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**Environmental Protection Agency**

**40 CFR Part 88**

**[AMS-FRL- ]**

**Clean Fuel Fleet Emission Standards, Conversions, and General Provisions and Amended Heavy-Duty Averaging, Banking, and Trading Regulations**

**AGENCY:** Environmental Protection Agency (EPA)

**ACTION:** Notice of Proposed Rulemaking (NPRM)

**SUMMARY:** Provisions in the Clean Air Act Amendments (CAAA) enacted in 1990 require the establishment of a Clean Fuel Fleet Program. Under this program, a percentage of the new vehicles acquired by certain fleet owners located in covered areas will be required to meet clean-fuel fleet vehicle (CFFV) emission standards. This requirement can be met by the purchase of new CFFVs, the conversion of conventional vehicles to CFFVs, or through purchases of credits pursuant to a credit program. Affected states will be required to revise their State Implementation Plans to incorporate the fleet program, including provisions to implement a credit program and exempt CFFVs from certain transportation control measures (TCMs).

The CAAA require EPA to promulgate regulations governing these provisions. Accordingly, regulations for the credit program and TCM exemptions were promulgated on ______, 1992 (__ FR ______). Today's NPRM contains proposals for implementing the additional statutory requirements, which

include emission standards for CFFVs and regulations governing the conversion of conventional vehicles to CFFVs. Several key definitions applicable to the Clean Fuel Fleet Program as a whole are also proposed.

Separate from the provisions proposed in today's NPRM for the CFF program, EPA is also proposing to change the credit accounting method used in its averaging, banking and trading program for heavy-duty engines such that manufacturers will be required to use credits scheduled to expire in the earliest model year before using credits that would expire in later model years.

**DATES:** Comments on this proposal will be accepted until "DATE". EPA will conduct a public hearing on "DATE". Additional information on the comment procedure and public hearing can be found under "Public Participation" in the Supplementary Information section of today's notice.

**ADDRESSES:** Interested parties may submit written comments (in duplicate if possible) to Public Docket No. A-92-30 at the following address: U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, DC 20460. The docket is available for public inspection from 8:30 a.m. until 12 noon and from 1:30 p.m. until 3:30 p.m. Monday through Friday. A reasonable fee may be charged for copying docket materials.

The public hearing will be held at (place, address a minimum 15 days after the proposal is published). The public hearing will begin at [x] a.m. and will continue until all testimony has been presented. A transcript of the hearing will be placed in the docket. Copies may also be obtained by arrangement with the court reporter on the day of the hearing.

**FOR FURTHER INFORMATION CONTACT**: Mr. Bryan Manning, U.S. EPA (RDSD-12), Regulation Development and Support Division, 2565 Plymouth Rd. Ann Arbor, MI 48105, Telephone: (313) 741-7832.

## I. Introduction

This NPRM proposes emission standards for clean-fuel vehicles (CFFVs), regulations for the conversion of conventional vehicles to CFFVs, and definitions of several key program terms and provisions. To promote a clear understanding of the role of these regulations in the Clean Fuel Fleet Program as a whole, this introductory section describes the statutory requirements, the nature of the regulated industry, the timing of the program provisions, and other actions related to today's proposal. Many of these subjects have also been discussed at length in an earlier NPRM, "Clean Fuel Fleet Credit Program, Transportation Control Measure Exemptions, and Related Provisions" (56 FR 50196, October 3, 1991) and in the final rule which is anticipated to be published shortly, and thus, they will not be detailed here.

### A. *Fleet Program Overview*

The fleet program is contained in part C, "Clean-Fuel Vehicles", of Title II of the Clean Air Act, as amended (CAA, the Act). The purpose of the program is to introduce clean-fuel vehicles in certain specified "covered areas" with air quality problems. "Covered areas" of the fleet program, as specified in CAA section 246(a), are those with 1980 populations of 250,000 or more that are also serious, severe, or extreme ozone nonattainment areas (based on 1987-1989 data) or carbon monoxide nonattainment areas (based on 1988-1989 data). Currently, there are 22 such areas in 19 states. In addition, CAA section 246(a)(3) requires all states containing all or part of an area with a 1980 population of 250,000 or more that is reclassified in the future as a serious, severe, or extreme ozone nonattainment area to prepare revised SIPs implementing the fleet program within one year of such reclassification. Any area subsequently reclassified to serious, severe, or extreme ozone nonattainment will also be covered.

CAA section 241 defines "covered fleets" as fleets of ten or more motor vehicles which are owned or operated, leased or otherwise controlled by a single person. Both private business and federal, state, and local government fleets are subject to the statute. Certain fleets and vehicles are exempt from the regulations, including fleets with vehicles that cannot be fueled at a central location, vehicles that are normally garaged at a personal residence, or vehicles that belong to vehicle classes without applicable clean-fuel vehicle (CFV) standards. These exemptions are discussed in detail in later sections of this NFRM.

The CAA requires states with covered areas to revise their State Implementation Plans (SIPs) to implement the Clean Fuel Fleet Program. The SIP revisions must be designed to ensure that fleet owners will include, through purchase or lease, a specified percentage of low emitting vehicles among the vehicles newly acquired for their fleets. These requirements can also be met by converting conventional vehicles to CFFVs or by obtaining credits. To qualify as a CFFV, a vehicle must meet one of three sets of standards. These are commonly referred to as low-emission vehicles (LEVs), ultra low-emission vehicles (ULEVs), and zero-emission vehicles (ZEVs). Credits can be obtained by purchasing ULEVs or ZEVs or by early or extra purchases of vehicles at any of the three levels. Three classes are covered by the program: light-duty vehicles and trucks (LDVs and LDTs) under 6000 lbs Gross Vehicle Weight Rating (GVWR); LDTs between 6000 lbs and 8500 lbs GVWR; and heavy-duty vehicles (HDVs) over 8500 lbs GVWR but under 26,000 lbs GVWR. HDVs over 26,000 lbs GVWR are not included in the mandatory program. The credits program has been discussed at length in an earlier NPRM, "Clean Fuel Fleet Credit Program, Transportation Control Measure Exemptions, and Related Provisions" (56 FR 50196, October 3, 1991) and in the final rule which is planned to be proposed soon.

Section 242(a) of the CAA requires EPA to promulgate CFFV emission standards for LEVs, ULEVs, and ZEVs in each of these vehicle classes for the purpose of implementing the CAA. The light-duty (LDV and LDT) CFFV emission standards being proposed are those EPA anticipates will be proposed for the California Pilot Test Program (pilot program) and are described below. As required by the CAA, heavy-duty CFFV emission standards are also proposed in today's NPRM, as well as standards for heavy-duty ULEVs and ZEVs for use in generating clean-fuel vehicle credits. In addition to LEVs, ULEVs, and ZEVs, EPA has proposed inherently low-emission vehicle (ILEV) standards for use in generating credits and obtaining exemptions from TCMs. ILEVs were discussed in an earlier NPRM ("Clean Fuel Fleet Credit Program, Transportation Control Measure Exemptions, and Related Provisions" (56 FR 50196)) and in the final rule which is anticipated to be published shortly; therefore, ILEVs will not be discussed in today's NPRM.

The CAA prescribes purchase requirements in terms of a percentage of the total number of new covered fleet vehicles of each class purchased each year. These requirements are phased in over three years. For LDVs and LDTs, the rate begins at 30 percent in 1998, increasing to 50 percent in 1999 and then to 70 percent in 2000 and beyond. The HDV purchase requirement begins at 50 percent in 1998 and remains at 50 percent thereafter. These requirements can be met in any of three ways: (1) by purchasing vehicles which meet the LEV, ULEV, or ZEV standards, (2) by redeeming credits generated by the fleet operators themselves or obtained from other entities, or (3) by converting existing or new conventional vehicles to CFFVs. Section 247(b) of the CAA provides that EPA must promulgate regulations governing such conversions. These regulations are proposed in today's notice.

Many implementation issues need to be resolved and key terms defined in order to establish the Clean Fuel Fleet Program. In response to suggestions by representatives of the states and the affected industry, EPA proposes to resolve some of these issues and define key terms by regulation in today's

NPRM and to publish a separate guidance document for others. The intent of these actions is to foster consistency among state programs, thus reducing confusion and improving efficiency and effectiveness.

## II. **Key Program Definitions/Uniformity**

### *A. Background*

The Clean Air Act provides a framework for the Clean Fuel Fleet Program and requires that EPA promulgate certain regulations regarding the program, which the affected states are to implement and enforce. In various meetings and hearings about the program's credit provisions, both fleet operators and affected states requested that EPA promulgate additional federal guidance and regulations to promote program uniformity. According to industry members, lack of certainty about the requirements of the program would increase their costs and decrease their ability to comply. Since they did not yet know what compliance would entail, they could not plan ahead. In addition, since different covered areas might have different programs, compliance would be made more difficult and expensive for fleet operators that have fleets in more than one covered area. The industry strongly requested that a patchwork set of state programs be avoided. The industry stated that this would assist their implementation, reduce their costs, and improve overall program effectiveness.

Fleet operators also said that the uncertainty acted as a disincentive to early implementation of the program, because early efforts might have to be abandoned when the program is finalized. Fleets would be discouraged from purchasing CFFVs beyond the minimum purchase requirements (i.e. 30% in 1998, 50% in 1999, and 70% in 2000 and later for LDVs/LDTs and 50% in the those model years for HDVs). Their efforts would be spent on minimal compliance, and fewer resources would be left to invest in alternative fuels, credit vehicles, or other optional measures beneficial to the environment. As a result, the members of the fleet industry requested regulations to ensure that states would enact similar programs.

Representatives of the affected states also requested action by EPA to clarify a number of fleet program issues. They indicated that further federal guidance would be beneficial in designing their programs and in obtaining legislative support within their own states. Indeed, given the budget and staffing situations of many states, federal help with this program was considered very important.

At the outset, it was EPA's view that program implementation should be left to the states. While this continues to be EPA's general view, after careful consideration of these arguments and the relevant CAA provisions, EPA agrees with the concerned parties that regulations governing key program definitions are necessary for the effective and efficient implementation of the fleet program. This conclusion is supported by several considerations. First, the need for uniformity among state programs is very important for fleets operating in more than one state. Second, if states do not have to expend resources to resolve basic program issues, they can use those resources for implementation and enforcement. Third, the implementation of various regulatory programs which the Agency is required to promulgate, such as the CFFV credits program and TCM exemptions, would proceed more smoothly if EPA also promulgated uniform definitions of key terms. More fundamentally, there is no reason to believe that Congress intended to allow state programs to vary in such basic ways; indeed one reason for a federal mandate for state programs is to avoid states competing against one another to keep or attract business through offers of less stringent regulatory requirements.

Thus, to reduce ambiguity and increase the effectiveness of the Clean Fuel Fleet Program, EPA proposes to define certain terms and resolve certain issues by regulation. EPA further proposes that these regulations be required to be included in the SIP revisions mandated by CAA section 246(a). EPA believes it has authority to promulgate these regulations under CAA section 301(a), which authorizes the Administrator to do what is necessary, including promulgating regulations, to carry out the Administrator's functions under the Act. For the reasons stated above, EPA believes these regulations are necessary to implement an effective and efficient fleet program.

In developing this proposal, EPA provided drafts to representatives of the states and received comments from them in return. These comments are available in the public docket and have been incorporated into this NPRM where appropriate.

The key terms arise largely in Title II Part C of the Act. The terms defined in the proposed regulations and discussed in the following section are: covered fleet operator; centrally fueled; capable of being centrally fueled; control; dealer demonstration vehicle; emergency vehicle; law enforcement vehicle; model year; motor vehicles held for lease or rental to the general public; new covered fleet vehicle; owned or operated, leased, or otherwise controlled; person; vehicle used for motor vehicle manufacturer product evaluations and tests; under normal conditions garaged at personal residence at night.

The proposed regulations also contain provisions for distributed fleets and multi-state nonattainment areas, because inconsistency regarding these issues could inhibit current fleet business practices and unnecessarily increase compliance costs.

Some terms important to the fleet program, such as covered fleet, covered area, and covered fleet vehicle, are not addressed in the regulations. EPA believes these terms are sufficiently defined in the Act. Other topics are omitted from the proposed regulations because the issues involved vary widely from one area to another, and EPA believes that nationwide regulations cannot adequately take these differences into account. Some of these omitted issues are: the development of SIP revisions, including who should participate in relevant discussions; fuel issues, including fuel availability and fuel use; enforcement; state SIP credits; and other miscellaneous issues. While regulations are not proposed for these issues, EPA recognizes that they are important to the state programs and plans to provide guidance on these issues in a separate document. Non-road definitions are being dealt with in another rulemaking (see discussion on page 19). Administration and enforcement issues (i.e., certification, Selective Enforcement Audits (SEA), recall, and labeling) are being addressed in the Pilot Program rule.

### B. *Definitions Determining the Fleets Covered by the Fleet Program*

According to section 246(b) of the Act, "each covered fleet operator in each covered area" shall purchase a certain portion of clean-fuel vehicles when making purchases of new vehicles. There are three terms included in the Act that are pivotal in determining which fleet vehicles and ultimately which fleets will be covered by the fleet program. These are "covered fleet operator," "centrally fueled," and "capable of being centrally fueled." EPA is presenting the proposed definitions for these terms together to facilitate the reader's understanding of their interrelatedness. Fleet operators or owners can determine whether they are covered fleet operators if they meet the criteria of these definitions.

#### 1. Covered Fleet Operator

EPA is proposing to define "covered fleet operator" as meaning a person who operates a fleet of at least ten "covered fleet vehicles" that meets the requirements described below. The covered fleet must either be primarily operated within the covered area (even if the covered fleet vehicles are garaged outside of it) or it must be centrally fueled, or garaged and maintained, at a site within the covered area. Under the Act, a "covered fleet vehicle" is one for which clean-fuel vehicle standards apply and which is in a covered fleet that is centrally fueled or capable of being centrally fueled, with the exception of vehicles garaged at a personal residence at night (§241(6)).

This definition is intended to clarify the criteria that help determine if a fleet operator is a covered fleet operator under the Act. For fleet operators to know whether they are covered fleet operators, they must know whether the two major criteria are applicable to their fleets or the vehicles in their fleet. These criteria are whether their fleets can be classified as "covered fleets," and whether some or all of their vehicles are "centrally fueled" or "capable of being centrally fueled."

The term "covered fleet" is defined in section 241(5) of the Act as "10 or more motor vehicles which are owned or operated by a single person... ." In conjunction with the term "covered fleet," the Act also lists types of vehicles that are not covered and are not to be counted in determining a covered fleet. Section 241(6) then defines "covered fleet vehicle" by stating that the term "means only a motor vehicle which is (i) in a vehicle class for which standards are applicable under this part; and (ii) in a covered fleet which is centrally fueled (or capable of being centrally fueled)," with the exception of a "vehicle which under normal operations is garaged at a personal residence at night." The Act, however, does not define "centrally fueled" or "capable of being centrally fueled," and proposed definitions for these terms are presented below.

EPA believes this definition for "covered fleet operator" is consistent with the definitions in section 241 of the Act and reflects the statutory requirements of section 246(b), which limits the program's application to "each covered fleet operator in each covered area." The phrase "in each covered area" excludes from the scope of the program fleet operators outside each covered area.

The statute does not clearly define which fleet operators are "in" a covered area. EPA believes that fleets which are operated from a covered area, or spend 75 percent or more of total fleet operating time in a covered area, should be considered to be operating "in" a covered area. EPA is proposing a 75 percent level for time used in an area because this represents a high degree of operation inside a covered area, with a concomitant impact on area emissions levels. Obviously, the more a fleet is used in a covered area, the greater its contribution to area pollution levels and, if clean-fuel vehicles are used, the greater its potential for reducing that pollution. The relatively high requirement of 75 percent ensures that only those fleets that spend a substantial amount of time in the covered area are required to take the steps necessary to reduce their contribution to pollution levels in the area. A lower percentage of fleet time in a covered area would make it harder to justify purchasing the required portion of new clean-fuel vehicles for use in the covered area since a fleet would not contribute as much to the air quality in that area. EPA requests comment on the choice of a 75 percent level for the total fleet operating time in a covered area, or whether a lower or higher percentage level would be more desirable.

EPA recognizes that states may have a difficult time enforcing compliance with this 75 percent specification for the myriad of fleets within their jurisdiction. Therefore, EPA proposes that fleets which are potentially affected report to their state the use pattern for each vehicle which the fleet operator asserts should not be counted toward the 75 percent requirement. Thus, fleet operators would only need to report on their non-covered vehicles. States would not be expected to make determinations for all fleet vehicles operating within their jurisdiction but rather only those vehicles which the fleet operator asserts should not be covered. Furthermore, because the states will be responsible for enforcing fleet compliance with fleet programs, EPA is proposing to allow states to choose the criteria that will be used by fleets to report the degree of fleet operation in a covered area. Examples of different methods for determining the percentage of use in a covered area include indicators of mileage, location of destination points, or fraction of time spent operating in the covered area.

Fleet owners have argued that establishing a minimum threshold for operation within a covered area and reporting which vehicles are centrally fueled or capable of being centrally fueled vehicles (as described below) would create substantial new paperwork and other burdens if they chose to demonstrate that some or all of their vehicles should not be covered. However, EPA shares the concern of the states that without such requirements fleets can too easily avoid participating in the program and, as a result, their vehicles operating in a covered area would not be clean-fuel vehicles.

EPA realizes that covered fleet operations could change over time and that the actual number of covered fleet vehicles at a later date could be higher or lower than that originally reported. EPA therefore proposes that covered fleet owners be able to appeal to their state to modify their reported figures on the number of covered fleet vehicles. By the same token, EPA proposes that states be allowed to require that the state be updated by covered fleet operators to ensure that any increases in covered fleet size can be monitored by the state.

2. Centrally Fueled

EPA is proposing to define "centrally fueled" as meaning that a fleet vehicle is usually refueled at a location that is owned, operated, or controlled by the covered fleet operator, or is under contract with the covered fleet operator.

This definition contains two requirements which EPA believes are important if vehicles are to be considered centrally fueled. The first is that vehicles be fueled at a designated location most, but not necessarily all, of the time. For example, a fleet owner may require fleet vehicles to refuel at such location except when it would be inconvenient or inefficient to do so because the vehicle is too far away or because the refueling location is closed. The second requirement is that the designated refueling location must be owned, operated, or controlled by, or must be under contract with, the fleet operator. This requirement reflects the need of the fleet operator to have some control over the type of fuel available at that location.

For the purpose of this definition, "location" means any building, structure, facility, or installation (i) which belong to the same person, (ii) which are located on one or more contiguous properties, (iii) which are under the control of the same person, and (iv) which contain a refueling pump or pumps for the use of the vehicles owned or controlled by that person. EPA proposes this definition because it encompasses the facilities of the fleet operator in their entirety. EPA believes that this definition of location is a reasonable one that will ensure that "location" is not defined so narrowly, e.g., as a single refueling pump, that it would be easy to avoid the requirements of the fleet program.

Under this definition, if fleet vehicles are required to be refueled at a service station with which the fleet owner has entered into a contract for such refueling purposes, then the fleet vehicles would be considered to be centrally fueled. However, if there is no such contract, and the fleet vehicles receive no special refueling benefits at the service stations (i.e., they are treated as normal retail customers), then they would not be considered centrally fueled. Credit card purchases would not be considered to be a refueling agreement.

EPA is proposing to define "usually fueled" as meaning a fleet vehicle is fueled at such location at least 75 percent of the time. This definition has been selected because EPA recognizes that there are special situations when vehicles which are normally centrally fueled cannot return to a designated location for refueling. Setting the proportion of refueling events at 75 percent would ensure that a vehicle is not deemed to be centrally fueled unless a substantial proportion of its refueling takes place at locations controlled by the fleet operator, while allowing for legitimate exceptions. EPA requests comment on the choice of the 75 percent level, and on whether a lower or higher percentage level would be more desirable.

EPA proposes that fleet operators demonstrate to the states which vehicles are not centrally fueled in a way similar to the approach used concerning those fleets usually operated in a covered area, as described in the definition for "covered fleet operator," above. Specifically, EPA proposes that fleets report to states which vehicles are not centrally fueled, along with how this determination was made. Vehicle refueling determinations are proposed to be based on average fleet operations. EPA proposes that each state determine the characteristics of average fleet operation for fleets in their state. That determination may be based on seasonal working patterns for each fleet or other considerations. EPA requests comments on whether these parameters should be clarified by EPA. EPA also requests comments regarding whether or not all applicable fleets are covered by this definition.

3. Capable of Being Centrally Fueled

EPA is proposing to define "capable of being centrally fueled" as meaning that it would be practical and economically feasible to refuel the covered fleet vehicles at a location that is owned, operated, or controlled by the covered fleet operator, or is under contract with the covered fleet operator, notwithstanding the requirements of the Clean Fuel Fleet Program. EPA proposes that fleets which have been centrally fueled at any time since November 15, 1990 be presumed to be capable of being centrally refueled. Also, fleets which consist of vehicles that do not travel further than their operational range on a single tank of fuel more than 50 percent of the time before returning to such common location are presumed to be capable of being centrally fueled.

For the purpose of this definition, EPA is proposing to treat "location" in the same manner as described above in the context of "centrally fueled."

