.

Because of the extent of use of diagnostic ultrasound procedures during pregnancy and the recognized susceptibility of embryonic tissue to a variety of insults, those studies indicating that ultrasound can effect the development of laboratory animals exposed in utero are of particular concern. Some of the reported effects include delayed neuromotor reflex development (Ref. 2), altered emotional behavior (Ref. 3), and fetal anomalies in rodents exposed to clinical diagnostic ultrasound devices with reported acoustic outputs ranging from 20 milliwatts per square centimeter

(mW/cm²) to 40 mW/cm² (spatial and temporal-average intensities) (Ref. 4).

An examination of the current literature suggests that some of the most sensitive indicators of ultrasound-induced alterations appear to be associated with the central nervous system. These reported effects include increased levels of an enzyme (glutamic oxaloacetic transaminase) in the cerebrospinal fluid of dogs (Ref. 5) and induced electrical activity in the brain (evoked electroencephalographic responses) of nonhuman primates (Ref. 6) after exposure to ultrasound from diagnostic instruments with reported acoustic spatial and temporal-average intensities of 1.5 mW/cm² and 3 mW/cm² respectively.

How the available bioeffects data translate into risk to humans exposed to ultrasound is not clear at this time. There have been attempts to use the available data, both positive and negative, to construct curves or limits that delineate threshold levels or lowest levels for significant biological effects (Refs. 7, 8, and 9). Such levels have been widely interpreted as representing "safe" levels of ultrasound. However, the Commissioner does not believe such graphic analyses of isolated bioeffect data, most of which represent studies not designed to measure threshold effects, can define a safe region. It will probably be several years before the risks of diagnostic ultrasound to humans can be established and quantified. Because human studies of adverse effects from ultrasound have been inadequate, there is no direct way at this time to establish the exposure limits that assure safety in the use of this modality. Thus, the Commissioner believes manufacturers should not state in advertising or promotional literature that diagnostic ultrasound is unequivocally safe.

In view of reports of biological effects in laboratory animals after exposure to ultrasound at intensities representative of those used in a diagnostic applications (Ref. 1) and a report of increased movement of the human fetus during examination with clinical diagnostic ultrasound (Ref. 10), the Commissioner believes an individual's exposure to ultrasound should be kept as low as practicable, consistent with obtaining essential diagnostic information. Also, ultrasound exposure of pregnant humans for commercial demonstration of equipment is not considered acceptable by most professional organizations in the field.

The Commissioner is also concerned about the rapidly growing use of this modality while definitive information on biological effects is lacking. In recent years ultrasound radiation has become a common diagnostic tool in many widely varied medical specialties. The types of devices used in diag-

nostic medicine include pulse-echo imaging devices, continuous-wave Doppler units, pulse devices, and transmission equipment. One study has advocated that diagnostic ultrasound be used as a routine screening practice in all pregnancies (Ref. 11). The Obstetrical and Gynecological Device Classification Panel recommended that physicians not use this modality indiscriminately. However, the extent to which exposure to ultrasound radiation actually occurs will depend on whether available equipment is actually used in obstetrics and whether marketing forecasts are valid.

Several investigators have measured acoustic intensity levels from commercial diagnostic pulse-echo devices. The results of these limited studies indicate that the spatial and temporal-average intensities for most available pulse-echo devices are less than 10 mW/cm² (Ref. 12). However, there is currently no way to assure that all equipment will operate at these levels. For example, a report submitted by a manufacturer to BRH indicates that time-average intensity output of approximately 80 mW/cm² can be expected from the manufacturer's pulse-echo equipment. Clearly, output levels of pulse-echo devices can vary widely without operator knowledge.

Similar variation can occur with continuous-wave Doppler devices (Ref. 13). One investigator has reported that obstetrical continuous-wave Doppler devices can be designed to operate at ultrasonic intensities below 5 mW/cm² (Ref. 14). Here again, widely varying outputs of similar devices designed to obtain the same medical information have been observed. It may be desirable to discourage marketing of equipment with higher intensity capabilities, unless they are justified on the basis of needed improvement in diagnostic capability. With regard to Doppler units, it is important to consider that exposure times can range from less than 1 minute to periods of several hours, as in the case of fetal monitoring during labor and delivery.