EPA has chosen this definition because it contains two tests for determining whether a fleet is capable of being centrally fueled: it must be practical and it must be economically feasible.

For it to be practical to provide central refueling, fleet vehicles must be able to return to that location at regular intervals. EPA believes that vehicles that do not travel farther than their operational range more than 50 percent of the time are capable of being centrally fueled. This is because to be able to return to the central refueling location at regular intervals, a vehicle must not travel farther than its operational range on a single tank of fuel. However, EPA believes it would be contrary to the purposes of the fleet program to exempt vehicles just because, on occasion, they travel farther than their operational range. Therefore, EPA proposes that a vehicle that travels no farther than its operational range 50 percent or more of the time be considered capable of being centrally refueled. EPA has chosen the 50 percent criteria because it reflects the fact that the vehicle can return to a central refueling location at least half of the time, thus allowing fleet owners a degree of flexibility in planning vehicle trips.

Second, even if a fleet vehicle does not travel farther than its operational range more than 50 percent of time, it must be economically feasible to provide or be provided central fueling. This means that the construction and maintenance of such a refueling site or the access to such a site must not cause undue economic hardship to the fleet owner. Undue economic hardship would have to be demonstrated by fleet operators to relevant state authorities. EPA requests comments on these requirements, on what criteria should be used to establish "undue economic hardship," and on whether EPA should define "undue economic hardship" or leave it for the states to define.

Fleets that are not currently centrally fueled but, according to this definition, are capable of being centrally fueled could achieve central refueling in several ways. Some fleets may find it convenient to contract with service stations for their clean-fuel needs. Contract point refueling is quite common among fleets. Alternatively, smaller fleets may be able to arrange to use the facilities of larger centrally-fueled fleets. For example, section 246(g) of the Act requires affected federal facilities to make their clean-fuel available for sale to other fleets. Another option for some fleets may be mobile refueling from tanker trucks. This method, which may require approval by the local fire marshall, is used by some large fleets and may be cost effective for some smaller fleets as well. EPA requests comments on these or other potential central refueling methods for fleets which would meet the "capable of being centrally refueled" criterion.

Some vehicles may be used for deliveries in the covered areas and some outside of the areas. At present, the same types of vehicles are often used for both purposes, since gasoline-powered vehicles have ranges in excess of 250 miles and gasoline is widely available. If fleet owners choose to use other fuels, their vehicles may have shorter ranges and use less widely-available fuels. Fleet operators will therefore have to determine how to segregate the operations and plan the trip assignments of the vehicles based on the fuels used. If such a determination is possible, EPA believes that the whole fleet should be considered capable of being centrally fueled, since the phrase "capable of centrally fueling" is used in the Act to describe both fleets and individual vehicles. EPA proposes that as long as the fleet has at least 10 vehicles that are capable of central refueling, the fact that one or more additional vehicles are not capable of central fueling does not mean that the entire fleet is incapable of central refueling. Therefore, covered vehicles purchased for use in such a fleet will trigger the purchase requirements, regardless of how individual vehicles will be fueled.

EPA is proposing that fleets which are potentially affected by this requirement report to their state whether some or all of their fleet vehicles are not capable of being centrally fueled and are therefore not covered under the fleet program. EPA would not require fleets to make this determination in any particular way. However, suggestions for methods to make this demonstration will also be included in the fleets guidance document referred to above.

Since the purchase requirements of the fleet program never exceed 70 percent of new vehicles in a class to which clean-fuel vehicle standards apply(or 50 percent for heavy-duty), fleet operators always have the flexibility to maintain some of their fleet as conventional vehicles (non-CFFVs). This is especially important because some fleets rotate a portion of their vehicles to different locations which could be outside the covered area. Fleet operators could identify those vehicles ahead of time and maintain them as conventional vehicle purchases. In the case where a fleet normally rotates a larger percentage of vehicles than the percentage of conventional vehicle purchases buffer allows, the fleet operator might choose to make up the balance by purchasing credits. As discussed below in connection with the definition of "new covered fleet vehicle," EPA is also proposing to provide flexibility by providing that vehicles transferred into an area for less than 120 days be excluded from the regulations of the program.

*C. Other Definitions and Important Issues*

1. Definitions

a. Control

The term "control" is used in three ways in section 241(5) of the Act, which defines covered fleet. First, it is used to join all entities under common management (e.g., different divisions of the same company), to ascertain which vehicles are subject to the requirements of the fleet program. Second, it is used to refer to the management of vehicles, to ascertain who decides how and when the vehicles are used. Third, it is used to refer to the management of employees. The term "control" is thus crucial to the program, but its use in three different contexts indicates that it needs three different definitions.

In the first case, when it is used to join all entities under common management, EPA is proposing to define "control" as a function of ownership rights in the entities. These ownership rights can take at least three forms. First, when one firm leases, operates, supervises, or in 51 percent or greater part owns facilities used by another person or firm, then the combined vehicles of both firms (or multiple firms in the case of three or more) shall be used to determine the number of vehicles owned by the entities that are subject to the fleet program. Thus, if firm A owns 51 percent of firm B's facilities, then the combined total of both firms' vehicles will be used to determine if they must comply with the requirements of the fleet program.

Second, when a third person or firm has equity ownership of 51 percent or more in each of two or more firms, the vehicles of those firms shall be aggregated. Thus, if firm A owns 51 percent of firm B and 51 percent of firm C, the sum of the vehicles of all three firms will be considered in determining the number of vehicles subject to the fleet program.

Third, when two or more firms have common corporate officers, in whole or in part, who are responsible for the overall direction of the companies, the vehicles of those firms shall be aggregated. Thus, if firm A and firm B have the same corporate officers, in whole or in part, acting in either the same or different capacities, then the sum of the vehicles of those firms will be considered in determining the number of vehicles subject to the fleet program.

EPA believes it would be useful to combine vehicles among firms that are closely related for purposes of the fleet program, based on either ownership of facilities, equity ownership, or common corporate officers. This is necessary because some fleets are organized among a variety of corporate entities, and section 241(5) indicates that these fleets be covered. EPA believes that the combination of these three tests will cover the majority of cases when firms are split up for tax, accounting, or other reasons. EPA is proposing a 51 percent level of ownership because it represents clear voting authority over an entity. EPA requests comments on this or other levels of ownership.

In the second case, when it is used to refer to the management of vehicles, EPA is proposing to define "control" as a function of the authority to make decisions about vehicle use. A person has control over a vehicle when that person decides who can operate the vehicle and the purposes for which the vehicle can be operated. Under the Act, vehicles owned or controlled are those "owned or operated, leased or otherwise controlled" by a person. Therefore, EPA will consider leased vehicles in the same way as owned vehicles under the program. Thus, an operator of a fleet of 10 or more leased vehicles is a covered fleet operator.

At the same time, EPA realizes that a person does not have the same level of control over a vehicle leased for a short period of time, especially regarding vehicle choice, compared to vehicles leased for a long period of time. As a result, only vehicles leased for 120 days or longer will be considered relevant to the program. The 120-day period was chosen because this period is slightly longer than a calendar season, to take into account short-term variations in fleet operations and seasonal fluctuations in the number of fleet vehicles, while excluding longer-term vehicle exchanges that sometimes occur within fleets. EPA requests comments on the length of this period for purposes of this definition.

In the third case, when it is used to refer to the management of employees, EPA is proposing to define "control" as a function of who decides how or when a person's time is used. A person has control over another person or an employee when that person directs the activities of the other in a precise situation, such as at the workplace.

These definitions are necessary to clarify whether or not a vehicle comes under the requirements of the fleet program when a person or firm does not hold beneficial title to it. For example, a leased vehicle is controlled by the lessee, since it is the lessee who determines who can use the vehicle and for what purposes. On the other hand, an employee's personal vehicle is not considered to be controlled by his or her employer because the employer cannot determine who uses it and for what purposes, despite the fact that the employee may use the vehicle for business purposes as well as personal purposes. This distinction is important because, in addition to ownership, control is one of the tests for determining if a vehicle comes under the requirements of the fleet program.

b. Dealer Demonstration Vehicle

EPA is proposing to define "dealer demonstration vehicle" as a vehicle that is operated by a motor vehicle dealer solely for the purpose of promoting motor vehicles sales or permitting potential purchasers to drive the vehicle for pre-purchase or pre-lease evaluation. This definition would exempt the vehicles held on the lot of a motor vehicle dealer as stock from which potential purchasers or lessees can choose. It clearly would not exempt vehicles held by dealers for their own business purposes, such as shuttle buses, loaner vehicles kept for the convenience of persons having repair work done on their vehicles, or other repair or business-related vehicles. However, the program would not apply to these vehicles if they are also offered for retail sale as part of the dealer stock or rotated through the fleet back to dealer stock.

The term "dealer" is defined in CAA section 216(4) as "any person who is engaged in the sale or the distribution of new motor vehicles or new motor vehicle engines to the ultimate purchaser."

c. Emergency Vehicle

EPA is proposing to define "emergency vehicle" as meaning any vehicle that is legally authorized by a governmental authority to exceed the speed limit to transport people and equipment to and from situations in which speed is required to save lives or property, such as a rescue vehicle, fire truck or ambulance. These vehicles normally have red and/or blue flashing lights and sirens. EPA is relying on the speed limit criterion because this is the way many states define "emergency vehicles." The requirement for legal authorization to exceed the speed limit may be problematic for localities that authorize tow trucks and certain utility vehicles to exceed the speed limit in special circumstances. However, those vehicles are not normally considered emergency vehicles in that their primary function does not include exceeding the speed limit, their response to an emergency does not usually require them to exceed the speed limit, and they are not usually equipped with blue and/or red flashing lights and sirens for use when exceeding the speed limit. Therefore, EPA is proposing that those vehicle types not be considered exempt for the purposes of this program.

d. Law Enforcement Vehicle

EPA is proposing to define "law enforcement vehicle" as meaning any vehicle which is primarily operated by a civilian or military police officer or sheriff, or by personnel of the Federal Bureau of Investigation, the Drug Enforcement Administration, or other agencies of the federal government, or by state highway patrols, or other similar law enforcement agencies, and which is used for the purpose of law enforcement activities including, but not limited to, chase, apprehension, surveillance, or patrol of people engaged in or potentially engaged in unlawful activities. For federal law enforcement vehicles, the definition contained in Executive Order 12759, Section 11: Alternative Fueled Vehicle for the Federal Fleet, Guidance Document for Federal Agencies, shall apply.

This definition is meant to clarify the difference between law enforcement vehicles and vehicles used for other security purposes. Under this definition, a vehicle is considered to be a law enforcement vehicle and is exempt from the Clean Fuel Fleet Program, by virtue of its use for official and legal law enforcement purposes, as conveyed by local, state, or federal government mandate. Security company vehicles do not generally comply with this definition, and as such are not exempt from the fleet program unless they are contracted by a law enforcement agency for the customary purposes described above. Vehicles operated by law enforcement agencies largely for staff or administrative purposes would not be covered under this exemption.

e. Model Year

EPA is proposing to define "model year" for purposes of fleet purchase requirements as September 1 through August 31. For each model year, states must ensure that fleet owners purchase the number of clean-fuel vehicles, as a percentage of total new vehicles, required under the Act. According to this definition, fleets would compute their purchases for compliance for the period from September 1 until August 31.

EPA proposes this definition of model year because it coincides with the period in which most automobile manufacturers introduce their new annual models. This should facilitate compliance, as fleets can make their purchase plans regarding clean-fuel vehicles when they make their plans for purchasing all new model vehicles.

EPA believes that the general definition for model year in section 202(b)(3)(A)(i) of the Act (the manufacturer's annual production period) is inappropriate for the clean-fuel vehicle fleet program for three reasons. First, EPA notes that the general definition of model year in section 202 applies only to Part A of Title II of the Act, not Part C of Title II, which is where the fleet provisions are located. Second, that definition allows a model year to last for almost two calendar years. This does not accord with the one-year period intended by Congress to apply to the vehicle purchase requirements of the clean-fuel vehicle program.

Third, that definition allows each manufacturer to choose its model year. While EPA considered allowing states or fleets to choose their own model year, EPA concluded that this would complicate the program unnecessarily. Different model years would make the program harder to administer, since there would be numerous model years for states to keep track of if the fleets chose their model years, or for fleets to keep track of if they do business in more than one state. Furthermore, EPA believes that allowing fleet owners to determine their own model years could allow fleets to inappropriately shift vehicle purchases between periods.

EPA invites comments on this proposal as well as the assumptions which led to it.

f. Motor Vehicles Held For Lease or Rental To The General Public

EPA is proposing to define "motor vehicles held for lease or rental to the general public" as meaning a vehicle that is owned or controlled primarily for the purpose of short-term rental or extended-term leasing (with or without maintenance), without a driver, pursuant to a contract.

This definition is intended to clarify whether a fleet falls under the exemption for leased or rented vehicles contained in section 241(5). According to this definition, the vehicles must be owned primarily for the purpose of renting or leasing them without a driver, effectively granting someone else control over them in exchange for money or other compensation. In addition, this exchange must be based on a contract. Thus, a firm cannot be found to "lease" its vehicles to its employees unless the vehicles are owned primarily for leasing them to the general public and they are leased pursuant to formal contracts which give control of the vehicle to the lessee.

EPA believes that the exemption for fleet vehicles held for lease or rental to the general public is intended to provide an exemption for fleets of vehicles from which potential lessees or renters can choose. This is important because not all potential lessees or renters are covered fleet operators who are required to rent or lease clean-fuel vehicles as part of the purchase requirements of the Act.

According to this definition, as long as vehicles held for lease or rental to the general public remain under the control of the lessor or renter (the "rental fleet operator"), they are not covered vehicles in a covered fleet and are not subject to the program. However, once control of any such vehicle is transferred from the rental fleet operator to a lessee or a renter for more than 120 days, the vehicle is counted as part of the lessee's or renter's fleet for purposes of determining whether the fleet is a covered fleet and subject to the purchase requirements of the program.

The 120-day period was chosen because this period is slightly longer than a calendar season, to take into account short-term variations in fleet operations and seasonal fluctuations in the number of fleet vehicles, while excluding longer-term vehicle exchanges that sometimes occur within fleets. EPA requests comments on the length of this period for purposes of this definition.

Covered fleet owners, as described above, who intend to lease or rent a vehicle for more than 120 days will be required to follow the purchase requirements of the Act, which may require leasing or renting clean-fuel vehicles. As a result, although vehicles held for lease or rental to the general public are exempt from clean-fuel vehicle fleet purchase requirements, rental fleet operators will want to consider purchasing clean-fuel fleet vehicles for renting or leasing to covered fleet operators.

g. New Covered Fleet Vehicle

EPA is proposing to define "new covered fleet vehicle" as a vehicle that has not been previously controlled by the current purchaser, regardless of the model year, except as follows: (1) vehicles that were manufactured before the start of the fleet program for such vehicle's weight class are not considered new, and (2) vehicles transferred due to the purchase of a company not previously controlled by the purchaser, or as part of an employee transfer, or for less than 120 days, are not considered new. Otherwise, all vehicles leased or purchased for a fleet are considered in determining the number of new covered fleet vehicles to be purchased by a covered fleet operator for purposes of calculating percentage purchase requirements.

The proposed definition of "new covered fleet vehicle" describes vehicles which are new to the fleet rather than newly manufactured. EPA does not believe that it would be appropriate to define "new covered fleet vehicle" as a "new motor vehicle" which, under section 216(3) of the Act, is defined as a vehicle for which "the equitable or legal title has never been transferred to an ultimate purchaser." To do so would allow fleet owners to avoid the requirements of the program simply by purchasing barely used vehicles that had already been titled to an ultimate purchaser.

As noted above, however, EPA is not proposing that all newly-purchased vehicles be deemed new covered fleet vehicles. EPA is proposing a number of exceptions from this general principle.

The first exception is for vehicles manufactured before the start of the fleet program. This would apply on a vehicle class basis. Thus, if the program does not begin until model year 1999 for light-duty vehicles, then the exception would apply for LDVs manufactured in model years through 1998. Since the program is statutorily required to begin in 1998 for heavy-duty vehicles, the exception for HDVs would apply to model years through 1997. Pursuant to the exception, a purchase of a vehicle manufactured in a model year before the program begins for that class would not be considered a purchase for the purpose of calculating percentage purchase requirements. The purpose of this exception is to allow fleet owners who have consistently purchased used vehicles to continue that practice by not being required to purchase CFFVs until used CFFVs become available.

The proposed definition also makes an exception for vehicles transferred into the covered fleet 1) as part of a takeover or other merger, 2) with a transferred employee, or 3) for less than 120 days. Fleet owners have told EPA that transfers of these types would be extraordinarily difficult to consider when calculating percentages. EPA does not want to force fleet owners to change practices more than necessary to comply with the statutory requirements. However, EPA wants to avoid enabling fleet owners to circumvent the program's requirements simply by purchasing vehicles outside of the covered areas and transferring them into the covered areas through so-called mergers or acquisitions. These three exceptions are discussed individually below.

First, vehicles transferred as part of a takeover or consolidation of operations will be excluded from the requirements of the program. If these vehicles were considered to be new, they could substantially increase the number of "purchases" in the year of acquisition and thus the requirement for the purchase of clean-fuel vehicles for that year. Moreover, in most cases the complying fleet owner does not choose the vehicles that are transferred as a result of a takeover, and such vehicles would not necessarily meet the clean-fuel standards. Since including such transferred vehicles may require covered fleet operators to purchase a substantial number of unneeded vehicles, credits, or vehicle conversions, EPA is proposing to exempt vehicles transferred into the fleet due to a takeover or other merger. However, any vehicles purchased to replace or add to the transferred fleet will be included.

Second, vehicles transferred with employees will be excluded from program requirements. EPA does not want these provisions to affect company personnel decisions (e.g., basing transfers or promotions on what company car the person drives). Additionally, EPA does not want to force the early sale of vehicles because the driver is moving and must be given a new car because of the location. However, any vehicle purchased for the use of a transferred employee after the transfer will be considered a new covered fleet vehicle.

Third, vehicles transferred for seasonal requirements (i.e., less than 120 days) are also proposed to be excluded from the requirements of the program. The choice of a maximum of 120 days was made to allow transfers for slightly longer periods of time than a calendar season. This will allow companies to respond to different "high seasons" without unnecessary confusion. EPA understands that this exception may be more subject to abuse than the other two, since it would allow companies to avoid the program by continuously rotating vehicles. Therefore, the proposed regulations will permit states to discontinue the use of this exception for fleet operators who abuse the discretion afforded them. EPA asks for comment on the proposed base definition and exceptions for new covered fleet vehicles.

h. Nonroad Vehicle; Nonroad Engine

The terms "nonroad vehicle" and "nonroad engine" will be defined by EPA in a rulemaking concerning emission standards for nonroad engines. EPA intends to use the definitions developed in that rulemaking to define nonroad vehicles and nonroad engines for the purpose of the fleet program. As a consequence, EPA is not proposing any definitions for these terms in this rulemaking. In the interim, the definitions of these terms contained in section 216 of the Act should be used for guidance.

i. Owned or Operated, Leased, or Otherwise Controlled By Such Person

The phrase "owned or operated, leased or otherwise controlled by such person" appears in CAA section 241(5). EPA is proposing to define this phrase as meaning that (1) such person holds the beneficial title to such vehicle, or (2) such person uses the vehicle for transportation purposes pursuant to a contract or similar arrangement, and the term of such contract or similar arrangement is for a period of 120 days or more.

In proposing this definition, EPA intends that any vehicles controlled by a fleet operator, whether by ownership or lease, will be included in the fleet program. The period of 120 days was chosen for reasons similar to those supporting the proposed regulations relating to vehicle transfers discussed above. Like transfers, leasing of vehicles can occur for short periods of time, and EPA does not believe that the burdens of the program are appropriate for short-term, temporary arrangements. EPA requests comment regarding whether another time period would be more appropriate.

j. Person

The Act refers to all fleets of ten or more vehicles which are owned by a person, or "by any person who controls such person, by any person controlled by such person, [or] by any person under common control with such person." EPA proposes to define the term "person" in accordance with section 302(e) of the Act. According to this definition, "the term 'person' includes an individual, corporation, partnership, association, State, municipality, political subdivision of a State, and any agency, department, or instrumentality of the United States and any officer, agent, or employee thereof."

l. Under Normal Circumstances Garaged at Personal Residence

EPA is proposing to define "under normal circumstances garaged at personal residence" as meaning a vehicle that, when it is not in use, is normally parked at the personal residence of the individual who usually operates it, rather than at a central refueling, maintenance, and/or business location. Such vehicles are not considered capable of central fueling and are therefore exempt from the program.

Although Congress explicitly provided only for an "at night" exemption, EPA believes that a corollary for people who work at night is appropriate and is consistent with the intent of the "at night" exemption. Thus, under this definition, vehicles owned by a business entity but treated as personal vehicles or employee's vehicles that are normally kept at the user's place of residence when not in use would be exempt from the program, notwithstanding the timing of the periods of use and non-use.

On the other hand, this definition does not consider vehicles which are actually centrally fueled to be exempt from the program. Section 241(6) provides that vehicles garaged at a personal residence are not to be considered "capable of being centrally fueled." The Act does not exempt these vehicles if they are in fact centrally fueled. The Agency believes that to do so would potentially open an unnecessary loophole and could defeat the purpose of the program. EPA is therefore not exempting fleet vehicles which are parked at a personal residence during off hours, but are still, in fact, centrally fueled. An example of such a vehicle would be a centrally-fueled repair truck that the owner sends home with an employee so that she/he can go directly to her/his repair jobs in the morning.

1. Vehicles Used for Motor Vehicle Manufacturer Product Evaluations and Tests

EPA is proposing to define "vehicles used for motor vehicle manufacturer product evaluations and tests" as vehicles that are owned and operated by a motor vehicle manufacturer or motor vehicle component manufacturer solely for the purpose of evaluating the performance of such vehicles for engineering, research and development, or quality control reasons. Under this definition, vehicles used by a motor vehicle manufacturer for production control or quality control reasons would be exempt from the fleet program. EPA also intends to exempt those vehicles covered under an EPA testing exemption issued under 40 CFR part 85 subpart R. EPA asks comment on whether vehicles provided to employees for their use as part of their compensation, but then returned to the company for sale should be considered to be test or evaluation vehicles. However, vehicles that are held by manufacturers for their own business purposes, such as vehicles allocated to salespeople for their business use, delivery vehicles, and other business-related vehicles, would not be exempt.

The term "manufacturer" is defined in CAA section 216(1) as "any person engaged in the manufacturing or assembling of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines or importing such vehicles or engines for resale, or who acts for and is under the control of any such person in connection with the distribution of new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines, but shall not include any dealer with respect to new motor vehicles, new motor vehicle engines, new nonroad vehicles or new nonroad engines received by him in commerce."

2. Issues

In addition to the above definitions, clarification of two key issues in the Clean Fuel Fleet Program is needed to ensure consistency among different SIPs. Clarification of these issues will facilitate fleet compliance and enhance implementation of the fleet program. The two issues, distributed fleets and multi-state nonattainment areas, are discussed below.

a) Distributed Fleets

Distributed fleets are fleets which are owned by one person (as defined above) but are operated from different locations within a covered area. For example, a chain of department stores might have three locations in one nonattainment area, each of which is permanently assigned some vehicles.

CAA section 241(5) of the Act defines a "covered fleet" as one consisting of "ten or more motor vehicles which are owned or operated by a single person." It goes on to direct that "in determining the number of vehicles owned or operated by a single person ... all motor vehicles owned or operated, leased or otherwise controlled by such person ... shall be treated as owned by such person." In section 241(6), the Act defines "covered vehicle" as a vehicle which is in a class for which standards are applicable and is in a covered fleet which is centrally fueled or capable of being centrally fueled.

These definitions are easy to apply to a fleet which is operated out of one central location. In that case, a covered fleet is one which contains ten or more vehicles which are centrally fueled (or capable of being centrally fueled) and which are owned or operated by one person. This discussion focuses on the more difficult question of distributed fleets, like the department store example described above. Three cases will be discussed: (1) when the total fleet consists of less than ten vehicles; (2) when the total fleet consists of ten vehicles or more, all of which are centrally fueled; and (3) when the total fleet consists of ten or more vehicles which are centrally fueled (or capable of being centrally fueled) and which primarily operate in the covered area, but the subfleets consist of less than ten such vehicles.

The first two cases are relatively straightforward. In the first case, when the total fleet consists of less than ten vehicles, then the fleet is not considered to be a covered fleet.

In the second case, when the total fleet consists of ten or more vehicles, and they are all centrally fueled, then the fleet is considered to be a covered fleet.

In the third case, the total fleet consists of ten or more covered vehicles which operate primarily in the covered area, but portions of that fleet operate out of separate facilities and one or more of the subfleets consist of less than ten vehicles. For example, a department store may have six covered vehicles at one store, seven at another and five at the third. EPA is proposing that as long as ten or more vehicles are centrally fueled or capable of being centrally fueled, then those vehicles are subject to the requirements of the program. Under this definition, while none of the subfleets in this example exceed the threshold value of ten covered vehicles, or portion thereof, the total fleet would still be a covered fleet if at least ten vehicles were capable of being centrally fueled. However, EPA is concerned that some fleets that could be included in the program without economic hardship may be excluded under this narrow definition. Therefore, EPA solicits comment on other ways to deal with this type of distributed fleet, to ensure that those fleets that could participate in the program actually do participate.

EPA believes that it is important for fleet owners to know with certainty whether or not distributed fleets are included in the program as soon as possible for planning purposes and that this issue be resolved by rulemaking. EPA invites comments on this issue.

b) Multi-State Nonattainment Areas

Multi-state nonattainment areas are nonattainment areas that cross state lines. If each state included in the nonattainment area regulates its fleets differently, the program compliance requirements for fleet owners would become much more complex than if they had to comply with one set of requirements for the entire area. Most of the fleets which operate in multi-state nonattainment areas cross state boundaries frequently. Therefore, more fleets would potentially be subject to conflicting requirements in a multi-state nonattainment areas than would be affected by conflicting requirements in geographically separate nonattainment areas.

In addition, the Act specifies that "credits may be traded or sold for use by any other person to demonstrate compliance with other requirements applicable under this section in the same nonattainment area." This legislative language supports a requirement that fleet programs in multi-state nonattainment areas be consistent to ensure that credits can be freely traded throughout the nonattainment area.

Therefore, to limit the number of fleets affected by conflicting requirements, and to ensure that the credits earned through the credits program uniformly apply across states, EPA is proposing to require that, to the greatest extent possible, multi-state nonattainment areas promulgate a single clean-fuel vehicle program. For example, the credit programs and TCM exemptions should be the same to optimize vehicle use and credit exchange among fleets. Also, the determination of program elements raised in the above definitions, such as average operating period and the criteria for determining the degree of operation within a covered area, should be substantially the same for states in a multi-state nonattainment area.

## III. Clean-Fuel Fleet Vehicle Emission Standards

Sections 242 and 243 of the Clean Air Act Amendments of

1990 require EPA to promulgate standards for the clean-fuel vehicles (CFVs) which will qualify for use in federal CFV programs, including the Clean Fuel Fleet Program and the California Pilot Test Program (pilot program). The pilot program establishes CFV sale and fuel availability requirements in the State of California, opt-in provisions for other states, and a credit program.

EPA is dealing with regulations covering the California Pilot Test Program in a separate rulemaking, which will address CFV standards for light-duty vehicles and light-duty trucks. EPA proposes to use a subset of these same standards, once they are finalized, for LDVs and LDTs covered by the fleet program. A synopsis of the light-duty standards and their relation to the Clean Fuel Fleet Program follows. The pilot program will not include HDEs. EPA's proposed standards for heavy-duty CFVs between 8,500 and 26,000 lbs GVWR are contained herein.

EPA would collect fees to recover costs for all compliance and enforcement activities performed by EPA for CFFVs and ILEVs under provisions established in the Motor Vehicle And Engine Compliance Program Fees rule (57 FR 30044, July 7, 1992). A manufacturer of CFFVs or ILEVs would be subject to the appropriate EPA compliance program fee depending on the type of certificate requested by the manufacturer (either a federal certificate or a California-only certificate)[1].

**[1]A "California-only certificate" is a certificate issued by EPA which signifies compliance with only the emission standards established by California and authorizes the sale of such vehicles**

*A. Light-Duty Clean Fuel Fleet Vehicle Standards*

EPA proposes that LDVs and LDTs meeting the pilot program's CFV standards qualify as clean-fuel fleet vehicles (CFFVs). EPA believes this is required by the provisions of Part C of Title II of the CAA. However, the pilot program includes both Phase I and Phase II emission standards, only the Phase II standards (established for 2001) would apply to the fleet program beginning in the 1998 model year. (As required by section 246(f)(4) and 249 of the CAA in order to provide standards for the generation of emission credits, EPA is also proposing emission standards for ULEVs and ZEVs in the pilot program rulemaking.)

The statutory requirements for CFV emission standards and their administration and enforcement are contained in sections 242, 243, 244, and 246 of the CAA. Under those provisions, CFFVs are to meet the Phase II standards beginning as early as model year 1998. If vehicles meeting those standards are not offered for sale in California as of that time, then the beginning of the fleet program is to be delayed until the first model year in which such vehicles are offered for sale in California or until model year 2001, whichever is earlier. EPA currently believes that such vehicles will be available in model year 1998, however. California has projected that 48% of all LDV sales in California in model year 1998 will be vehicles certified to the LEV standards, which are the California equivalents of the Phase II standards. This

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**or engines only in California.**

projection is contained in the California Air Resources Board's (CARB) waiver request entitled "Adoption of California Light- and Medium-Duty Vehicle Emission Standards and Test Procedures Requiring Low-Emission Vehicles--Request for Waiver of Federal Preemption," dated October 4, 1991, which has been placed in the docket for this rulemaking.

CAA section 246(f)(4) directs EPA to establish additional, more stringent CFV standards, for the purpose of generating credits to be used towards compliance with the fleet program. CFVs meeting the more stringent standards will earn credits in both the pilot program and fleet program. There will be no standards specific to the pilot program or fleet program; rather clean-fuel vehicle standards are applicable under both programs. Thus, the clean-fuel vehicle standards for non-methane organic gases (NMOG), CO, NOx, formaldehyde, and particulate matter (if applicable) will also be used as the standards for clean-fuel fleet vehicles. The only difference is that CFFVs must meet the Phase II emission standards beginning in 1998.

Zero-emission vehicles (e.g. electric vehicles) are vehicles which have no emissions of the following pollutants: NMOG, NOx, CO, particulates, and formaldehyde. As is being proposed in the pilot program NPRM, compliance would be assessed, without testing, through engineering analysis. The engineering proposed in the pilot program regulation would include a description and analysis of all primary or auxiliary equipment and engines which concluded that no emissions of the stated pollutants would be possible. The engineering analysis would determine that the vehicle fuel system(s) does not contain either carbon or nitrogen compounds (including air) which when burned form the above regulated exhaust emissions. Such criteria would also assure that evaporative emissions would not occur. Given this criteria there is no need to perform emission testing because the above pollutants can not be emitted from the vehicle. A vehicle would not be a ZEV unless it meets the above criteria. Any vehicle with additional power system(s) or auxiliary engine(s) that might produce regulated pollutants (e.g. hybrid vehicle or an electric vehicle with an auxiliary power source to run other vehicle systems) will be subject to the testing requirements of Part 86 or Part 88 or future applicable regulations and may not qualify as a ZEV.

The specific CAA LDV and LDT standards, which will be proposed in the NPRM for the California Pilot Test Program, are shown in Table 1a through Table 3b. The requirements for the implementation of CFV emission standards, such as standards for flexible and dual-fuel vehicles, administration and enforcement provisions (i.e. certification, SEA, recall, and labeling), and the possible replacement of CAA standards by standards promulgated in CARB's LEV program, will all be addressed at length in the pilot program. Comments on the feasibility and appropriateness of the LDV and LDT standards are best made in response to the Pilot Program NPRM. However, EPA does solicit comment on the feasibility of the Phase II standards for 1998 LDVs and LDTs.

**CAA CFV Standards**

**Table 1a**

50,000 MILE STANDARD

| Vehicle Emission Category | LDTs ≤ 6000 gvwr and ≤ 3750 lvw and all LDVs | LDTs ≤ 6000 gvwr and > 3750 lvw and ≤ 5750 lvw |
|---|---|---|
| <u>LEV</u> | | |
| NMOG | 0.075 | 0.100 |
| CO | 3.4 | 4.4 |
| NOx | 0.2 | 0.4 |
| PM*** | 0.08 | 0.08 |
| HCHO | 0.015 | 0.018 |
| <u>ULEV</u> | | |
| NMOG | 0.040 | 0.050 |
| CO | 1.7 | 2.2 |
| NOx | 0.2 | 0.4 |
| PM*** | 0.08 | 0.08 |
| HCHO | 0.008 | 0.009 |

*** Applies to Diesel Vehicles Only

**Table 1b**

100,000 Mile STANDARD

| Vehicle Emission Category | All LDVs and LDTs ≤ 6000 gvwr and ≤ 3750 lvw | LDTs ≤ 6000 gvwr and > 3750 lvw and ≤ 5750 lvw |
|---|---|---|
| LEV | | |
| NMOG | 0.090 | 0.130 |
| CO | 4.2 | 5.5 |
| NOx | 0.3 | 0.5 |
| PM*** | 0.08 | 0.08 |
| HCHO | 0.018 | 0.023 |
| ULEV | | |
| NMOG | 0.055 | 0.070 |
| CO | 2.1 | 2.8 |
| NOx | 0.3 | 0.5 |
| PM*** | 0.04 | 0.04 |
| HCHO | 0.011 | 0.013 |

*** Applies to Diesel Vehicles Only

**Table 2a**

50,000 MILE STANDARD

| Vehicle Emission Category | LDTs > 6000 gvwr and ≤ 3750 tw | LDTs > 6000 gvwr and > 3750 tw but ≤ 5750 tw | LDTs > 6000 gvwr and > 5750 tw but ≤ 8500 tw |
|---|---|---|---|
| LEV | | | |
| NMOG | 0.125 | 0.160 | 0.195 |
| CO | 3.4 | 4.4 | 5.0 |
| NOx | 0.4 | 0.7 | 1.1 |
| PM* | ---- | ---- | ---- |
| HCHO | 0.015 | 0.018 | 0.022 |
| ULEV | | | |
| NMOG | 0.075 | 0.100 | 0.117 |
| CO | 1.7 | 2.2 | 2.5 |
| NOx | 0.2 | 0.4 | 0.6 |
| PM* | ---- | ---- | ---- |

| | | | |
|---|---|---|---|
| HCHO | 0.008 | 0.009 | 0.011 |

** Applies to Diesel Vehicles Only; No 50,000-Mile Option

**Table 2b**

120,000 MILE STANDARD

| Vehicle Emission Category | LDTs > 6000 gvwr and ≤ 3750 tw | LDTs > 6000 gvwr and > 3750 tw but ≤ 5750 tw | LDTs > 6000 gvwr and > 5750 tw but ≤ 8500 tw |
|---|---|---|---|
| LEV | | | |
| NMOG | 0.180 | 0.230 | 0.280 |
| CO | 5.0 | 6.4 | 7.3 |
| NOx* | 0.6 | 1.0 | 1.5 |
| PM** | 0.08 | 0.10 | 0.12 |
| HCHO | 0.022 | 0.027 | 0.032 |
| ULEV | | | |
| NMOG | 0.107 | 0.143 | 0.167 |
| CO | 2.5 | 3.2 | 3.7 |
| NOx* | 0.3 | 0.5 | 0.8 |
| PM** | 0.04 | 0.05 | 0.06 |
| HCHO | 0.012 | 0.013 | 0.016 |

* Does not Apply to Diesel Vehicles

** Applies to Diesel Vehicles Only

## Table 3a

NMOG Standards for Flexible- and Dual-Fueled Vehicles When Operating on Clean Alternative Fuel.

Light-Duty Trucks up to 6,000 lbs. gvwr and Light-Duty Vehicles

| Vehicle Type | 50,000 mile Standard | 100,000 mile Standard |
|---|---|---|
| Beginning in Model Year 1998 | | |
| LDTs (0-3,750 lbs. lvw) and LDVs | 0.075 | 0.090 |
| LDTs (3,751-5750 lbs. lvw) | 0.100 | 0.130 |

Light-Duty Trucks More than 6,000 gvwr

| Vehicle Type | 50,000 mile Standard | 120,000 mile Standard |
|---|---|---|
| Beginning Model Year 1998 | | |
| LDTs (0-3,750 lbs. tw) | 0.125 | 0.180 |
| LDTs (3,751-5,750 lbs. tw) | 0.160 | 0.230 |
| LDTs (5,751-8,500 lbs. tw) | 0.195 | 0.280 |

## Table 3b

NMOG Standards for Flexible- and Dual-Fueled Vehicles When Operating on Conventional Fuel.

Light-Duty Trucks up to 6,000 lbs. gvwr and Light-Duty Vehicles

| Vehicle Type | 50,000 Mile NMOG Standard | 100,000 Mile NMOG Standard |
|---|---|---|
| Beginning Model Year 1998 | | |
| LDTs (0-3,750 lbs. LVW) and LDVs | 0.125 | 0.156 |
| LDTs (3,751-5,750 lbs. LVW) and LDVs | 0.160 | 0.200 |

Light-Duty Trucks More than 6,000 gvwr

| Vehicle Type | 50,000 Mile NMOG Standard | 120,000 Mile NMOG Standard |
|---|---|---|
| Beginning Model Year 1998 | | |
| LDTs (0-3,750 lbs. TW) | 0.25 | 0.36 |
| LDTs (3,751-5,750 lbs. TW) | 0.32 | 0.46 |
| LDTs (5,751-8,500 lbs. TW) | 0.39 | 0.56 |

*B. Heavy-Duty Clean-Fuel Fleet Vehicle Standards*

CAA section 245 prescribes that engines intended for use in clean-fuel vehicles greater than 8,500 and up to 26,000 pounds GVWR meet a combined non-methane hydrocarbon (NMHC) plus NOx emissions standard of 3.15 grams per brake horsepower hour (g/BHP-hr), reflecting a 50 percent reduction from the combined HC and NOx standards mandated under 40 CFR 86.094-11 for model year 1994 heavy-duty diesel engines (HDDE). This new standard would apply to all light and medium heavy-duty engines which are to be certified for inclusion in the clean-fuel vehicle program, independent of fuel type. Thus, it would apply to gasoline, diesel, methanol and gaseous fuels, and potentially other fuels that are not yet regulated by the Agency.

Section 245(b) provides for a less stringent standard or standards if the statutory level of 3.15 g/BHP-hr is determined to be infeasible for clean diesel-fueled engines. Under this provision, EPA must make a determination by December 31, 1993 as to the feasibility of this standard for clean diesel-fueled engine technology, taking into account durability, costs, lead time, safety, and other relevant factors. If the Administrator determines that the standard is not feasible for clean diesel-fueled engines, the standard may be revised to a level that the Administrator determines to be feasible, but must be at least a 30 percent reduction from the combined NMHC and NOx standards for model year 1994 heavy-duty engines. A 30 percent reduction would be equivalent to a NMHC and NOx standard of 4.4 g/BHP-hr.

Section 246(f)(4) also requires that credit-generating standards be promulgated for heavy-duty clean-fuel vehicles, including standards for heavy-duty ULEVs and ZEVs. These standards are required to be "comparable" to the credit-generating standards established for light-duty vehicles.

1. The Heavy-Duty Low-Emission Vehicle (HDLEV) NMHC + NOx Standard

a. *Feasibility of a 3.15 g/Bhp-hr NMHC + NOx Standard.*

As noted above, EPA is required to determine whether the 3.15 g/BHP-hr NMHC + NOx standard is feasible for clean diesel-fueled heavy-duty engines. However, determination that the 3.15 g/BHP-hr standard is feasible does not require a determination that the standard is feasible for every diesel engine family, but rather that it is feasible for at least enough diesel engine families such that fleet operators have enough choice to fill their requirements. The clean-fuel vehicle standard is not a mandatory national standard for all heavy-duty vehicles manufactured, but instead applies to vehicles that fleet owners in certain areas must buy as a certain percentage of their vehicle purchases beginning in model year 1998. Therefore, this standard need only be feasible for some heavy-duty diesel engine families, not all of them. EPA recognizes that some fleet operators may not be able to purchase the engines they would consider optimal for their needs, but EPA believes that the standard it promulgates need only be feasible such that fleet operators will have enough choice in the marketplace to purchase engines that will suit their needs.

Information is available which suggests that the 3.15 g/BHP-hr standard could be achieved by engines which are designed to operate using clean alternative fuels such as methanol and gaseous fuels (compressed natural gas (CNG) and liquid petroleum gas (LPG)). There is already a methanol-fueled HDE family near the emission standard and the limited data available for gaseous fuels indicates that levels of less that 1 g/BHP-hr NMHC + NOx could be achieved by some stoichiometric CNG engines.

A review of the 1992 HDE certification results, however, indicates that essentially no current gasoline or diesel HDE family meets the 3.15 g/BHP-hr standard. Of the 14 gasoline HDE families certified in 1992, three are within one g/BHP-hr of the standard (see Figure 1). Based on the aftertreatment control technology used by and available for gasoline engines, EPA believes that 3.15 g/BHP-hr level would be within reach for a number of these families. For diesel engines, however, the results presented in Figure 1 indicate that achieving the 3.15 g/BHP-hr standard would be problematic for the majority of engine families. Only one of 53 families certified in 1992 is within one g/BHP-hr of the 3.15 level; most have combined HC and NOx certification levels of 5.5 g/BHP-hr or less (for diesel engines NMHC and HC are roughly equivalent). The certification data indicate that generally all diesel engine families have HC certification levels less than 0.5 g/BHP-hr, so most reductions would have to be achieved in NOx emissions. Thus, achieving a 3.15 g/BHP-hr NMHC + NOx standard would essentially require NOx-certification levels on the order of 2.5 to 2.6 g/BHP-hr.