From these examples, the Commissioner, in accord with recommendations of the Obstetrical and Gynecological Device Classification Panel, believes it prudent to use the lowest practical exposure levels, consistent with obtaining needed diagnostic information, and to use diagnostic ultrasound only when there is a valid medical reason. In this respect, the Commissioner believes the proposed recommendations of the Technical Committee of the Ultrasound Section of the National Electrical Manufacturers Association (NEMA) for abdominal scanning (10 mW/cm² for pulse-echo devices) provide reasonable guidelines for the upper limits of spatial and temporal-average intensities that

should be expected from these types of diagnostic ultrasound equipment (Ref. 19).

Information on acoustic emissions and imaging characteristics should be available to the user so that the user can make informed judgments regarding the use of this diagnostic modality. The Commissioner believes disclosure of output levels, as well as imaging characteristics, would aid the user in selecting equipment that would provide the desired diagnostic information while at the same time expose the patient to the lowest levels of ultrasonic radiation. Disclosure of imaging characteristics and output information would discourage claims that higher output necessarily implies more useful equipment. The Commissioner is considering requirements that output and imaging information be provided to users by manufacturers. In addition, user training activities are needed to eliminate unproductive exposure and to assure that consistently high quality diagnostic information is produced.

Several factors, including system sensitivity, resolution, gray scale dynamic range, registration, and calibration, directly affect the diagnostic capability of Doppler and/or pulse-echo equipment. Optimizing these factors can yield superior diagnostic information with minimum ultrasound exposure. Measurement surveys by FDA and other institutions indicate these factors vary widely among commercial models of diagnostic ultrasound equipment (Refs. 15 and 16). Other reports show that in the absence of routine testing and maintenance these factors vary with time for individual devices, and the informational quality of diagnostic ultrasound equipment will deteriorate (Refs. 17 and 18). The Commissioner is considering the promulgation of recommendations to users and/or equipment performance standards to improve this situation.

Because of these concerns and unresolved issues, BRH will continue to conduct biological effects investigations, evaluate equipment performance, and support research in these areas. Also, NEMA is considering ways to support biological effects studies. As in other problem areas (e.g., effects of ionizing radiation), no single study can provide all the necessary information. A program of collaborative research including well designed and executed studies is needed to determine the extent of risk to human health posed by exposure to diagnostic ultrasound. In addition to investigating biological effects, work will continue on developing methods to measure and evaluate the acoustic emissions and the imaging characteristics of diagnostic ultrasound equipment. The BRH will continue to measure and evaluate the performance of such equipment

through laboratory tests and review of reports that manufacturers are required to submit as specified in §§ 1002.10 and 1002.12 (21 CFR 1002.10 and 1002.12). Current and future data will be evaluated relative to the development of recommendations and performance standards and BRH may obtain additional performance and other technical data from manufacturers. In addition, the Commissioner encourages ultrasound users to notify BRH of accidental overexposures and adverse reactions of patients and workers.

The Commissioner recognizes and encourages the constructive efforts of the industry and others towards the development of standards for safe and effective diagnostic ultrasound equipment. A joint project by NEMA and the American Institute of Ultrasound in Medicine (AIUM) may result in a voluntary safety performance standard for this equipment. In addition, the Acoustical Society of America is actively developing standards for diagnostic ultrasound devices. The Commissioner will carefully consider the results, if timely and effective, of these and other voluntary efforts before taking further action.

The Commissioner will consult one or more of the advisory committees concerned with the safety and effectiveness of diagnostic ultrasound devices—the Technical Electronic Product Radiation Safety Standards Committee (TEPRSSC), the Medical Radiation Advisory Committee (MRAC), and appropriate medical device panels—concerning any further proposed action and any comments received in response to this notice. The TEPRSSC is a permanent statutory advisory committee to the Secretary of Health, Education, and Welfare and must be consulted before the establishment of standards under the Radiation Control for Health and Safety Act of 1968. The MRAC advises and consults with BRH in formulating policy and developing a coordinated program related to use of radiation in the healing arts. Medical device panels have been established under section 513(b) of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360c(b)) to make recommendations to the Commissioner for the classification of medical devices for human use. The MRAC and TEPRSSC considered drafts of this notice at their respective meetings on May 8 through 10 and June 1 and 2, 1978. Both committees generally supported the plan to publish a notice of intent concerning diagnostic ultrasound. Earlier, the Obstetrical and Gynecological Device Classification Panel recommended that all diagnostic and monitoring ultrasound devices be classified in class II, performance standards.

The following questions and conceptual criteria for users and manufacturers are provided for consideration and comment. Such criteria may be the subject of future proposed performance standards or voluntary recommendations under the acts administered by the agency.