Insert Figure 1

However, the catalytic NOx reduction technology available for gasoline HDEs is not readily available or transferable for diesels. A standard this low would almost certainly require some form of NOx-reducing aftertreatment device or an exhaust gas recirculation system optimized for diesel engine use. NOx-reducing aftertreatment devices are not currently available for engines using lean-burn combustion, including diesel engines, where the concentration of oxygen in the exhaust is very high. Under these conditions, the catalytic reduction of NOx to molecular nitrogen and oxygen is less thermodynamically favorable than in exhaust from a gasoline-fueled engine. Moreover, EPA is not aware of any aftertreatment technology (now or in the future) that is effective in reducing NOx emissions from diesel engines. Other technologies such as injector and cylinder design, improved turbocharger and aftercooling technology, and electronic controls show promise in reducing diesel engine NMHC and NOx emissions, but the individual and combined efficiency of these approaches on a variety of engine designs has not been shown.

The lack of available emissions control strategies does not necessarily result from a lack of incentive for their development. The current HDE NOx averaging, trading and banking programs provide an incentive for manufacturers to lower the NOx emissions of their engines to generate emission credits. While current NOx certification emission levels are below the current 5.0 g/BHP-hr standard, there has been little progress in the development of new NOx control technologies that could achieve a 3.15 g/Bhp-hr NMHC + NOx standard.

Also, the comments received in response to the proposed 1998 4.0 g/BHP-hr NOx standard for all heavy-duty engines (56 FR 48350, September 24, 1991) suggested that even the feasibility of this standard is not certain (see Docket A-91-28). While most commenters stated that the 4.0 g/BHP-hr NOx standard was feasible, some did express doubt that all diesel-fueled engines could comply by 1998. Though EPA is confident that 4.0 g/BHP-hr NOx in 1998 is feasible, the evidence presented by the commenters raises significant questions about the ability of an adequate number of diesel-fueled engine families to comply with a 3.15 g/BHP-hr NMHC + NOx standard in that same time frame, since that standard would effectively require that NOx emissions be reduced to below 3.0 g/BHP-hr.

A report recently released for review by Acurex under contract with CARB, entitled "Technical Feasibility of Reducing NOx and Particulate Emissions From Heavy-Duty Engines," concludes that NOx can potentially be reduced to as low as 2.5 g/BHP-hr. The full text of the report is in the public docket for this rule[2]. The 2.5 g/BHP-hr standard would require the use of a combination of some or all of the following emission control approaches: very high pressure fuel injection, variable geometry turbocharging, air-to-air aftercooling, optimized combustion, electronic unit injections with minimized sac volumes, rate shaping, exhaust gas recirculation and sophisticated electronic control of all

[2]Acurex Environmental Project Under Contract with California Air Resources Board, "Technical Feasibility of Reducing NOx and Particulate Emissions Form Heavy-Duty Engines," Acurex Environmental Project 8450, Contract No. A132-085.

engine systems. Such controls would create substantial increases in costs and fuel consumption. Most of the devices described in the Acurex report are in relatively early stages of development and would require extensive changes in heavy-duty diesel-powered engines compared to today's designs. The report states that if a combination of these emission control strategies is used, diesel engines potentially could meet a 2.5 g/BHP-hr standard. However, EPA is very doubtful that the many technological breakthroughs required to implement this standard could be achieved in time for the production of an adequate number of 1998 model year engine families to allow fleet owners to meet purchase requirements.

Moreover, as the Acurex study notes, the economic impact for diesel engines of reaching this standard would be substantial (the Acurex report estimates costs as high as 1.7 times the cost of an equivalently rated 1994 engine and a 5 percent penalty in fuel economy). Since costs for gasoline vehicles are not likely to be as significant, a standard of this level could effectively eliminate diesel-fueled engines as economically viable engines in the marketplace.

In summary, while it appears probable that many gasoline and other clean alternative fuel engine families could comply with the 3.15 g/BHP-hr NMHC + NOx standard by the 1998 model year, EPA does not currently believe that manufacturers will be able to comply with the standard for a sufficiently broad spectrum of 1998 model year light and medium diesel HDE families. Moreover, even if this level of control were technologically feasible, the costs associated with it could potentially exclude diesel-fueled engines from the clean-fuel engine market. Given that the provisions of section 245(b) require that EPA make a determination as to the feasibility of this standard for clean diesel-fueled engine technology, taking into account durability, costs, lead time, safety, and other relevant factors, EPA believes Congress intended to include clean diesel HDEs within the clean-fuel market. Therefore, EPA proposes to determine at this time that the 3.15 g/BHP-hr NMHC + NOx standard is not technologically feasible for 1998 and later clean diesel-fueled engines, taking into account durability, costs, leadtime, safety, and other relevant factors, However, EPA reserves the right to reconsider the 3.15 g/BHP-hr NMHC + NOx standard at a later time if diesel NOx control technology develops to a point which would make this level feasible for an adequate number of diesel engine families.

*b. Proposed NMHC + NOx LEV Standard.*

For the reasons described below, EPA is proposing a combined NMHC + NOx emission standard of 3.5 g/BHP-hr for all clean-fuel HDEs. Since NMHC levels are generally less than 0.5 g/BHP-hr, this proposed standard contemplates NOx levels of approximately 3.0 g/BHP-hr. Of course, these vehicles and engines would, as specified by section 242(b) of the Act, also be required to meet all other applicable emission standards and requirements of 40 CFR Part 86 (such as standards for CO, particulates, smoke and evaporative emissions, as applicable) for the model year during which they are certified/produced.

In assessing the level at which to propose the clean-fuel HDE emission standards, EPA's objective was to select the lowest level which could be considered to be technologically feasible for the 1998 model year, taking into account durability, costs, leadtime, safety, and other relevant factors. The determination of technological feasibility was based upon analysis of current certification emission levels, public statements by manufacturers and other relevant factors such as technology availability and leadtime, and technology development to meet the emission standards in other programs. The Regulatory Support Document proposed for this rule discusses emission control technologies potentially available to manufacturers in the time frame of the fleet program[3].

Assuming HC and NMHC are equivalent (NMHC actually is somewhat less than total HC), the analysis of current certification emission levels presented in Figure 1 shows that six light or medium diesel HDE families (out of a total of 53) and ten gasoline-fueled HDE families (out of a total of 14) are within one g/BHP-hr of the 3.5 g/BHP-hr level. Moreover, three of those gasoline-fueled HDE families are within 0.5 g/BHP-hr of the level. Thus, the additional amount of reduction over many of today's engines is on the order of 1 - 2 g/BHP-hr.

By the 1998 model year all diesel fueled HDDEs will have to be able to meet an NOx standard of 4.0 g/BHP-hr. As noted in the previous section, EPA received many comments in Docket A-91-28 stating that the 4.0 g/BHP-hr NOx standard for all 1998 and later HDEs, which is one g/BHP-hr lower than the existing standard, is feasible. As is discussed further

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[3] U.S. Environmental Protection Agency, Office of Mobile Sources, "Regulatory Support Document - Emissions Standards for Heavy-Duty Fleets," September 1992

below, development of the technology necessary to comply with 4.0 g/BHP-hr NOx standard will make it more likely that a significant number of light and medium diesel HDE families will be able to comply with the 3.5 g/BHP-hr NMHC + NOx standard. This is the case because the technologies likely to be used to achieve the 4.0 g/BHP-hr NOx standard will tend to provide step type reductions in emissions rather than smaller incremental reductions. These technologies when applied to different diesel engine families will provide different levels of reductions. Thus, in some cases, the technologies needed to comply with the 4.0 g/BHP-hr NOx standard may also be sufficient to achieve NOx levels of approximately 3.0 g/BHP-hr.

Requirements in the state of California will also help to provide the technology needed to meet the proposed standard. As part of its LEV program, the state of California has implemented an NMHC + NOx standard of 3.5 g/BHP-hr for incomplete medium-duty vehicles.[4] Manufacturers will be required to produce medium-duty LEVs beginning with the 1998 model year. At least one manufacturer has stated that the CARB 1998 3.5 g/BHP-hr NMHC + NOx standard for incomplete medium-duty vehicles and diesel engines is feasible[5]. All manufacturers desiring to market LEV diesel HDEs in California will need to develop the technology required to meet the

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[4] CARB's incomplete vehicle standards limit emissions based upon power output rather than miles travelled; in this respect and the weight ranges covered they are comparable to the EPA heavy-duty engine standards.

[5] "Final CARB Workshop on Clean Fuels/Low Emission Vehicles Proposal" on June 5, 1990, CVS News -- California Motor Vehicle Pollution Control Program News and Analysis, July 1990 issue, Sierra Research, Inc., pages 8 and 9.

California standard. This technology will be directly transferable to LEV diesel HDEs used in the federal Clean-Fuel Fleet Program.

Furthermore, California is now exploring the possibility of even tighter NOx and PM emission standards for the various categories (technologies/fuels) of HDEs. In support of that work CARB funded the Acurex report mentioned earlier. The report considered the potential for more stringent NOx standards for gasoline, diesel, gaseous, and alcohol fueled HDEs. Based on the conclusions of the report, the 3.5 g/BHP-hr standard would be feasible for diesel, gasoline, natural gas, and alcohol heavy-duty engines by 1998. According to the report, diesel powered vehicles could reach NOx levels at or below the current California LEV NMHC + NOx standard, referred to above, using a combination of one or more technologies including very high pressure fuel injection, variable geometry turbocharger, air-to-air aftercooler, optimized combustion chamber, electric unit injectors with minimized sac volume, optimized fuel injection nozzles, fuel injection rate shaping, exhaust gas recirculation and sophisticated electronic control of all engine systems. The report stated that gasoline heavy-duty engines also could be produced with NOx emissions at or below the current California LEV standard using approaches such as additional EGR, improved three-way catalyst technology, and with the use of cleaner gasoline. Finally, the report indicated that gaseous and alcohol fueled engines will require less technological effort to meet a more stringent emission level.

Given the arguments above, as well as the fact that manufacturers have more than five years before the purchase requirements for clean-fuel fleet vehicles begin, EPA believes that most gasoline-fueled HDE families and many diesel HDE families can meet a standard of 3.5 g/BHP-hr NMHC + NOx by the 1998 model year. For reasons given above in section 1.a. (feasibility of 3.15 g/BHP-hr standard), EPA does not believe a standard below 3.5 g/BHP-hr NMHC + NOx is feasible by 1998. If EPA were to enact a manufacturer-based credit exchange program as suggested in section 4.e. below, the additional flexibility available to manufacturers could help increase the number of engine families made available to fleet operators.

As stated above, the development work conducted to meet the CARB 3.5 g/BHP-hr NMHC + NOx standard for incomplete medium-duty vehicles will undoubtedly be beneficial to development of technology and engines to meet the federal fleet LEV standards. However, EPA recognizes that differences in certification fuel may cause a difference in emission rates. CARB and EPA have different test fuel specifications for diesel fuel. CARB limits the aromatics content of the test fuel to a maximum of ten percent, while federal test fuels contain approximately 30 to 35 percent aromatics. There is evidence to suggest that the use of CARB test fuel would lead to lower NMHC + NOx emissions as compared to those expected on EPA certification fuel.[6] Apparently, this occurs because lower aromatic content in the fuel improves its cetane

[6]"Effects of Fuel Aromatics, Cetane Number, and Cetane Improver on Emissions from a 1991 Prototype Heavy-Duty Diesel Engine," T. Ullman, R. Mason, and D. Montalvo, Southwest Research Institute, SAE Paper 902171., U.S. Environmental Protection Agency, Office of Mobile Sources, "Effect of Test Fuel Differences on NMHC + NOx Emissions," Memorandum from Michael Samulski to the docket for this rulemaking, 1992 (One study suggests an NMHC + NOx offset of about 0.3 g/BHp-hr for the different fuels).

rating and thus enhances combustion. Furthermore, future differences in gasoline certification fuel are possible as federal and California reformulated gasoline programs are implemented. These changes may or may not affect NMHC + NOx emissions. Thus, even though the federal fleet and CARB NMHC + NOx standards would be at the same numerical level, due to differences in test fuel, they may in fact require slightly different emission control strategies to achieve compliance.

EPA sees significant benefit in harmonizing the federal fleet and CARB LEV requirements if possible, and seeks comment and information on the NMHC + NOx emission differences caused by differences in the California and EPA gasoline and diesel certification fuels on engines using the technology expected to meet the proposed standard. Based on these effects, EPA also seeks comment on how to deal with the test fuel differences in setting the NMHC + NOx standards. Also, given the significant differences in the NMHC + NOx emission control potential for gasoline and diesel engines, EPA seeks comment on whether the NMHC + NOx standard could legally be set at different levels for these technologies. If so, should different levels be set? Commenters supporting this approach to revised standards are asked to suggest specific levels for gasoline and diesel engines, with special focus on technology and the effects of certification fuel differences. Commenters are also requested to consider whether a banking, trading and averaging program, which allows averaging across fuel types (see discussion below), would be helpful or desirable in this program. These comments should include recommendations for the appropriate levels for emission standards, emission caps and other parameters involved in these programs.

The LEV standards proposed above would apply to HDEs used in clean-fuel vehicles of 8,501 to 26,000 lbs. GVWR to meet the purchase requirements of the fleet program. Additional purchases of vehicles in these weight classes beyond the program requirements and purchase of vehicles greater than 26,000 lbs. meeting these standards would earn emission credits (see the final rule on CFFV credits). Credits can also be earned by vehicles/engines meeting the ULEV/ZEV standards. These are discussed next.

2. Heavy-Duty ULEV and ZEV Standards

As previously discussed, section 246(f)(4) of the CAA requires EPA to promulgate emission standards for ULEVs and ZEVs, for the purpose of determining fleet program credits. The provision states that the standards:

> "shall be more stringent than those otherwise applicable to clean-fuel vehicles under this part....The standards...for [light-duty] vehicles...shall conform as closely as possible to standards which are established by the State of California for ULEV and ZEV vehicles in the same class. For vehicles of 8,500 lbs. GVWR or more, the Administrator shall promulgate comparable standards for purposes of this subsection.

Under this provision, EPA must determine the appropriate level for the heavy-duty ULEV and ZEV standards. It is useful to note that since these standards are credit-generating standards, their intended purpose is primarily to provide compliance flexibility for manufacturers and fleet operators. The Agency's goal then, in selecting these standards, is to provide the maximum flexibility allowable under section 246 (f)(4) of the Act, while ensuring that there would be no negative impacts on the environment. For clarity, it should be emphasized that the ULEV and ZEV standards are voluntary and apply to all heavy-duty engines, including those used in HDVs of more than 26,000 lbs. GVWR. In this respect, they are unlike the heavy-duty LEV standards discussed previously, which are mandatory for vehicles 26,000 lbs. GVWR or less, but voluntary for those over 26,000 lbs GVWR.

*a. Ultra Low-Emission Vehicle Standards.* EPA is proposing that heavy-duty ULEVs be required to meet standards for NMHC + NOx, CO, particulate, and formaldehyde emissions. NMHC + NOx has been selected as a criteria pollutant for consistency with the LEV standards.

EPA believes that it is appropriate to require specific emission standards for CO, particulates, and formaldehyde because section 246(f)(4) of the Act requires that the heavy-duty ULEV standard be "comparable" to light-duty ULEV standards. EPA interprets this requirement to mean that ULEVs standards for heavy-duty engines should require approximately the same percentage of emission reduction compared to heavy-duty LEV standards, as light duty ULEV standards require, compared to light-duty LEV standards. The light-duty ULEV standards for CO, particulate, and formaldehyde require approximately 50 percent reductions in emissions compared to light-duty LEV standards. Therefore, it is appropriate that the heavy-duty ULEV standards also require approximately 50 percent reductions of these pollutants compared to standards for heavy-duty LEVs. (Heavy-duty LEVs must meet the same standards for CO and particulates as do conventional heavy-duty vehicles. Similarly, the Phase I CO and particulate standards for light-duty CFVs will be the same as those for conventional light-duty vehicles in those model years. Though formaldehyde is not regulated for heavy-duty LEVs, formaldehyde is regulated in the light-duty ULEV standards. EPA believes that heavy-duty vehicles that emit formaldehyde are likely to participate in the ULEV program. As emissions of formaldehyde are of significant concern to EPA and to Congress, as evidenced by the inclusion of formaldehyde standards for light-duty low-emission vehicles and the inclusion of formaldehyde as a hazardous air pollutant, EPA believes it is appropriate to include standards for formaldehyde emissions in the heavy-duty ULEV program. EPA has the authority to regulate formaldehyde emissions not only under section 246(f)(4), but also under CAA sections 202(a) and 301(a).) The numerical standards EPA is proposing are shown in Table 4. These standards are consistent with the requirements of the California LEV program.

**Table 4**

**Proposed Standards for Heavy-Duty ULEVs**

| NMHC + NOx (g/Bhp-hr) | CO (g/Bhp-hr) | Particulate (g/Bhp-hr) | HCHO (g/Bhp-hr) |
|---|---|---|---|
| 2.5 | 7.2 | 0.05 | 0.05 |

EPA's technical analysis indicates that these are approximately the lowest standards which EPA can reliably project will be met by a significant number of clean alternative fuel vehicles in the 1998 time frame.[7] It is true that the lower standards would allow for greater credits on a per-vehicle basis; however, they would likely not provide a greater total benefit since they would be much more difficult to meet. Another important consideration is that these levels are the same as the ULEV standards adopted by California for incomplete medium-duty vehicles and diesel engines. Consistency between Federal and California requirements is a significant economic and market efficiency factor for fleet purchasers and manufacturers and is in the spirit of the requirement of the statute as presented above. Finally, the ULEV NMHC + NOx standard is about 40 percent lower than EPA's heavy-duty LEV standard for NMHC + NOx. This 40 percent reduction is comparable to the NMOG and NOx reductions that

[7] "*Regulatory Support Document: Emissions Standards for Heavy-Duty Fleets*," Environmental Protection Agency, Standard Development and Support Branch, September 1992 (found in the docket for this rulemaking).

EPA requires under its ULEV standards for light-duty vehicles and light-duty trucks, which range from 38 to 50 percent.

*b. Zero-Emission Vehicle Standards.* Zero-emission vehicles (e.g. electric vehicles) are vehicles which have no emissions of the pollutants of concern. Therefore, EPA proposes heavy-duty ZEV standards of zero for NMHC + NOx, CO, particulates, and formaldehyde. Compliance would be assessed, without testing, through engineering analysis. The engineering analysis proposed in the regulations accompanying this NPRM would include a description and analysis of all primary or auxiliary equipment and engines which concluded that no emissions of the stated pollutants would be possible. The engineering analysis would determine that the vehicle fuel system(s) does not contain either carbon or nitrogen compounds (including air) which when burned form the above regulated exhaust emissions. Such criteria would also assure that evaporative emissions would not occur. Given this criteria there is no need to perform emission testing because the above pollutants cannot be emitted from the vehicle. A vehicle would not be a ZEV unless it meets the above criteria. Any vehicle with additional power system(s) or auxiliary engine(s) they might produce regulated pollutants (e.g. hybrid vehicle or an electric vehicle with an auxiliary power source to run other vehicle systems) will be subject to the testing requirements of Part 86 or Part 88 or future applicable regulations and may not qualify as a ZEV.

3. Request for Comments Related to Heavy-Duty Standards

The Agency specifically requests comments in several areas related to the heavy-duty clean-fuel vehicle standards. First, EPA requests comments on the feasibility of a 3.15 g/Bhp-hr NMHC + NOx LEV standard for 1998 model year diesel-fueled vehicles, which was specified in the Act. EPA requests comments on the feasibility of the LEV standard which was proposed (3.5 g/Bhp-hr), for all types of HDEs. In addition to discussion of general feasibility, comments should address whether this standard is equitable for all fuel/engine types, or whether it would be appropriate or legally justifiable to establish separate standards which included consideration of other factors such as fuel type or engine cycle. Emissions data and other technical information should be included in these comments, to the extent possible, to allow the Agency to better resolve this issue. EPA also asks for comments on what role credit exchange programs should play in setting these standards. EPA also requests comments on the ULEV standards; both on the levels selected, and on the inclusion of CO, particulate, and formaldehyde standards.

4. Other Issues

a. *Flexible-and Dual-Fuel HDEs.* Section 243(d) of the Act prescribes a set of emission standards for flexible and dual-fuel light-duty vehicles and light-duty trucks. Under this provision, the NMOG standard that is applicable when the vehicle is operated using the conventional fuel is slightly higher than the applicable NMOG standard when the vehicle is operated using the alternative fuel. The Act does not address whether such standards should or should not be included for flexible or dual-fuel HDEs in the fleets program. It is possible that similar standards could be implemented for HDEs in the same manner as prescribed in the statute for light-duty vehicles and light-duty trucks. Though flexible and dual-fuel vehicles have been shown to have significantly lower emissions of NMOG when operating on alcohol, than when operating on gasoline, the heavy-duty standards are expressed as NMHC (or equivalent (NMHCE)), which unlike NMOG is not adjusted for reactivity. Thus, there is less justification for separate NMHC standards. EPA's experience with the certification of light-duty flexible-fuel (methanol/gasoline) vehicles has shown that NMHCE emissions are roughly comparable for the two fuels for a given vehicle. Similar behavior would be expected for other fuel types as well. Thus, the Agency does not believe that separate NMHC standards are necessary for flexible or dual-fuel HDEs. Moreover, it is unclear whether EPA has the authority to issue such standards for HDEs under section 245 and 246 of the Act. EPA asks for comment, however, on the appropriateness, desirability, and authority for special flexible and dual-fuel emission standards for clean-fuel HDEs. Those suggesting separate standards for flexible and dual fuel HDEs should suggest an approach as well as appropriate emission standards. Specific comment is requested on whether a scheme such as that used for light-duty vehicles is appropriate.