QUESTIONS AND CONCEPTUAL CRITERIA RELATED TO THE CLINICAL USE OF DIAGNOSTIC ULTRASOUND EQUIPMENT

1. Diagnostic ultrasound should be used for human exposure only when there is a valid medical reason. Which of the following or what additional reasons should be considered valid (and under what conditions): medical diagnosis, patient or fetal monitoring, and educational and research applications approved by institutional review boards?

2. Users of diagnostic ultrasound equipment should have adequate training. How extensive should such training be? Should such training be only formalized training? Should it include instruction in both operator techniques and interpretation of diagnostic ultrasound information, instruction in performance measurements and procedures, and instruction in biological effects of ultrasound radiation?

3. Users of diagnostic ultrasound should implement adequate routine quality assurance programs to monitor equipment performance. What should be the elements of such programs? For example, should system sensitivity, depth calibration, and transducer resolution be periodically measured? What other measurements should be made?

QUESTIONS AND CONCEPTUAL CRITERIA RELATED TO THE MANUFACTURE OF DIAGNOSTIC ULTRASOUND EQUIPMENT

1. Manufacturer's specifications regarding ultrasound emissions as well as imaging effectiveness should be provided to the user. Which of the following or what additional parameters should be specified? (Items related to acoustic output defined in the proposed AIUM nomenclature (Ref. 20) are italicized):

- Maximum and average ultrasound intensity in time and space;
- Maximum and average ultrasound power;
- Transducer pulse shape, pulse duration, and pulse repetition rate;
- Transducer frequency spectrum information;
- Transducer beam pattern (axial and transverse);
- Transducer focal length and focal zone;
- Area of transducer beam cross-section and beam width (at focal length, if focused);
- Lateral resolution for each transducer;

i. Range resolution for each transducer (except for continuous-wave Doppler);

j. Sensitivity;

k. Position registration accuracy (for compound B-scan);

l. System dynamic range;

m. Range calibration accuracy (pulse-echo equipment).

2. Manufacturers should adopt quality control and testing programs adequate to assure that equipment performance specifications are met and that information provided with equipment is accurate. What are the elements of an adequate testing program for the manufacture of diagnostic ultrasound equipment?

3. Ultrasonic equipment maximum output capabilities should be as low as practical, consistent with obtaining needed diagnostic information. Should there be a specific recommended or mandatory limit on equipment output? For example, such a limit might require that diagnostic ultrasound equipment not produce spatial peak, time-average intensities in excess of 100 mW/cm² unless the manufacturer can strongly justify such exposures based on needed improvement in diagnostic capability. Would such a limit discourage trends to increased equipment output? Would such a limit be viewed as a "perfectly safe" level?

4. Diagnostic ultrasound should be used for human exposure only when there is a valid reason for its use. Are there any valid reasons for exposure of living humans to diagnostic ultrasound for purposes of commercial demonstration?

Persons or organizations wishing further information made public on the development of the action program for ultrasound diagnostic equipment and its use may write to the contact person whose address appears in the heading of this notice.

The following references are on file at the office of the Hearing Clerk, FDA, and may be seen in that office between 8 a.m. and 4 p.m., Monday through Friday:

- (1) Stratmeyer, M. E., "Research Directions in Ultrasound Bioeffects—A Public Health View," Symposium on Biological Effects and Characterizations of Ultrasound Sources, June 2 and 3, 1977, pp. 240-245, HEW Publication (FDA) 78-8044.
- (2) Murai, N., K. Hoshi, and T. Nakamura, "Effects of Diagnostic Ultrasound Irradiated During Fetal Stage on Development of Orienting Behavior and Reflex Ontogeny in Rats," *Tohoku Journal of Experimental Medicine*, 116:17-24, 1975.
- (3) Murai, N., K. Hoshi, C. Kang, and M. Suzuki, "Effects of Diagnostic Ultrasound Irradiated During Fetal Stage on Emotional and Cognitive Behavior in Rats," *Tohoku Journal of Experimental Medicine*, 117:225-235, 1975.
- (4) Shoji, R., E. Momma, T. Shimizu, and S. Matsuda, "An Experimental Study on the Effects of Low Intensity Ultrasound on De-

veloping Mouse Embryos," *Teratology*, 6:119, 1972.