*b. Optional LDT Certification.* For a number of years, manufacturers have had the option of certifying their HDEs used in vehicles between 8501 and 10,000 lbs. GVWR using the LDT emission standards and provisions. This provision is found in 40 CFR 86.085-1(b). EPA finds no reason why the treatment of CFVs should be different than conventional vehicles in this regard, and thus for consistency EPA proposes to continue this option for clean-fuel HDEs. EPA seeks comment on the desirability and need for its continuation.

*c. Heavy-Duty Test Procedures.* While this action proposes to establish NMHC + NOx standards for heavy-duty vehicles and engines, current regulations do not include test procedures for the measurement of methane separate from other hydrocarbons and thus the calculation of NMHC emissions is not possible. The current heavy-duty test procedures only measure the total amount of hydrocarbons (including methane), but do not separately measure the amount of any individual hydrocarbons such as methane. Therefore, EPA is proposing additional test procedures for the separate measurement of methane and calculation methods for NMHC emissions, as discussed below. Measurement of total hydrocarbon (THC) emissions will be unchanged, and will continue the current practice of using a flame ionization detector (FID).

The proposed test procedures call for the separate measurement of methane using gas chromatography[8] as specified in the Society of Automotive Engineers (SAE) Recommended Practice J1151. This is consistent with both the previously established EPA procedure for light-duty vehicles and light-duty trucks (40 CFR 86.111-94 and 40 CFR 86.140-94), and the California procedure for methane measurement. This approach does not permit continuous methane measurement of exhaust samples and will require that a bag sample be collected for

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[8]Gas Chromatography -- A separation technique in which a sample of the gaseous state is carried by a flowing gas (carrier gas) through a tube (column) containing stationary material. The stationary material performs the separation by means of its differential affinity for the components of the sample.

all classes of vehicles and engines.

Under the proposed approach for measuring NMHC, THC will first be measured using the FID. Then, methane will be measured using gas chromatography. This methane measurement will then be multiplied by a "FID response factor."[9] The mass of NMHC is then the difference between the THC (as measured by the FID) and the methane (as measured by gas chromatography, multiplied by the FID response factor). EPA is not at this time proposing to specify the precise means by which the FID response factor for methane is to be determined; EPA requests comments on whether it would be appropriate to specify a procedure, and if so, what procedure should be used.

In order to provide manufacturers with additional flexibility, EPA proposes to make the measurement of methane (and subsequent calculations) optional. Manufacturers would be allowed to measure and report THC emissions for compliance with the NMHC standards. Since THC emissions are the sum of the methane and NMHC emissions, they will be higher than the NMHC emissions alone; thus, if the THC emissions are lower than the standard, the NMHC will also be below the standard. While this option in effect increases the stringency of the standard, some manufacturers may find that the savings associated with using a simpler test procedure justify

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[9]This response factor is necessary because the FID responds differently to methane than it does to other hydrocarbons. In order to find what portion of FID's THC reading is attributable to methane, the tester must know the relationship between the FID response to other hydrocarbons and to methane. Such a "FID response factor" is calculated by noting the response of the FID, calibrated for typical HCs, to a known quantity of methane. For example, if a sample known to be 10.0 grams of methane gives a FID reading of , say, 11.0 grams, then the FID response factor is 11.0/10.0 or 1.10.

certifying under this option. This is especially true for diesels, where the methane fraction is small.

*d. Averaging, Trading, and Banking.* The Agency has previously established an extensive credit exchange program for NOx and PM emissions from heavy-duty engines[10]. Under this program, a manufacturer can take emissions credits for producing vehicles that are below the applicable standards, and then use those credits either on its own engines within the same averaging set or to sell to other manufacturers for use in families in the same averaging set which do not meet the applicable standards (trading). These emission credits can be used in the year generated or retained for later use (banking). Fleet average emissions are unchanged by this program.

It would be inappropriate for a manufacturer to receive certification emission credits for LEV, ULEV and ZEV sales to fleet owners. The CFFV standards are mandatory for covered fleet vehicle purchases; also allowing manufacturer credits for certification would result in less emission reduction than is contemplated in the Act. Thus EPA is proposing that all LEVs, ULEVs, and ZEVs used in the fleets program for either compliance or credit purposes be excluded from the manufacturers' credit exchange program. Similarly, due to the lack of control over fuel use, dual- and flexible-fuel CFFVs would not be able to generate credits if they do not meet the CFFV standard on both fuels.

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[10]Certification Programs for Banking and Trading of Oxides of Nitrogen and Particulate Emission Credits for Heavy-Duty Engines; Final Rule, 55 FR 30584.

However, EPA proposes to allow manufacturers to divide a clean-fueled engine family into two engine families, one labeled under Part 88 (the Part which regulates clean-fuel fleet vehicles) and one labeled under Part 86 (the Part which regulates conventional vehicles) only. Those labeled under Part 88 will include on the label an indication that this engine is intended to be part of a clean-fueled vehicle program, and as such, they will be excluded from the manufacturers credit exchange programs. Those labeled under Part 86 only will not include any indication on the label that the engine meets any of the emissions requirements of Part 88, and as such, they will be excluded from all clean-fueled vehicle programs, but may be included in a manufacturers credit exchange programs. The Agency believes that this approach will prevent "double counting" of emissions benefits, but will still provide the manufacturers flexibility in determining the most cost effective means of complying with the requirements of Part 86.

*e. Credit Exchange Programs for Manufacturers of Heavy-Duty Clean-Fuel Fleet Vehicles*

As was mentioned above in the discussion of the feasibility of the proposal HDE NMHC + NOx, EPA is requesting comment on a credit exchange program for use within the HDE CFF program. The basic purpose of this program would be to enhance the feasibility of the proposed HD CFV standards by increasing compliance flexibility. This would have positive effects in areas such as cost, cost effectiveness, and model availability. More specifically, the program would permit manufacturers to use credits obtained through averaging, banking and trading programs to qualify engines as LEVs that otherwise would not be able to qualify as LEVs. Credits would be generated by other clean-fuel fleet HDEs certified at levels below the LEV standards. This could be accomplished by allowing manufacturers to set and certify to FELs as in the current HDE credit exchange programs or perhaps limit credits only to engines able to qualify as ULEVs or ZEVs and base the credit calculation on those levels instead of FELs. For the most part this program would be very similar in nature to the current HDE NOx and PM credit exchange programs and many of the provisions and concepts in that program would also apply.

However, implementing a program of this nature for certification presents some problems not encountered in the current program. LEVs are eligible for TCM exemptions. Should vehicles/engines which qualify as LEVs using credit also be eligible for these exemptions? Allowing HDEs to qualify as a LEV using credits from other clean-fuel HDEs could potentially mean that credit using and credit generating engines would not be located in the same nonattainment area. Is this inconsistent with the provisions of Section 246(f)(2)(A) which limits purchase credit exchanges among fleet owners to within the same nonattainment area? Another issue arises from the fact that the CFF program is directed at nonattainment areas instead of the nation as a whole. Any such averaging program would have to provide that the applicable standard be met on average in each covered nonattainment area; otherwise the emission benefits that would result from the program would not be achieved in every nonattainment area. It is notable that other statutory provisions establishing control measures for nonattainment areas under Title II explicitly require that any average of emission credits provide that applicable standards be met on average in every affected nonattainment area (see section CAA 211(k)(7)). EPA requests for comment on how such a provision could be implemented. Another issue is whether a vehicle would be able to meet the exhaust emission qualification criteria for the ILEV program using credits. Furthermore, there are significant questions concerning whether an averaging program, which would allow vehicles not meeting CFFV standards to nonetheless qualify as CFVs, is legally permissible under Title II Part C of the CAA.

Finally, there are the more practical issues regarding FEL caps, credit life, discounting and cross fuel/subclass credit exchanges. EPA is especially interested in the role of cross fuel credit exchanges in light of the differences between gasoline and diesel engine technology NOx control capabilities. When the current NOx/PM credit exchange programs were promulgated, EPA decided not to allow cross-fuel (or cross-cycle) trading in part because of concerns that manufacturers would be inequitably affected by such a program. The HDE market has now evolved to the point that this is of less concern. In the clean-fuel fleet program NMHC + NOx credits are more likely to be generated by otto-cycle engines and used by diesel cycle engines. And while light-duty diesel cycle and otto-cycle engines have similar useful life periods, medium duty diesel cycle engines have a useful life of about 70 percent longer than otto-cycle engines excluding rebuilds. Thus a trading ratio on the order of 1:1 and 2:1 would be appropriate for credit exchanges between light and medium-diesel cycle and otto-cycle engines. More specifically, a medium diesel cycle engine would need to obtain 2 g/BHP-hr NMHC + NOx credits from otto-cycle engines for every 1 g/BHP-hr NMHC + NOx it required.

EPA asks for comment on the desirability and appropriateness of a credit exchange program to qualify engine families as LEVs. Attention is requested to the issues raised above as well as to how the program should be similar or different to the current program in terms of scope, construction, and related provisions.

f. *Labeling.* Section 86.095-35 of Part 86 requires that all heavy-duty vehicles and engines certified by EPA have a permanently affixed label indicating that this vehicle or engine meets all of the applicable requirements of Part 86. The Agency is proposing that all heavy-duty LEVs, ULEVs, and ZEVs will be required to meet additional labeling requirements so the purchaser (e.g. fleet operator) knows the vehicle is a CFFV and "double counting" of emissions benefits by the purchasers or manufacturers of CFFVs is prevented as discussed above in section 4.e.. The proposal would require that those clean-fuel vehicles and engines that are regulated under both Part 86 and Part 88 (e.g., gasoline-fueled vehicles, methanol-fueled vehicles) shall meet the standard labeling requirements of Part 86 with the addition of a statement that this vehicle or engine meets the applicable heavy-duty LEV, ULEV, or ZEV standards. However, certain clean-fuel vehicles (for instance electric vehicles) are regulated under Part 88 but have not yet been regulated under Part 86. EPA proposes to require that, for these clean-fuel vehicles not yet regulated under Part 86, the manufacturer affix a permanent label that indicates that the vehicle or engine meets the requirements of Part 88 for heavy-duty LEVs, ULEVs, or ZEVs, as applicable, but does not necessarily meet the requirements of Part 86. The reason for this requirement is to inform the consumer that a vehicle is a CFFV but is not subject to part 86 regulations, and, thus, this vehicle is not eligible to be used in the averaging, trading, and banking program in part 86. Manufacturers of ZEVs need a label which specifically indicates a CFFV is a ZEV. The precise language used on the label will be specified in the future.

## IV. Conversions to Clean-Fuel Fleet Vehicles

CAA section 247 states that fleet owners may meet clean-fuel fleet vehicle purchase requirements through the conversion of existing or new gasoline or diesel-powered vehicles to clean-fuel vehicles. A converted CFFV will thus be considered a new vehicle for the purposes of the clean-fuel fleet program, and so it will be eligible not only to meet the CFFV purchase requirements but also to earn credits and TCM exemptions. For this purpose, a clean-fuel vehicle (or engine) is one which meets the applicable CFV emission standards and other requirements as prescribed in CAA sections 242 through 245. Considering the environmental goals of clean-fuel fleet program and the credits and TCM exemptions available to fleet owners under the program, it is important to ensure that converted vehicles comply with CFFV emission standards. Congress recognized this by specifically directing EPA in section 247(b) to promulgate regulations governing conversions of conventional vehicles to CFVs that "... will ensure that a converted vehicle will comply with the standards applicable under this part to clean-fuel vehicles."

The following sections describe the history and characteristics of the conversion industry, past and present EPA actions applicable to conversions, and EPA's proposal for the regulation of clean-fuel fleet vehicle conversions.

A. History and Characteristics of the Conversion Industry

In the past, the vehicle conversions industry has been dominated by entities which performed a small number of conversions, usually as a sideline to their primary business (fuel companies, gas utilities, auto repair shops, and start-up companies dedicated to conversions). In many of these instances, the primary business itself was small. Most of the conversions have been to gaseous fuels (i.e., compressed natural gas (CNG) or liquefied petroleum gas (LPG)) rather than to alternative liquid fuels. Generally speaking, these small converters (installers) did not have extensive experience in vehicle conversions, nor did they have the use of conversion equipment and kits or access to equipment and procedures that could check the quality of the conversion job.

More recently, larger-scale conversion businesses have emerged that perform what can be called "engineered conversions." Although these installers (engineered converters) also tend to focus on gaseous fuel conversions, they are otherwise fundamentally different from the operations described above. They are generally small companies with a significant conversion business (conversion hardware manufacturers, specialty engineering firms, and technology centers of fuel companies). They usually collaborate closely with the original vehicle manufacturer in the design of the new fuel systems and even in the marketing of the converted vehicles, and they generally perform relatively large numbers of conversions of a single type of vehicle with a single type of conversion equipment. These installers are expected to have substantial technical resources and ability to perform high quality conversions and to evaluate their work when the conversion is completed.

Developments and trends in the conversion industry indicate that by the time the Clean Fuel Fleet Program is fully implemented in 1998, engineered conversions are likely to comprise a substantial majority of all conversions[11]. The demand for vehicles meeting the CFFV standards will presumably grow, thus increasing the conversion market share for companies capable of producing large numbers of high-quality converted vehicles. EPA requests comment on this assessment of the trend toward larger companies doing engineered conversions, including how frequently such companies may market their conversion equipment to smaller entities for installation.

*B. History of EPA's General Regulatory Approach for Conversions of Vehicles*

To a limited degree, vehicle conversions have occurred for decades. Prior to enactment of the Clean Air Act of 1970, conversions could be done largely independently of

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**[11]U.S Environmental Protection Agency, Office of Mobile Sources, "A Preliminary Assessment of Gaseous Fuels Aftermarket Conversions Industry," EPA Contract 68-C1-0059.**

environmental concerns. As the federal motor vehicle control program developed in the early 1970's and emission standards were promulgated, the need emerged to address the responsibilities of those who convert vehicles to fuels other than those on which they were certified. Since conversions involve changes to vehicles/engines that have been certified as meeting applicable emission standards, conversions are typically subject to the tampering prohibitions of CAA section 203(a)(3).

EPA established guidelines in the past regarding the Agency's enforcement of the tampering prohibitions. These guidelines are contained in two documents entitled "Mobile Source Enforcement Memorandum No. 1A," dated June 25, 1974, and "Fact Sheet: Conversion of Vehicles and Engines to Operate on Natural Gas or Propane," dated November 1, 1991. These documents have been placed in the docket for this rulemaking. The purpose of these documents was to reduce uncertainty concerning potential liability and to provide assurance that certain acts pertaining to the use or sale of aftermarket parts or systems, or the adjustment or alteration of parts or system parameters, would not result in enforcement actions being taken. Essentially, the guidelines state that a modification to a certified emissions control configuration will not be cited as a violation of the tampering prohibition if there is a reasonable basis for knowing that emissions from the vehicle are not adversely affected. The ultimate determination as to whether emissions are adversely affected lies with EPA.

In the 1990 CAA Amendments the final paragraph of section

203(a) was amended to limit the scope of the tampering provisions of CAA section 203(a)(3). Section 203(a), as amended, provides an exception to the tampering provisions of section 203(a)(3) where a conventional vehicle is converted "...for use of a clean alternative fuel and if such vehicle continues to comply with section 202 standards when operating on the alternative fuel...and if in the case of a clean alternative fuel vehicle (as defined by the Administrator), the device or element is replaced upon completion of the conversion procedure and such action results in proper functioning of the device or element when the motor vehicle operates on conventional fuel."

The 1990 Amendments also exempted under section 247(d) conversions of conventional vehicles to clean fuel vehicles from tampering liability if the converted vehicles comply with clean fuel vehicle standards.

The agency has recently dealt with the issue of conversions of vehicles to alternative fuels in an NPRM entitled Gaseous-Fueled Vehicle Emission Standards (__FR_____,[DATE]) (the Gaseous Fuels NPRM). The conversions provisions in the Gaseous Fuels NPRM are not specific to gaseous fuels, but are proposed to apply to all conversions regardless of fuel type. To provide assurance that converted vehicles comply with applicable emission standards, that NPRM proposes that any vehicle conversion be considered tampering unless the vehicle has been properly converted to a configuration which has been certified by EPA as meeting applicable standards. The certification procedures proposed in the Gaseous Fuels NPRM will be proposed in today's rulemaking as the basis for certification procedures of vehicles converted to CFFVs, as described below. For vehicles converted to fuels for which no standards exist, the provisions of Memorandum 1A discussed above apply (i.e., EPA will not prosecute a modification to a certified emission control configuration if the emissions from the vehicle are not adversely affected).

According to the Gaseous Fuels NPRM, conversion configurations of vehicles or engines would include all of the hardware necessary to allow a vehicle to operate on a fuel other than the fuel for which the vehicle or engine was originally manufactured. Before the conversion kit could be sold to the public, the installers and/or manufacturers would be required to certify it. In the case of a dedicated fuel conversion, certification would entail performing the applicable emission test procedures, as described below, and meeting all emission standards and related provisions which apply to a new vehicle/engine operating on the alternative fuel at the time of manufacture. In the case of a dual fuel conversion[12], the vehicle/engine would not only need to be certified to meet the emission standards and provisions for the alternative fuel, but also would need to continue to meet the emission standards and provisions to which it was originally certified when operating on the conventional fuel. In either case, the conversion configuration would be certified to cover all vehicles in the same engine family that were converted. Separate certifications would be required for

[12] A dual fuel conversion is any conversion of a vehicle/engine engineered and designed such that the vehicle/engine can be operated on two different fuels but not a mixture of the fuels.

each engine family. Any installation on a vehicle of a non-certified conversion configuration would be considered tampering, as would the improper installation of any conversion kit. Kit manufacturers and installers would be required to also accept in-use liability for warranty and recall as outlined in section 207 of the Act and its implementing regulations.

The Gaseous Fuels NPRM further proposed that converters certify a conversion configuration according to the Small-Volume Manufacturers Certification Program (55 FR 7178, February 28, 1990) and that converters be treated the same as small volume manufacturers for this purpose. The Agency noted in the Gaseous Fuels NPRM that, although the maximum number of vehicles which can be certified by a given manufacturer under the small volume program is 10,000, no such limits were proposed for aftermarket conversion certification volumes. The Small-Volume Manufacturers Program requires manufacturers to provide full low mileage emission data which show compliance with new vehicle emissions standards, but requires complete durability testing only for vehicles with unproven technology. The primary purpose of this program is to reduce the burden of durability testing for small volume manufacturers while still assuring that in-use vehicles with properly installed conversion kits would perform as intended throughout their useful life. This approach still provides reasonable assurance of emission compliance, since at some point in time, every technology would go through durability testing. In addition, the certification requirements proposed for conversion configurations include the adjustable parameter provisions (currently applicable to all certified vehicles), which are intended to minimize the chances of miscalibration during installation and maintenance and thus further assure in-use compliance.

*C. Proposed Regulations for CFFV Conversions*

The conversion provisions in the Gaseous Fuels NPRM would apply to any vehicle converted to the use of any fuel different from that on which the vehicle was certified by the vehicle's original manufacturer. While these provisions would require that emissions from converted vehicles meet the applicable emission standards whenever manufacturers certify configurations, they are not intended to fulfill all of the requirements of section 247 of the CAA. Converted vehicles participating in the CFF program under section 247 must meet the CFFV standards. In addition, the language of section 247 may require somewhat different measures to fulfill all of the fleet program requirements.

Section 247(b) specifically directs EPA to issue regulations concerning the conversion of conventional vehicles to clean-fuel vehicles. Furthermore, provisions of section 247(c) state that "any person who converts conventional vehicles to clean-fuel vehicles .... shall be considered a manufacturer for purposes of sections 206 and 207 and related enforcement provisions." In implementing this provision a threshold issue is who should be considered a "person who converts" -- the person who installs conversion configurations or the person who manufacturers conversion kits or both. For the reasons set forth below, EPA is proposing two options for the scope of the term "converter" for the purposes of the CFF program. Under the first option, a converter will be the person(s) or entity that installs a conversion configuration on a vehicle in order to convert the vehicle into a CFFV. Thus, a person installing a conversion kit into a vehicle for sale or use as a CFFV would be required to demonstrate that the vehicle configuration complies with the CFFV standards in order to receive a federal certificate of conformity. Under the second option, the term converter would include the manufacturer of the conversion kit as well as the installer of the conversion kit. In this option, both the kit manufacturer and the installer would be responsible for demonstrating that a vehicle converted to a CFFV has a configuration that complies with CFFV standards in order to receive a certificate of conformity. For the first option enforcement actions would be taken against the installer, and for the second option enforcement actions would be taken against the installer or the kit manufacturer, or both.

EPA proposes that under either approach converters shall be considered manufacturers, as defined in section 216 of the CAA, for all regulatory purposes. A federal certificate of conformity is required for all vehicles converted to use as a clean-fuel vehicle. In addition, the converter would be responsible for warranting each vehicle's emissions for its useful life and would also be subject to Selective Enforcement Auditing.

The Agency expects that under either option set forth above, installers and kit manufacturers will enter into indemnification arrangements to place the actual cost of recall and repair on the responsible party. The Agency believes these parties are better situated to resolve this issue than is the Agency. For example, some conversion installers may choose to enter into agreements with conversion kit makers that would result in a joint entity becoming the "manufacturer" for purposes of the proposed rule. The Agency envisions that arrangements between conversion installers and conversion kit makers might develop whereby, for example, conversion kit makers certify the conversion configurations and conversion installers act as the conversion hardware manufacturers' agents or representatives.

The Agency is proposing the first approach for regulating converters for the following reasons. First, the requirement of section 247(c) of the CAA that "any person who converts conventional vehicles into clean-fuel vehicles shall be considered a manufacturer for the purposes of sections 206 and 207 and related enforcement provisions" appears to require EPA to treat installers as manufacturers since it is installers who complete the conversion process. As a result, conversion installers would be treated as manufacturers for all aspects of enforcement including certification, SEA, and recall. Second, liability is more easily assigned and enforcement may be less complicated if the person that performs the final step of a conversion is held accountable.

Third, installers to some extent are similar to manufacturers of new automobiles (original equipment manufacturers (OEMs)), in that they install the relevant parts and materials on the vehicle. Kit manufacturers (unless they are also installers) do not place their kits on vehicles but require other entities to perform the installation (or build the vehicle conversion configuration). Such kit manufacturers do not have direct responsibility for installation of their kits, distinguishing them from OEMs.

The second option recognizes that both the conversion kit maker and the installer have a critical role in assuring that a converted vehicle meets emission standards. The kit maker must design and engineer the system properly for each configuration while the installer must be certain that the kit is installed in accordance with the kit makers instructions and good engineering practice. Under the second approach the installers would maintain legal responsibility, but kit manufacturers would also be legally responsible as manufacturers whether or not they had entered into agreements with installers to form a joint entity. EPA is proposing the second approach for the following reasons. First, the Agency believes that the term "converter" can be reasonably interpreted to include conversion kit manufacturers, who are certainly in the business of "convert[ing] conventional vehicles to clean fuel vehicles," as well as installers. Thus, EPA could hold such kit manufacturers legally responsible for some or all of the certification, SEA testing, in-use testing, warranty, and recall requirements under the CAA for vehicles that have been converted using the manufacturers' conversion kits. Second, given the large number of installers in relation to the number of kit manufacturers, it may be much more practical to focus enforcement efforts on the kit manufacturers. This approach may also be more equitable in that EPA can directly bring enforcement actions against a kit manufacturer where EPA believes that an emissions failure was caused by the design or manufacture of the kit. This approach is more flexible in that it allows EPA to focus enforcement efforts upon a kit manufacturer or installer or both, depending on who is liable for emission-related problems in a particular case. Also, the kit manufacturer may likely be more readily identifiable through vehicle inspection than the installer. Third, the kit manufacturers may also have substantial control over the installation process, both through the installation instructions they provide with the kit and through the possibility of setting up their own installation dealerships. Fourth, this option is more consistent with the liability provisions proposed in the Gaseous Fuels rulemaking, thus allowing for more compatible enforcement of the two conversion programs.

Moreover, given that to a degree conversion kits are customized for each vehicle model, kit manufacturers are also analogous to manufacturers of new automobiles (OEMs) to some extent, in that they are the designers and manufacturers of the equipment installed in the converted vehicle, much as manufacturers of new automobiles design and manufacture the final configuration and many of the parts in new automobiles. If an emissions-related failure occurs on a converted vehicle and that failure has been caused by a problem in the design or manufacture of the conversion kit, the kit manufacturer would be responsible for the failure.

EPA requests comment on the two approaches discussed above for the scope of the term converter. Commenters should especially address the following issues: whether and to what extent kit manufacturers are in a better position than installers to carry out the requirements of the CAA for certification, testing, etc.; whether installers will be able to require kit manufacturers to assume responsibility contractually for requirements that kit manufacturers are not legally responsible for; whether the regulated community believes it is important for the liability provisions of EPA's conversion programs (e.g. Gaseous Fuels, Clean-Fuel Fleets, Urban Bus) to be handled consistently; whether EPA can or should require kit manufacturers and installers to both be liable for meeting the requirements of the CAA; whether enforcement will be improved if the liability provisions include kit manufacturers. Further, commenters should address any other issues that are pertinent to this discussion.

1. Applicability

The program applies to dedicated, dual, or flexible fuel conversions of light-duty vehicles, light-duty trucks, and heavy-duty vehicles/engines. CFFV conversions must meet the CFFV emission standards (LEV, ULEV or ZEV) of 40 CFR Part 88 and must also meet the applicable emission standards and provisions of Part 86 to the extent they are not consistent with the requirements of Part 88.

2. Certification

As was the case for the Gaseous Fuels NPRM provisions for conventional conversions, EPA proposes that the Small Volume Manufacturer Certification Program (40 CFR 86.092-14) be used to certify CFFV conversion configurations. Again, this is because requiring full certification testing may be overly burdensome for the relatively small companies usually marketing aftermarket conversions, especially in terms of durability testing. However, any converter has the option of using the EPA full certification program (40 CFR 86.094-23) for any conversion configuration.

A converter must demonstrate durability as required in the Small Volume Manufacturers Certification program unless it is authorized to specifically use another converters durability data (deterioration factors). If there is a lack of deterioration factors available, converters may use assigned deterioration factors form the Small Volume Manufacturers Certification Program. Assigned deterioration factors for clean-fuel vehicle conversions will be developed in a subsequent EPA action.

For certification testing of aftermarket conversions, it should be noted that the extra weight of the conversion hardware and fuel tanks may change the equivalent test weight of the vehicle, and thus a different road load horsepower may be needed for dynamometer testing of the vehicle. Therefore, EPA proposes that the converter shall be required to determine the vehicle's new road load power test weight and inertia weight class according to 40 CFR 86.129-80 and 40 CFR 86.129-94.

The converter of a dedicated fuel conversion configuration must certify the configuration to the CFFV standards of Part 88 and the conventional fuel emission standards and provisions of Part 86, to the extent they are not superseded by Part 88. The converter of dual- and flexible-fuel vehicle conversion configurations must certify the configurations to both the clean fuel requirements (Part 88) and the conventional fuel requirements (Part 86). As with all CFFVs, dual- and flexible-fuel vehicles shall meet the Part 88 requirements (as well as Part 86 requirements) when operating on clean-fuel, and they shall meet Part 86 requirements when operating on conventional fuel. Specifically, as with the Gaseous Fuels NPRM, it should be noted that all configurations must comply with the adjustable parameter provisions currently applicable to all certified vehicles. Once a converter has certified a conversion configuration for a specific vehicle/engine model, the certification will be valid for all conversions of that vehicle/engine model performed by that converter using the certified configuration, unless the conversion installation violates the tampering provisions of section 203 of the Act.

Separate certification is required for each conversion configuration for each converter desiring to conduct such a conversion. (This would be required under either option described above for the scope of the term "converter.") Once a conversion configuration is certified for a given model year vehicle/engine it will remain valid for conversions in future years of the same model year vehicle/engine, unless new information is obtained for the vehicle/engine model after the first model year that changes have occurred. EPA also proposes that the conversion configuration certification be eligible for carryover if the OEM vehicle/engine is also certified under carryover provisions. EPA believes these certified conversion configurations will result in similar emissions from model year to model year.

EPA requests comment on the manner in which it should regulate conversion installers that are not listed as manufacturers in the original certificate for a conversion configuration. Under CAA section 247(c), anyone who installs a particular conversion configuration is required to accept liability as a manufacturer for the purposes of sections 206 and 207. A question arises about the manner in which installers not listed on the original certificate would meet the requirements of section 206. One approach would be to require every installer to be listed on the certificate filed for each conversion configuration, and to require new installers to be added to the certificate. Under another approach, EPA could deem an installer to have met the certification requirements of section 206 if the installer has used a conversion configuration that has already been certified and if the installer notifies EPA of such conversions and/or maintains records of each vehicle converted (i.e., make of vehicle, vehicle identification number, serial number of conversion kit, and the date and location of the conversion). As discussed elsewhere in this section, installers would still be responsible as manufacturers for all other requirements under sections 206 and 207.

Identification of a converted CFFV as a LEV, ULEV, or ZEV would be based on this certification information. As with any certification program, records would have to be kept of all such tests and made available to EPA enforcement personnel upon request. To aid in their identification, converted CFFVs would have to be labeled as a clean-fuel fleet vehicle on their engine labels, as also required.

Finally, EPA proposes that the provisions of Part 86 Subparts G and K of the CFR relating to Selective Enforcement Auditing apply to a converter for which the Administrator initiates such an audit.

3. In-Use Compliance

Section 247(c) of the CAA provides that any person who converts conventional vehicles to clean-fuel vehicles shall be considered a manufacturer, for the purposes of in-use compliance (section 207), as well as certification (section 206). Therefore, EPA proposes to hold converters liable for the in-use emissions compliance of conversions that they have performed. Thus, the warranty, in-use testing, and recall provisions of 40 CFR parts 85 and 86 apply to all converters under this program.

As discussed above, EPA is proposing two options for the term "converter." Under either option the converter would be liable for all in-use compliance for the purposes of the CFF program. Under the first approach enforcement actions would be taken against the installer. Under the second approach enforcement efforts would focus upon either the installer or kit manufacturer or both.

Section 247(c) states "... Nothing ... shall require a person who performs such conversions to warrant any part or operation of a vehicle other than required under this part. Nothing in this paragraph shall limit the applicability of any other warranty to unrelated parts or operations." EPA believes that this provision means that a converter is not required to warrant any vehicle for parts or operation existing in the vehicle prior to conversion and not affected by the conversion. The preexisting in-use compliance requirements for such parts or operations are not changed by the conversion. However, where the conversion is intended to create a dual-fuel configuration, it must be demonstrated that the conversion does not affect the vehicle's ability to comply with the standards to which it was originally certified to, when operating on the original fuel.

EPA proposes that OEMs remain responsible for any parts that retain their original purpose. The Agency recognizes that there may be cases where the conversion is responsible for the in-use noncompliance of the vehicle on the original fuel, even though the conversion did not directly affect the performance of any OEM components. For example, if the OEM vehicle were certified with a compliance margin which would have allowed for some increase in in-use emissions, and the extra weight of the conversion hardware and fuel tanks reduced that margin to the point where in-use noncompliance on the original fuel began to occur, the liability would be with the converter. It is possible, then, that the converter, the OEM, or both, could be liable for a converted vehicle's in-use emissions performance, depending on the cause of any particular problem. As another example, if a dual-fuel vehicle is experiencing in-use emissions problems on the original fuel, the OEM would be held liable if EPA determines that the problem was caused by a problem with OEM equipment, such as a catalyst failure. However, if EPA determines that the catalyst failure was caused by the new fuel, the liability would be with the converter. In any event, in-use enforcement involving OEM versus converter liability will be handled on a case-by-case basis.

The CAA does not specify whether the useful life period (mileage limits) for purposes of in-use liability should be measured from the time of original vehicle manufacture, or from the time of conversion. Thus, Agency requests comment on when the useful life period should begin. If the mileage limits are measured from the time of conversion, the Agency requests comment on how the mileage of the vehicle at the time of conversion should be recorded and communicated to EPA.

According to the requirements of section 247(d) of the CAA, conversions of conventional vehicles to CFFVs shall not be considered tampering, as defined in section 203(a)(3), if the converted vehicle has been converted using a configuration certified to meet the applicable emission standards for CFFVs and other provisions as proposed above. EPA proposes that such an exception to the tampering provisions be codified in the regulations. Regardless of the legal arrangements in the conversion industry between conversion installers, conversion kit makers, or others, EPA is proposing that any installation on a vehicle of a non-certified conversion configuration would be considered a tampering violation on the part of the party which actually did the conversion installation. However, it should also be noted that the manufacturer of the conversion kit may also, in some cases, be liable for causing tampering as described in the tampering prohibitions in section 203(a) of the CAA.

EPA believes that since conversion installers will be held liable (under either option of the term "converter") for improper emissions performance of CFFV conversions, installers will pay considerable attention to CFFV emission performance to reasonably assure that these conversions meet CFFV standards. However, the LEV, ULEV, and ZEV emission standards are considerably more stringent than conventional standards, and converted vehicles certified as CFFVs will be eligible to earn marketable credits and receive TCM exemptions as CFFVs (LEVs, ULEVs, or ZEVs) or ILEVs. Furthermore, the conversion industry has been largely unregulated, and it consists of a large number of relatively small businesses. Thus, EPA requests comment on whether further requirements for aftermarket conversion installers, manufacturers, and/or fleet operators are necessary to assure compliance with the CFFV standards, and if so, what specific types of requirements would be useful and what exemptions would be appropriate.

EPA specifically seeks comment on one possible approach. This approach involves conducting some form of post-installation test to assess the quality of the installation from an emissions perspective. As part of the certification of each conversion configuration the converted vehicle/engine would also be tested using the idle emission test of 40 CFR 85.2212 with the exhaust CO concentration measured and recorded. Then, prior to release to the customer, each converted vehicle would have its idle CO emission rate measured. This could be done at the local I/M station if available, by the conversion installer using relatively simple analytical equipment, or by contract. If the check is done by the I/M station then the vehicle would have to pass the cutpoint for that area. If done in-house or by contract, it would have to be within 20 percent of the value measured during certification. In any case records would need to be kept for each vehicle.

Such an approach would be most useful in uncovering gross installation errors and would provide some additional level of assurance that CFFV emission standards are being met. Costs would normally be less than $20 per vehicle. Measurement of CO is appropriate because CO emissions generally track NMHC levels closely and CO measurement avoids the complicating effects of measuring methane in some clean-fuel vehicle exhausts.

## V. Proposed Changes to the Current Heavy-Duty Averaging, Banking, and Trading Credit Accounting Regulations

Separate from the provisions proposed in today's NPRM for the CFF program, EPA also proposes changes to the existing Averaging, Banking, and Trading (AB&T) regulations. T h e These regulations promulgated on July 26, 1990 for heavy-duty engines prohibit a manufacturer from banking and withdrawing emission credits from the same averaging set in the same model year. See 40 CFR 86.091-15(a)(2)(iii). According to the credit accounting method in the regulations, a manufacturer must first combine all transactions for an averaging set in a given model year. The manufacturer could then bank any excess credits or withdraw credits if there is a credit shortfall. This is similar to the last-in-first-out inventory accounting system (LIFO), because the most recently generated credits must be used first to average before older credits can be withdrawn from the bank.

This provision has been a source of confusion for some members of the regulated industry. On May 29, 1992, the Engine Manufacturers Association (EMA) met with EPA to explain why its members thought § 86.091-15(a)(2)(iii) allowed them to both withdraw previously banked credits and deposit new credits in the same model year and averaging set.[13] In addition, EMA suggested that FIFO credit accounting had several advantages over LIFO. EPA subsequently informed EMA that § 86.091-15(a)(2)(iii) did not allow FIFO credit accounting, but that the Agency would review its previous decision to require LIFO credit accounting.

Originally, the ABT program was developed to provide flexibility for manufacturers to use a mix of emission control technology and minimize the costs associated with emission reductions. This flexibility would in turn create environmental benefit by the earlier introduction of cleaner engines into the market. In addition, environmental benefits would be derived from a 20% discount on all banked and traded credits and a limited life on all credits.

After comparing the two credit accounting methods, EPA has concluded that the benefits intended to be derived from the ABT program are more likely to be realized under the FIFO credit accounting method, and that LIFO credit accounting may

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[13] Such a credit accounting method is similar to the FIFO (first-in, first-out) inventory accounting system. Previously banked credits from earlier model years would be used to offset engine families from the current model year that exceeded the standard, allowing credits to be banked from cleaner engine families in the current model year.

reduce the program's effectiveness in providing these benefits. Forcing manufacturers to average first with new credits from cleaner technology engines may actually encourage a manufacturer to continue using dirtier technology in the years when previously banked credits are still available, and delay the introduction of cleaner technology until its bank of credits has been depleted.

At the May 29, 1992 meeting, several manufacturers stated that LIFO credit accounting would probably cause them to change their future production plans. To avoid having credits from prior model years expire unused, manufacturers indicated that they would be forced to delay the introduction of cleaner technology until just before any emission standard change. A provision which even unintentionally encourages manufacturers to employ such a strategy undermines the incentive of the AB&T program for the early introduction of cleaner technology. In addition, it would be contrary to our goal of providing compliance flexibility.

On the other hand, with FIFO credit accounting, there is not the same incentive to delay the introduction of cleaner technology. Allowing manufacturers to both bank and withdraw credits not only gives them the opportunity to optimize the use of credits that have already been banked, but also enables them to use a wide mix of engine control technology and a more cost effective control program. Thus, the major rationale for changing to FIFO credit accounting is that LIFO credit accounting actually creates a disincentive for the early introduction of cleaner technology engines.

In analyzing the differences in credit generation and usage between the two accounting methods (and thus, earlier introduction of cleaner technology), EPA looked at historical data of credit transactions that have already occurred in model years 1990, 1991, and 1992.[14] Unfortunately, the data collected on past practices reflects manufacturers' mistaken belief that FIFO credit accounting could be used. EPA is therefore unable to predict from the data how LIFO credit accounting affects manufacturer's use of cleaner technology with enough accuracy to compare the two credit accounting methods. EPA's proposal to implement FIFO credit accounting is therefore based on a logical conclusion of the effects of credit accounting on the early introduction of cleaner emission control technology. This conclusion is supported by several manufacturers' claims that they introduced cleaner technology in 1991 and 1992, but would not have done so if they knew FIFO credit accounting was not allowed at the time.

During the initial rulemaking for the ABT program, EPA described three concerns which supported LIFO credit accounting method. Those concerns were discouraging hoarding, encouraging the availability of credits for trading, and preventing the de facto extension of credit life by banking new credits and withdrawing an equivalent number of old credits from the same averaging set each year. 50 FR 30599 (July 26, 1990). For the following reasons, EPA now believes that those three potential problems will not be a concern with the FIFO credit accounting system either.

[14] Historical and projected data concerning credit generation and usage can be found in the docket. See "Historical and Projected Credit Data," Memorandum from Paulina Chen to Docket (Month, day, 1992).

Hoarding refers to the practice of storing up a large number of credits over several years. This is a concern to EPA because a manufacturer could theoretically delay the implementation of a standard change for a year or more by storing up enough credits and using them all at the time of the standard change. While EPA is still concerned about hoarding, we believe that the three year limit on credit life is sufficient to take care of this problem regardless of the credit accounting method used. As the credit data in the docket reflects, notwithstanding which accounting system is used, manufacturers will have a difficult time holding on to a large number of credits for more than three years because credits must constantly be regenerated.

Hoarding and availability of credits for trading are of course related-- if more credits are hoarded, fewer will be available for trading. Therefore, EPA believes that under FIFO availability of credits for trading will not be a problem for the same reasons that hoarding will not be a problem. In fact, the credit data in the docket shows that more credits would be available for trading if FIFO credit accounting is used as opposed to LIFO. EPA recognizes that during the infancy of the ABT program no trading has occurred. EPA believes, however, that this is the result of the level of the standards for $NO_x$ and PM to date and is not related to the type of credit accounting method that is used.

Lastly, although de facto extension of credit life was a concern in the initial rulemaking for this program, careful consideration of the credit accounting methods has caused EPA to believe that the threat of such extension is essentially nullified by the environmental safeguards. Because of the limited life of credits, manufacturers cannot perform de facto extension of credit life without actually generating a new credit for each credit that would be replaced. Moreover, each new credit that is generated and banked for future use is discounted by 20%, and manufacturers may lose more of their credits to discounting under the FIFO credit accounting method.

Under this proposal, manufacturers will be allowed to both bank and withdraw credits in the same averaging set during a given model year. In order to prevent manufacturers from defeating the environmental safeguards of the program by manipulating credit accounting methods, manufacturers will be required to use the oldest credits first. Mathematical examples of proper credit accounting are available in the docket.[15]

EPA proposes that this change in the credit accounting method apply to the 1993 and later model years. Application of the proposed change to prior model years raises serious questions of retroactivity, including EPA's statutory authority to issue legislative rules with retroactive effect. See Bowen v. Georgetown University Hospital, 488 US 179 (1988). EPA invites comment on its authority to make the proposed credit accounting change applicable to model years 1991 and 1992, as well as the need and desirability for such a change. EPA understands that certain manufacturers have assumed that FIFO credit accounting was allowable and made

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[15] See "Examples of FIFO Credit Accounting," Memorandum from Paulina Chen to Docket (Month, day, 1992).

production plans accordingly. Therefore, many manufacturers claim to have pulled ahead new, cleaner technology in 1991 and 1992 to generate PM credits for the 1994 standard change. If LIFO credit accounting is applied to the 1991 and 1992 model years, those manufacturers will lose most of the credits that they anticipated being available in 1994. EPA does not wish to punish manufacturers for introducing cleaner technology early and creating an environmental benefit. Therefore, EPA believes it may be appropriate to make the proposed change applicable to model years 1991 and 1992, and to require the recalculation of the 1991 and 1992 credit totals using the FIFO accounting method.