(5) Tsutsumi, Y., K. Sano, T. Kuwabara, T. Takakura, K. Hayakawa, T. Suzuki, and M. Katanuma, "A New Portable Echo-Encephalograph, Using Ultrasonic Transducers; and its Clinical Application," *Medical Electronics and Biological Engineering*, 2:21-29, 1964.

(6) Hu, J. H. and W. D. Ulrich, "Effects of Low-Intensity Ultrasound on the Central Nervous System of Primates," *Aviation, Space, and Environmental Medicine*, 47:640-643, 1976.

(7) Nyborg, W. L., "Physical Mechanisms for Biological Effects of Ultrasound," report based on series of lectures presented March 12 to April 2, 1976, at the Bureau of Radiological Health, HEW Publication (FDA) 78-8062.

(8) Ulrich, W. D., "Ultrasound Dosage for Experimental Use on Human Beings," Naval Medical Research Institute Research Report, Proj. M4306, 01-101-0 BXXO, Report #2, August 18, 1971.

(9) Wells, P. N. T., "The Possibility of Harmful Biological Effects in Ultrasound Diagnosis," in "Proceedings of Symposium on Cardiovascular Applications of Ultrasound," Beese, Belgium, May 29 and 30, 1973.

(10) David, H., J. B. Weaver, and J. F. Pearson, "Doppler Ultrasound and Fetal Activity," *British Medical Journal*, 2:62-64, 1975.

(11) Donald, I., "New Problems in Sonar Diagnosis in Obstetrics and Gynecology," *American Journal of Obstetrics and Gynecology*, 118:299-309, 1974.

(12) Stewart, H. F., G. R. Harris, and H. M. Frost, "Development of Principles and Concepts for Specification of Ultrasonic Diagnostic Equipment Performance," *Ultrasound in Medicine*, Vol. 3B, Edited by Dennis White and Ross Brown, Plenum Press, pp. 2115-2142, 1977.

(13) Rooney, J. A., "Determination of Acoustic Power Outputs in the Microwatts-Milliwatts Range," *Ultrasound in Medicine and Biology*, 1:1-4, 1973.

(14) Ziedonis, J. G., "Ultrasonic Power Levels Used in Commercial Equipment for Medical Applications and How to Control It for Patients Safety," Proceedings of the Society of Photo-Optical Instrumentation Engineers, 47:110-111, Aug. 1 and 2, 1974.

(15) Christensen, S. L. and P. L. Carson, "Performance Survey of Ultrasound Instrumentation and Feasibility of Routine Monitoring," *Radiology*, 122:449-454, 1977.

(16) Erickson, K. R., P. L. Carson, and H. F. Stewart, "Field Evaluation of the AIUM Standard 100 mm Test Object," *Ultrasound in Medicine*, Vol. 2, Edited by White and Barnes, Plenum Press, New York, 1976.

(17) Goldstein, A., "Gray Scale Shifts in Ultrasound Displays," *Radiology*, 121:175-182, 1976.

(18) Smith, S. W., H. Lopez, and H. F. Stewart, "Methods and Results of Dynamic Range Testing of Diagnostic Ultrasound Instrumentation," Proceedings of the Society of Photo-Optical Instrumentation Engineers (in press).

(19) Technical Committee of the Ultrasound Section of the Radiation Imaging Products Division, National Electrical Manufacturers Association, "Recommendations of the Technical Committee Proposed for Consideration," submitted to the Ultrasound Subcommittee of the BMD OB/Gyn

Device Classification Panel, October 22, 1976.

(20) Proposed American Institute of Ultrasound in Medicine (AIUM) Nomenclature, Fifth Draft, August 21, 1977.

This notice of intent is issued under the Public Health Service Act, as amended by the Radiation Control for Health and Safety Act of 1968 (secs. 356 and 358, 82 Stat. 1174-1179 (42 U.S.C. 263d and 263f)); the Federal Food, Drug, and Cosmetic Act as amended (21 U.S.C. 301 et seq.); and authority delegated to the Commissioner (21 CFR 5.1).

Interested persons are invited to participate in the development of an action program by submitting written comments, views, and data on the subject. Communications should reference the docket number appearing in the heading of this document and should be sent to the hearing Clerk (HFA-305), Food and Drug Administration, Rm. 4-65, 5600 Fishers Lane, Rockville, MD 20857, by August 13, 1979. Timely comments will be considered in formulating the action program. Comments received after the closing date may be considered, depending on the stage of development of any standards or recommendations.

Dated: February 1, 1979.

SHERWIN GARDNER,
*Acting Commissioner
of Food and Drugs.*

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