The Averaging, Banking, and Trading program provisions also require that manufacturers submit revised end-of-year reports within 90 days after end-of-year reports are submitted. (See 40 CFR 86.091.23(h)(3)(iv)). However, in order to achieve more accurate credit counts of engines tracked to a point of first retail sale, EMA recommended that EPA provide manufacturers an additional 90 days to report credit usage and accumulation.

EPA will retain the 90-day period after the end of the model year for end-of-year reports to be submitted for assessment of the credit situation at the earliest reasonable date. However, to assist manufacturers in obtaining a higher degree of accuracy in their credit accounting, EPA proposes extension of the correction and revision period from 90 days to 180 days. Therefore, manufacturers will have a total of 270 days after the end of the model year to submit their final credit calculations in the revised reports.

## VI. Regulatory Impacts

EPA has prepared a draft Regulatory Impact Analysis (RIA) that evaluates the program costs, potential program benefits, and cost effectiveness of the Clean Fuel Fleet Program. Included here is a summary of the results of those analyses. The program costs and potential benefits related to light-duty vehicles and trucks are evaluated separately from those of heavy-duty vehicles (above 8,500 lbs GVWR) because the CFFV standards and the technology used to meet them are very different for the light-duty and heavy-duty classes.

The amended Averaging, Banking, and Trading Credit Accounting Regulations for heavy-duty engines proposed above do not add economic and environmental impacts.

### *A. Program Costs*

#### 1. Light-Duty Vehicles and Light-Duty Trucks

To estimate the potential costs of clean-fuel fleet LDVs and LDTs, EPA has developed two scenarios representing different assumptions about the future use of nonconventional fuels. Scenario I assumes no major changes from conditions that exist today. Scenario II assumes the emergence of some driving force that would encourage or require OEMs to offer more non-petroleum fuel/vehicle combinations.

Using the above scenarios, the incremental acquisition and operating costs, coupled with estimates of the number of CFFVs operating, can be used to estimate an overall cost of the fleet program for LDVs and LDTs. The incremental acquisition cost is the amount a fleet owner must pay for a CFFV above the cost of a comparable conventional vehicle, and different incremental costs are associated with each vehicle/fuel type. EPA estimates an incremental acquisition cost of $170 for vehicles fueled with reformulated gasoline, $300 for alcohol-fueled vehicles, $2,000 for gaseous-fueled vehicles, and $3,300 for electric vehicles.

Another fleet program cost is incurred in the operation of clean-fuel vehicles. Estimated operating costs, for all of the vehicle/fuel combinations, are based solely on fuel costs, since no additional maintenance is expected for CFFVs above their conventional counterparts. Compared to conventional gasoline equivalent cost of $1.31 in the year 2000, the projected gasoline equivalents for the same year are as follows: $1.36 for reformulated gasoline, $1.12 for alcohol fuels, $1.09 for CNG, $0.62 for LPG, and $1.12 for electricity. Thus, all fuels except for reformulated gasoline represent a cost savings when compared to the estimated price of conventional gasoline on the year 2000.

The incremental costs for new CFFV acquisitions and their operation were summed for each year future year between 1998 and 2010 to yield an estimated total annual cost of the fleet program for LDVs and LDTs. The net present value of the costs under Scenario I for the years 1998 through 2010 is almost $597 million in 1998 dollars. Under Scenario II, the net present value of the potential costs in years 1998 through 2010 is estimated at $574 million in 1998 dollars. Projected annual costs for each of the years from 1998 to 2010 are presented in the RIA. This analysis does not take into account infrastructure costs.

2. Heavy-Duty Vehicles

In the RIA, incremental acquisition costs were estimated for conventional gasoline and diesel HDVs expected to be capable of meeting CFFV standards through the use of technological changes rather than the use of clean fuels themselves. However, possible manufacturing process changes or slightly higher component costs may be incurred when adapting these technologies to HDEs. The analysis projects that these changes could increase the variable production cost of heavy-duty gasoline engines by $50.00 and heavy-duty diesel engines by about $100.00. Factoring in a 29 percent retail mark-up would bring the estimated increase in manufacturing costs to $64.50 and $129.00 per engine for gasoline and diesel engines respectively. In addition to this increased manufacturing/component cost per engine, consumers will also have to pay for the amortized cost of research and development and engine certification, as well as retail price mark-up. Thus, the total incremental acquisition cost is estimated at $110 more per gasoline engine and $260 more per diesel engine as compared with engines used in conventional heavy-duty vehicles.

Gasoline- and diesel-fuel HDVs meeting CFFV standards are not expected to have added fuel or maintenance costs over conventional HDVs. However, some fleets operating in areas where reformulated gasoline is not routinely supplied may have to obtain this fuel to meet heavy-duty CFFV standards. Thus, an incremental fuel cost of five cents per gallon is applied to approximately 10 percent of all fleet HDVs.

The incremental costs for new CFFV acquisitions and operations were summed for each year to yield an estimated total annual cost of the fleet program for HDVs. Three scenarios were developed based on differing assumptions about vehicle mix and about costs of alternative-fuel vehicles compared to conventional HDVs. The first scenario, Scenario A, assumes no nonconventional-fuel vehicles will be purchased for the fleet program, while the second, Scenario B, assumes 20 percent of fleet vehicles will be nonconventional-fuel vehicles. The third scenario, Scenario C, assumes 30 percent of fleet vehicles are nonconventional-fuel vehicles. Thus, for the first twelve years of the program 1998 net present value is estimated to be $33 million for Scenario A, $53 million for Scenario B, and $-2 million for Scenario C. This analysis does not take into account infrastructure costs.

*B. Program Benefits*

The draft RIA also presents an analysis of the expected emission benefits of the Clean Fuel Fleet Program. These benefits were estimated by comparing the total emissions from covered fleet vehicles to the emissions which the same number of conventional vehicles would produce in the absence of a fleet program. As in the economic analysis, the emission benefits of LDVs and LDTs were studied separately from HDVs, and the results of both are summarized below. The same scenarios used in the economic analysis, assuming different degrees of participation by non-petroleum fueled vehicles, were used in the benefits analysis. Along with vapor emission reductions, reductions in NMOG, NOx, and CO combustion emissions from LDVs and LDTs, and reductions in NMHC, NOx, and CO combustion emissions from HDVs, are discussed below.

1. Light-Duty Vehicles and Light-Duty Trucks

To estimate the environmental benefits of the fleet program, emission inventories were generated for two cases. First, the number of covered fleet LDVs and LDTs estimated to be operating in each year were considered to be conventional vehicles, and the inventories were calculated using the conventional vehicle standards. Second, emission inventories for the covered fleet vehicles were calculated using the LEV standards. The difference between the two inventories yields the amount of NMOG and NOx reductions achieved, or the "emission benefit." The 1998 net present values (using a discount rate of 10 percent) of the light-duty NMOG and NOx reductions realized for the years 1998 through 2010 are approximately 15,000 tons and 16,000 tons, respectively.

Since LEVs will not generally achieve CO emission reduction, potential CO inventories were determined using the number of light-duty ULEVs and ZEVs. The 1998 net present value of the annual CO reductions is projected to range between 45,600 tons and 68,400 tons.

In addition to combustion emission benefits, the fleet program will also realize benefits from vapor emission reductions resulting from use of CNG, LPG, and electric vehicles. Some of these benefits will be achieved be inherently low-emission vehicles (ILEVS); however, a calculation of the amount of vapor reduction attributable to ILEVs was not attempted because the purchase of these vehicles is voluntary and their numbers are very uncertain.

Vapor emission benefits of the fleet program were determined by multiplying the number of in-use CFFVs projected to be operating on CNG, LPG, and electricity, by the average annual vehicle miles traveled for each class, and by the projected vapor emission reduction (grams/mile/vehicle) expected for each vehicle class. The 1998 net present value of the light-duty vapor emission reduction realized from the 1998 through 2000 are approximately 4,600 tons under Scenario I and 7,000 tons under Scenario II.

Thus, summing the benefits together, the 1998 net present values of NMOG and CO emission reduction achieved by the light-duty portion of the fleet program for the years 1998 through 2010 are projected to range from 19,600 to 22,000 tons and 45,600 to 68,400 tons respectively. The NOx emission reduction is estimated to be approximately 15,900 tons.

2. Heavy-Duty Vehicles

Similar to the analysis conducted for light-duty fleet vehicles, the emission benefits of heavy-duty clean-fuel fleet vehicles have been estimated by comparing total emissions from a base case to the emissions from a scenario using clean-fuel vehicles. The clean-fuel vehicle scenario assumes that all covered fleet HDVs operate at the LEV emission level, and is used to generate emission inventories of NMHC and NOx. CO benefits expected to be realized at the ULEV level are also summarized below (heavy-duty ZEVs are not likely to be a viable option to fleet owners at the time the fleet program begins and thus no CO benefits are expected from vehicles other than heavy-duty ULEVs).

Yearly emission inventories of NMHC and NOx were generated by multiplying the number of in-use heavy-duty vehicles by the number of vehicle miles traveled and multiplying the result by the appropriate difference in emission factors. The 1998 net present value of the heavy-duty NMHC and NOx emission reduction realized from the 1998 through 2000 are approximately 4,000 tons and 12,700 tons, respectively.

In determining CO benefits, there is no reduction in the CO emission standard for heavy-duty vehicles meeting the minimum clean-fuel vehicle (LEV) requirements, but gasoline ULEVs will achieve a benefit. Those vehicles operating at the ULEV level, will include a 50 percent reduction in CO emissions from their conventional or LEV counterparts. Diesel heavy-duty vehicles are not expected to generate incremental CO benefits since they currently emit below the heavy-duty ULEV standard for CO. The net present value of the CO emission benefits are projected to range from 12,600 to 22,100 tons/year.

Vapor emission benefits were projected for gasoline-powered HDVs. For the years 1998 through 2010 the program yields 1998 net present value vapor emission benefits of 1,000 to 2,000 tons.

Thus, summing the benefits together, the 1998 net present values of NMHC and CO emission reduction achieved by the heavy-duty portion of the fleet program for the years 1998 through 2010 are projected to range from 4,000 to 6,000 tons and 0 to 22,100 tons respectively. The NOx emission reduction is estimated to be approximately 12,700 tons.

3. Additional Program Benefits

The increased use of clean alternative fuels due to the fleet program may well result in the displacement of some of the use of conventional fuels. EPA projects for the first twelve years of the program 3.2 to 6.4 billion gallons of petroleum-based fuel will be conserved. In addition to emission benefits and the conservation of petroleum resources, the fleet program may provide a number of non-quantifiable benefits, as well. The program will potentially furnish incentives for the development of clean-fuel vehicle technology, stimulate the vehicle conversion industry, support the wider distribution of alternative fuels and related infrastructure, and encourage the public to purchase and use clean-fuel vehicles.

*C. Cost Effectiveness*

For both light-duty and heavy-duty portions of the fleet program, the overall cost effectiveness was determined by dividing the total 1998 net present value costs of the first 12 years of the program by the associated discounted 12-year benefits. The overall cost effectiveness for LDVs is estimated to range between $5,000 and 7,400 per ton of all pollutants. The analysis suggests that the fleet program will provide a greater reduction in emissions per dollar spent if more light-duty vehicles operate on alternative fuels. The overall estimated heavy-duty cost effectiveness ranges from $1,700 per ton to a savings of $50 per ton.

## VII. Public Participation

### *A. Comments and the Public Docket*

As in past rulemaking actions, EPA strongly encourages full public participation in arriving at final decisions. In addition to those areas where specific comment has been requested, EPA solicits comments on all aspects of today's proposal from all interested parties. Whenever applicable, full supporting rationale, data, and detailed analyses should also be submitted to allow EPA to make maximum use of the comments. All comments should be directed to the EPA Air Docket Section, Docket No. A-92-30 (see "ADDRESSES"). Comments on this Notice will be accepted until DATE.

### *B. Public Hearing*

Any person desiring to present testimony at the public hearing (see "DATES") is asked to notify the contact person listed above intent at least seven days prior to the day of the hearing. The contact person should also be provided an estimate of the time required for the presentation of the testimony and notification of any need for audio/visual equipment. A sign-up sheet will be available at the registration table the morning of the hearing for scheduling the order of testimony.

EPA suggests that sufficient copies of the statement or material to be presented be brought to the hearing for distribution to the audience. In addition, it would be helpful for EPA to receive an advance copy of any statement or material to be presented at the hearing prior to the scheduled hearing date. Such advance copies should be submitted to the contact person listed above.

Mr. Richard D. Wilson, Director of the Office of Mobile Sources, is hereby designated presiding Officer of the hearing. The hearing will be conducted informally, and technical rules of evidence will not apply. Written transcripts of the hearing will be made. The official record of the hearing will be kept open for 30 days following the hearing to allow submission of rebuttal and supplementary testimony.

## VIII. Statutory Authority

The statutory authority for this proposal is provided by sections 246(f)(4), 247(a), 247(b), and 301(a) of the CAA.

## IX. Administrative Designation and Regulatory Analysis

Under Executive Order 12291, EPA must judge whether a regulation is major and therefore subject to the requirement that a Regulatory Impact Analysis be prepared. Major regulations have an annual effect on the economy of $100 million or more, have a significant adverse impact on competition, investment, employment or innovation, or result in a major price increase for the affected product.

This Notice, covering clean-fuel vehicle standards, conversions, and other implementing provisions, is considered "major" under this definition, since the Clean Fuel Fleet Program will cost more than $100 million. Therefore, I have determined that the proposal, according to the established criteria, does constitute a major regulation. An RIA has been prepared, and is available in the docket for this rulemaking.

This regulation was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291. Any written comments from OMB and any EPA response to OMB comments are in the public docket for this rulemaking.

Today's proposal to change the accounting method used to calculate credits for the ABT program is not major according to the established criteria. By providing greater flexibility in meeting the emission standards, this proposal will actually help to reduce the cost of heavy-duty engines rather than increase their cost. Therefore, the Administrator has determined that this proposal does not constitute a major regulation.

X. Compliance with Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 requires federal agencies to consider potentially adverse impacts of federal regulations upon small entities. In instances where significant impacts are possible on a substantial number of these entities, agencies are required to perform a regulatory flexibility analysis.

EPA has determined that this regulation will not have a significant impact on a substantial number of small entities. Fleets with less than ten vehicles are not covered by this rulemaking. For those fleets that are covered, EPA expects that the purchase requirements will usually be met by vehicles that cost little more than conventional vehicles. In addition, purchase requirements will not begin for several years (1998), and these purchase requirements will be phased-in over a three year period at rates that never exceed 70 percent of vehicles purchased.

Therefore, consistent with section 605 of the Regulatory Flexibility Act, 5 U.S.C. 601 et seq., I certify that this regulation does not have a significant impact on a substantial number of small entities.

The purchase requirements may be met by converting existing or new conventional vehicles to CFFVs. Converters of vehicles to CFFVs are to be considered manufacturers for purposes of Sections 206 and 207 and related enforcement provisions, as specified in section 247 of the CAA. Thus, converters are liable for the emission compliance of conversions they perform and warranting each vehicle's emissions for its useful life. Converters will also need to certify conversion configurations. However, all converters will be able to certify their conversion configurations according to the Small-Volume Manufacturers Certification Program, which exempts vehicles with proven technology from most durability testing requirements, eliminating some of the certification burden.

Since many converters are small entities, it is expected some converters will choose to share or shift that liability by entering into legal agreements with manufacturers of conversion hardware. Thus, conversion installers would likely act as agents for the larger conversion hardware manufacturers who could cover the cost of certification. The Agency expects that installers and conversion hardware manufacturers will enter into arrangements that would result in a joint entity becoming the "manufacturer" for purposes of the proposed rule. EPA also expects that these arrangements would generally place the actual cost of recall and repair on the responsible party. Therefore, as mentioned above, the conversion requirements will not have a significant economic impact on small business entities.

With respect to today's proposal to change the accounting method used to calculate credits for the ABT program, none of the affected HDE manufacturing entities could be classified as a small business. Thus, I certify that this change to the ABT rules will not have a significant adverse impact on a substantial number of small business entities.

**XI. Paperwork Reduction Act**

The information collection requirements in this proposed rule have been submitted for approval to the Office of

Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. An Information Collection Request document has been prepared by EPA (ICR No. ) and a copy may be obtained from Sandy Farmer, Information Policy Branch; EPA; 401 M St., S.W. (PM-223Y); Washington, D.C., 20460, or by calling (202) 260-2740.

Public reporting burden for this collection of information is estimated to be 2,609 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of ta needed, and completing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to: Chief, Information Policy Branch; EPA; 401 M St., S.W. (PM-223Y); Washington, D.C., 20460; and to the Office of Management and Budget, Washington, D.C., 20503, marked "Attention: Desk Officer for EPA". The Final Rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

**XII. List of Subjects in 40 CFR Part 80**

Administrative practice and procedure, Air pollution control, Gasoline, Labeling, Motor vehicle pollution, Reporting and recordkeeping requirements.

Dated:

William K. Reilly

Administrator

6. A new § 86.098-15 is proposed to be added to Subpart A to read as follows:

**§ 86.098-15 NOx and particulate averaging, trading and banking for heavy-duty engines.**

(a)(1) Heavy-duty engines eligible for NOx and particulate averaging, trading and banking programs are described in the applicable emission standards sections in this subpart. **All heavy-duty engine families which include any engines labeled for use in clean-fueled vehicles as specified in Part 88 are not eligible for these programs.** Participation in these programs is voluntary.

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7. A new § 86.098-24 is proposed to be added to Subpart A to read as follows:

**§ 86.098-24 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 respects:

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

(ii) -- (iii) [Reserved]

(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).

(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) Light-duty trucks and 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.

**(iii) Engines identical in all of the respects listed in paragraphs (a)(2) and (a)(3)(i) of this section may be further divided into different engine families if some of the engines are expected to be sold for inclusion in the clean fueled vehicle program of 40 CFR Part 88, and if the manufacturer chooses to certify the engines to both the clean fueled vehicle standards of 40 CFR Part 88 and the general standards of 40 CFR Part 86. One engine family shall include engines that are intended for general use. For this engine family, only the provisions of 40 CFR Part 86 shall apply. The second engine family shall include all engines that are intended to be used in clean fueled vehicles. For this engine family, the provisions of both 40 CFR Part 86 and 40 CFR Part 88 shall apply. The manufacturer may submit one set of data to certify both engine families.**

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in paragraphs (a)(2) and (a)(3) of this section, the Administrator will establish families for those engines based upon those features most related to their emission characteristics. Engines that are eligible to be included in the same engine family based on the criteria in paragraphs (a)(2) and (a)(3)(i) of this section may be further divided into different engine families if the manufacturer determines that they may be expected to have different emission characteristics, **or if the manufacturer chooses to certify the engines to both the clean fueled vehicle standards of 40 CFR Part 88 and the general standards of 40 CFR Part 86 as described in paragraph (a)(3)(iii) of this section.** ~~This~~ **The** determination **of the emission characteristics** will be based upon a consideration of the following features of each engine:

(i) The dimension from the center line of the crankshaft to the center line of the camshaft.

(ii) The dimension from the center line of the crankshaft to the top of the cylinder block head face.

(iii) The size of the intake and exhaust valves (or ports).

* * * * *

8. A new § 86.1309-98 is proposed to be added to Subpart N to read as follows:

**§ 86.1309-98 Exhaust gas sampling system; Otto-cycle engines.**

(a)(1) General. The exhaust gas sampling system described in this paragraph is designed to measure the true mass of gaseous emissions in the exhaust of either gasoline-fueled, natural gas-fueled, liquified petroleum gas-fueled, methanol-fueled Otto-cycle engines. 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 volume of sample must be collected for analysis. Mass emissions are determined from the sample concentration and total flow over the test period.

(2) Engine exhaust to CVS duct. For methanol-fueled engines, cooling of the exhaust gases in the duct connecting the engine exhaust to the dilution tunnel shall be minimized. This may be accomplished by:

(i) Using a duct of unrestricted length maintained at 235±15 °F (113±8 °C). (Heating and possibly cooling capabilities as required,) or

(ii) Using a short up to 12 feet long, duct constructed of smooth wall pipe with a minimum of flexible sections, maintained at 235±15 °F (113±8 °C) prior to the test and during periods when the engine is not in operation (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded), or

(iii) Using a smooth wall duct less than five feet long with no required heating, or

(iv) Omitting the duct and performing the exhaust gas dilution function at the engine exhaust manifold or immediately after exhaust aftertreatment systems.

(3) Positive displacement pump. The Positive Displacement Pump Constant Volume Sampler (PDP - CVS) (Figure N**98** - 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 samples for the bag sample and ~~for methanol fueled vehicles~~, **where applicable**, the methanol sample (Figure N**98** - 2) and the formaldehyde sample (Figure N**98** - 3), are achieved by sampling at a constant flow rate. For methanol-fueled engines, the sample lines for the methanol and formaldehyde samples are heated

to 235±15 °F (113±8 °C). Note: For 1990 through 1994 model year methanol-fueled engines, methanol and formaldehyde sampling may be omitted provided the bag sample (hydrocarbons and methanol) is analyzed using a HFID calibrated with methanol.

(4) Critical flow venturi. The operation of the Critical Flow Venturi Constant Volume Sampler (CFV - CVS) (Figure N98 - 4) is based upon the principles of fluid dynamics associated with critical flow. The CFV system is commonly called a constant volume system (CVS) even though the flow varies. It would be more proper to call the critical flow venturi (CFV) system a constant proportion sampling system since proportional sampling throughout temperature excursions is maintained by use of small CFVs in the sample lines. ~~For methanol fueled engines, one line supplies sample for the bag sample, another line supplies sample for the methanol sample, and a third line supplies sample for the formaldehyde sample.~~ **For tests where separate methanol and/or formaldehyde samples are collected in addition to the bag sample, separate sample lines are required (one each for the methanol sample, the formaldehyde sample, and the bag sample). For methanol-fueled vehicles**, the lines for the methanol and formaldehyde samples are heated to 235±15 °F (113±8 °C) with care being taken to ensure that the CFVs of the sample probes are not heated.

Note: For 1990 through 1994 model year methanol-fueled engines, methanol and formaldehyde sampling may be omitted provided the bag sample (hydrocarbons and methanol) is analyzed using a HFID calibrated with methanol. The variable mixture flow rate is maintained at choked flow, which is inversely proportional to the square root of the gas temperature, and is computed continuously. Since the pressure and temperature are the same at all venturi inlets, the sample volume is proportional to the total volume.

(5) Other systems. Other sampling and/or analytical systems including the systems described in §86.1310 for petroleum-fueled diesel engines may be used if shown to yield equivalent results, and if approved in advance by the Administrator.

(6) Since various configurations can produce equivalent results, exact conformance with these drawings 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. Other components such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(b) Component description, PDP - CVS. The PDP CVS, Figure

N98 - 1, consists of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling systems (see Figure N98 - 2 for methanol sampling system and Figure N98 - 3 for formaldehyde sampling system) including sampling lines which are heated to 235±15 °F (113±8 °C) in the case of the methanol-fueled engine (heating of the sample lines may be omitted, provided the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of sample due to cooling and resulting condensation in the sample lines), and associated valves, pressure and temperature sensors. The PDP - CVS shall conform to the following requirements:

(1) Exhaust system backpressure must not be artificially lowered by the CVS or dilution air inlet system. Measurements to verify this should be made in the raw exhaust immediately upstream of the inlet to the CVS. (For diesel engines, this measurement should be made immediately upstream of the backpressure set device.) This verification requires the continuous measurement and comparison of raw exhaust static pressure observed during a transient cycle, both with and without the operating CVS. Static pressure measured with the operating CVS system shall remain within ±5 inches of water (1.2 kPa) of the static pressure measured without connection to the CVS, at identical moments in the test cycle. (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.) This requirement is essentially a design specification for the CVS/dilution air inlet system, and should be performed as often as good engineering practice dictates (e.g., after installation of an uncharacterized CVS, addition of an unknown inlet restriction on the dilution air, etc.).

(2) The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump and after the heat exchanger, shall be maintained within ±10 °F (±5.6 °C) of the average operating temperature observed during the test. (The average operating temperature may be estimated from the average operating temperature from similar tests.) The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4 °F (1.9 °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. This is especially critical in the case of methanol-fueled engines and may also be of concern with natural gas-fueled and liquified petroleum gas-fueled engines; see ''Calculation of Emissions and Fuel Economy When Using

Alternative Fuels,'' EPA 460/3 - 83 - 009.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample, covering the total test period, may be collected for determination of formaldehyde background ~~(methanol fueled engines)~~, **where applicable**.

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient capacity so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the PDP.

(c) Component description, CFV. The CFV sample system, Figure N**98** - 4, consists of a dilution air filter (optional) and mixing assembly, cyclone particulate separator (optional), unheated sampling venturies for the bag, methanol and formaldehyde samples ~~from methanol fueled engines~~ **as applicable**, heated sample lines (235±15 °F (113±8 °C)) for the methanol and formaldehyde samples from methanol-fueled vehicles (heating of the sample lines may be omitted provided, the methanol and formaldehyde sample collection systems are close coupled to the probes thereby preventing loss of samples due to cooling and resulting condensation in the sample lines), critical flow venturi, and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

(1) Static pressure variations in the raw exhaust shall conform to the specifications detailed in paragraph (b)(1) of this section.

(2) The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4 °F (±1.9 °C). The temperature measuring system used in a CVS without a heat exchanger shall have a response time of 1.50 seconds to 62.5 percent of a temperature change (as measured in hot silicone oil). There is no response time requirement for a CVS equipped with a heat exchanger.

(3) The pressure measuring system (sensors and readout) 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 prevent water condensation in the system. This is especially important with methanol-fueled engines and may also be of concern with natural gas-fueled and liquified petroleum gas-fueled engines: see ''Calculation of Emissions and Fuel Economy When Using Alternative Fuels,'' EPA 460/3 - 83 - 009.

(5) Sample collection bags for dilution air and exhaust samples shall be of sufficient size so as not to impede sample flow. A single dilution air sample covering the total test period may be collected for determination of formaldehyde background ~~(methanol fueled engines)~~, **where applicable**.

(6) The methanol sample collection system and the formaldehyde sample collection system shall each be of sufficient capacity so as to collect samples of adequate size for analysis without significant impact on the volume of dilute exhaust passing through the CFV.

9. A new § 86.1310-98 is proposed to be added to Subpart N to read as follows:

**§ 86.1310-98 Exhaust gas sampling and analytical system; petroleum-fueled and methanol-fueled diesel engines.**

(a) General. The exhaust gas sampling system described in this paragraph is designed to measure the true mass of both gaseous and particulate emissions in the exhaust of petroleum-fueled and methanol-fueled heavy-duty diesel engines. This system utilizes the CVS concept (described in §86.1309) of measuring **the combined** mass emissions of HC, CH3OH and HCHO from methanol-fueled engines and **the mass emissions of CH4**, CO, CO2, and particulate from both fuel types. A continuously integrated system is required for THC (petroleum-fueled engines) and NOx (petroleum-fueled and methanol-fueled engines) measurement, and is allowed for all CO and CO2 measurements plus **the combined emissions of** CH3OH, HCHO, and HC from methanol-fueled engines. **Where applicable, separate sampling systems are required for methanol and for formaldehyde.** The mass of gaseous emissions is determined from the sample concentration and total flow over the test period. The mass of particulate emissions is determined from a proportional mass sample collected on a filter and from the sample flow and total flow over the test period. As an option, the measurement of total fuel mass consumed over a cycle may be substituted for the exhaust measurement of CO2. General requirements are as follows:

(1) This sampling system requires the use of a PDP - CVS and a heat exchanger, or a CFV - CVS with either a heat exchanger or electronic flow compensation. Figure N98 - 5 is a schematic drawing of the PDP system. Figure N98 - 6 is a schematic drawing of the CFV system.

(2) The THC analytical system for petroleum-fueled diesel engines requires a heated flame ionization detector (HFID) and heated sample system (375±20 °F (191±11 °C)).

(i) The HFID sample must be taken directly from the diluted exhaust stream through a heated probe and integrated continuously over the test cycle. Unless compensation for varying flow is made, the HFID must be used with a constant flow system to ensure a representative sample.

(ii) The heated probe shall be located in the primary dilution tunnel and far enough downstream of the mixing chamber to ensure a uniform sample distribution across the CVS duct at the point of sampling.

(3) Methanol-fueled engines require the use of a heated

flame ionization detector (HFID) (235±15 °F (113±8 °C)) for hydrocarbon analysis. With a heated FID, the hydrocarbon analysis can be made on the bag sample and the methanol and formaldehyde analyses are performed on the samples collected for these purposes (Figures **N98** - 2 and **N98** - 3).

Note: For 1990 through 1994 model year methanol-fueled engines, methanol and formaldehyde sampling may be omitted provided the hydrocarbon plus methanol analyses are performed using a FID calibrated on methanol.

(4) For methanol-fueled engines, cooling of the exhaust gases in the duct connecting the engine exhaust to the dilution tunnel shall be minimized. This may be accomplished by:

(i) Using a duct of unrestricted length maintained at 235±15 °F (113±8 °C) with heating and possibly cooling capabilities as required, or;

(ii) Using a short duct up to 12 feet long, constructed of smooth wall pipe with a minimum of flexible sections, maintained at 235±15 °F (113±8 °C) prior to the test and during periods when the engine is not in operation (insulation may remain in place and/or heating may occur during testing provided maximum temperature is not exceeded), or;

(iii) Using a smooth wall duct less than five feet long with no required heating, or;

(iv) Omitting the duct and performing the exhaust gas dilution function at the engine exhaust manifold or immediately after exhaust aftertreatment systems.

(5) Heated sample lines are required for the methanol and formaldehyde samples for methanol-fueled engines (care must be taken to prevent heating of the sample probes unless compensation for varying flow rate is made). The sample collection lines shall be heated to 235±15 °F (113±8 °C). **Heating (to a temperature below 250°F) may also be necessary for the formaldehyde sample line to prevent condensation when testing petroleum-fueled engines for which formaldehyde emissions are measured.**

(6) The CO and CO2 analytical system requires:

(i) Bag sampling (§86.1309) and analytical (§86.1311) capabilities, as shown in Figure **N98** - 5 (or Figure **N98** - 6), or

(ii) Continuously integrated measurement of diluted CO and CO2 meeting the minimum requirements and technical specifications contained in paragraph (b)(5) of this section. Unless compensation for varying flow is made, a constant flow system must be used to ensure a representative sample.

(7) The NOx analytical system requires a continuously integrated measurement of diluted NOx meeting the minimum requirements and technical specifications contained in paragraph (b)(5) of this section. Unless compensation for varying flow is made, a constant flow system must be used to ensure a representative sample.

(8) The mass of particulate in the exhaust is determined via filtration. The particulate sampling system requires dilution of the exhaust in either one or two steps to a temperature never greater than 125 °F (51.7 °C) at the primary sample filter. A backup filter provides a confirmation of sufficient filtering efficiency.

(9) Since various configurations can produce equivalent results, exact conformance with these drawings 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. Other components, such as snubbers, which are not needed to maintain accuracy on some systems, may be excluded if their exclusion is based upon good engineering judgment.

(10) **The CH4 analytical system requires:**

**(i) Bag sampling capabilities (§86.1309), as shown in Figure N98-5 or N98-6, and**

**(ii) A dual-column gas chromatograph system as described in the Society of Automotive Engineers Recommended Practice SAE J1151.**

**(11)** Other sampling and/or analytical systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(b) Component description. The components necessary for exhaust sampling shall meet the following requirements:

(1) Exhaust dilution system. The PDP - CVS shall conform to all of the requirements listed for the exhaust gas PDP - CVS in §86.1309(b). The CFV - CVS shall conform to all of the requirements listed for the exhaust gas CFV - CVS in §86.1309(c). In addition, the CVS must conform to the following requirements:

(i) The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at or below the temperatures required for the measurement of particulate and hydrocarbon emissions noted below and at, or above, the temperatures where condensation of water in the exhaust gases could occur. This may be achieved by either of the following two methods:

(A) Single-dilution method. The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream at a temperature of 125 °F (51.7 °C) or less, at the sampling zone in the primary dilution tunnel and as required to prevent condensation at any point in the dilution tunnel. Direct sampling of the particulate material may then take place (Figure **N98** – 5).

(B) Double-dilution method. The flow capacity of the CVS must be sufficient to maintain the diluted exhaust stream in the primary dilution tunnel at a temperature of 375 °F (191 °C) (250 °F (121 °C) for methanol fueled engines) or less at the sampling zone and as required to prevent condensation at any point in the dilution tunnel. Gaseous emission samples may be taken directly from this sampling point. An exhaust sample must then be taken at this point to be diluted a second time for use in determining particulate emissions. The secondary dilution system must provide sufficient secondary dilution air to maintain the double-diluted exhaust stream at a temperature of 125 °F (51.7 °C) or less immediately before the primary particulate filter in the secondary dilution tunnel.

(ii) For the CFV – CVS, either a heat exchanger or electronic flow compensation (which also includes the particulate sample flows) is required (see Figure N98 – 6).

(iii) For the CFV – CVS when a heat exchanger is used, the gas mixture temperature, measured at a point immediately ahead of the critical flow venturi, shall be within ±20 °F (±11 °C) of the average operating temperature observed during the test with the simultaneous requirement that condensation does not occur. The temperature measuring system (sensors and readout) shall have an accuracy and precision of ±3.4 °F (1.9 °C). For systems utilizing a flow compensator to maintain proportional flow, the requirement for maintaining constant temperature is not necessary.

(iv) The primary dilution air and secondary dilution air (if applicable):

(A) Shall have a temperature of 77±9 °F (25±5 °C). For the first 10 seconds this specification is 77±20 °F (25±11 °C).

(B) May be filtered at the dilution air inlet.

(C) May be sampled to determine background particulate levels, which can then be subtracted from the values measured in the detailed exhaust stream.

(2) [Reserved]

(3) Continuous HC measurement system. (i) The continuous THC sample system (as shown in Figure N98 - 7 or N98 - 8) uses an ''overflow'' zero and span system. In this type of system, excess zero or span gas spills out of the probe when zero and span checks of the analyzer are made. The ''overflow'' system may also be used to calibrate the THC analyzer per §86.1321(b), although this is not required.

(ii) No other analyzers may draw a sample from the continuous HC sample probe, line or system, unless a common sample pump is used for all analyzers and the sample line system design reflects good engineering practice.

(iii) The overflow gas flow rates into the sample line shall be at least 105 percent of the sample system flow rate.

(iv) The overflow gases shall enter the heated sample line as close as practicable to the outside surface of the CVS duct or dilution tunnel.

(v) The continuous hydrocarbon probe shall be:

(A) Installed in the primary dilution tunnel at a point where the dilution air and exhaust are well mixed (i.e., approximately 10 tunnel diameters downstream of the point where the exhaust enters the dilution tunnel).

(B) Sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influence of any wakes or eddies.

(C) Heated over the entire length to maintain a 375±20 °F (191±11 °C) (235±15 °F) (113±8 °C) if continuous HC sampling is used on methanol-fueled engines) wall temperature. (Insulation and other techniques may also be used to maintain the temperature.)

(D) 0.19 in. (0.48 cm) minimum inside diameter.

(E) Free from cold spots (i.e., free from spots where the probe wall temperature is less than 355 °F (180 °C)).

(vi) The dilute exhaust gas flowing in the continuous hydrocarbon sample system shall be:

(A) At 375±10 °F (191±6 °C) (235±15 °F (113±8 °C) if continuous THC is used for methanol-fueled engines) immediately before the heated filter. This gas temperature will be determined by a temperature sensor located immediately upstream of the filter. The sensor and its readout shall have an accuracy and precision of ±3.4 °F (±1.9 °C).

(B) At 375±10 °F (191±6 °C) (235±15 °F (113±8 °C) if continuous THC is used for methanol-fueled engines) immediately before the HFID. This gas temperature will be determined by a temperature sensor located at the exit of the heated sample line. The sensor and its readout shall have an accuracy and precision of ±3.4 °F (1.9 °C).

(vii) The response time of the continuous measurement system shall be no greater than:

(A) 1.5 seconds from an instantaneous step change at the port entrance to the analyzer to within 90 percent of the step change.

(B) 20 seconds from an instantaneous step change at the entrance to the sample probe or overflow span gas port to within 90 percent of the step change. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets if necessary.

(C) For the purpose of verification of response times, the step change shall be at least 60 percent of full-scale chart deflection.

(4) Primary-dilution tunnel. (i) The primary dilution tunnel shall be:

(A) Small enough in diameter to cause turbulent flow (Reynolds Number greater than 4000) and of sufficient length to cause complete mixing of the exhaust and dilution air;

(B) At least 18 inches (46 cm) in diameter with a single-dilution system or at least 8 inches (20 cm) in diameter with a double-dilution system;

(C) Constructed of electrically conductive material which does not react with the exhaust components; and

(D) Electrically grounded.

(ii) The temperature of the diluted exhaust stream inside of the primary dilution tunnel shall be sufficient to prevent water condensation.

(iii) The engine exhaust shall be directed downstream at the point where it is introduced into the primary dilution tunnel.

(5) Continuously integrated NOx, CO, and CO2 measurement systems.

(i) The sample probe shall:

(A) Be in the same plane as the continuous THC probe, but shall be sufficiently distant (radially) from other probes and the tunnel wall so as to be free from the influences of any wakes or eddies.

(B) Heated and insulated over the entire length, to prevent water condensation, to a minimum temperature of 131 °F (55 °C). Sample gas temperature immediately before the first filter in the system shall be at least 131 °F (55 °C).

(ii) The continuous NOx, CO, or CO2 sampling and analysis system shall conform to the specifications of 40 CFR Part 86, Subpart D, with the following exceptions and revisions:

(A) The system components required to be heated by Subpart D need only be heated to prevent water condensation, the minimum component temperature shall be 131 °F (55 °C).

(B) The system response defined in §86.329 - 79 shall be no greater than 20 seconds. Analysis system response time shall be coordinated with CVS flow fluctuations and sampling time/test cycle offsets, if necessary.

(C) Alternative NOx measurement techniques outlined in §86.346 - 79 are not permitted for NOx measurement in this subpart.

(D) All analytical gases shall conform to the specifications of §86.1314.

(E) Any range on a linear analyzer below 155 ppm shall have and use a calibration curve conforming to §86.330 - 79.

(F) The measurement accuracy requirements specified in §86.338 - 79 are superseded by those specified in §86.1338.

(iii) The chart deflections or voltage output of analyzers with non-linear calibration curves shall be converted to concentration values by the calibration curve(s) specified in Subpart D (§86.330 - 79) before flow correction (if used) and subsequent integration takes place.

(6) Particulate sampling system. The particulate collection system must be configured in either of two ways. The single-dilution method collects a proportional sample from the primary tunnel, and then passes this sample through the collection filter. The double-dilution method collects a proportional sample from the primary tunnel, and then transfers this sample to a secondary dilution tunnel where the sample is further diluted; the double-diluted sample is then passed through the collection filter. Proportionality (i.e., mass flow ratio) between the primary tunnel flow rate and the sample flow rate must be maintained within ±5 percent for systems with or without flow compensation. Without flow compensation, proportional sampling is achieved by introducing the secondary dilution air at a constant mass flow rate, and removing the double-diluted sample at a constant mass flow rate. The requirements for these two systems are:

(i) Single dilution method. (A) The particulate sample probe shall be:

(1) Installed facing upstream at a point where the dilution air and exhaust air are well mixed (i.e., on the primary tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the primary dilution tunnel).

(2) Sufficiently distant (radially) from other sampling probes so as to be free from the influence of any wakes or eddies produced by the other probes.

(3) 0.5 in. (1.3 cm) minimum inside diameter.

(4) The distance from the sampling tip to the filter holder shall be at least 5 probe diameters for filters located inside the primary dilution tunnel, and not more than 40 inches (102 cm) for filters located outside the primary dilution tunnel.

(5) Designed to minimize the deposition of particulate in the probe (i.e., bends should be as gradual as possible, protrusions (due to sensors, etc.) should be smooth and not sudden, etc.).

(B) The particulate sample pump(s) shall be located sufficiently distant from the dilution tunnel so that the inlet gas temperature is maintained at a constant temperature (±5 °F (±2.8 °C)) if flow compensation is not used.

(C) The gas meters or flow instrumentation shall be located sufficiently distant from the tunnel so that the inlet gas temperature remains constant (±5 °F (±2.8 °C)) if flow compensation is not used.

(D) Other sample flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(ii) Double-dilution method. (A) The particulate sample transfer tube shall be configured and installed so that:

(1) The inlet faces upstream in the primary dilution tunnel at a point where the primary dilution air and exhaust are well mixed (i.e., on the primary tunnel centerline, approximately 10 tunnel diameters downstream of the point where the exhaust enters the primary dilution tunnel).

(2) The particulate sample exits on the centerline of the secondary tunnel and points downstream.

(B) The particulate sample transfer tube shall be:

(1) Sufficiently distant (radially) from other sampling probes (in the primary dilution tunnel) so as to be free from the influence of any wakes or eddies produced by the other probes.

(2) 0.5 in (1.3 cm) minimum inside diameter.

(3) No longer than 36 in (91 cm) from inlet plane to exit plane.

(4) Designed to minimize the deposition of particulate during transfer (i.e., bends should be as gradual as possible, protrusions (due to sensors, etc.) should be smooth and not sudden, etc.).

(5) Constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded.

(C) The secondary dilution air shall be at a temperature of 77±9 °F (25±5 °C). For the first 10 seconds this specification is 77±20 °F (25±11 °C).

(D) The secondary-dilution tunnel shall be:

(1) 3.0 inches (7.6 cm) minimum inside diameter.

(2) Of sufficient length so as to provide a residence

time of at least 0.25 seconds for the double-diluted sample.

(3) Constructed of electrically conductive material which does not react with the exhaust components, and electrically grounded.

(E) Additional dilution air must be provided so as to maintain a sample temperature of 125 °F (51.7 °C) or less immediately before the primary sample filter.

(F) The primary filter holder shall be located within 12.0 in (30.5 cm) of the exit of the secondary dilution tunnel.

(G) Other sample flow handling and/or measurement systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(7) Particulate sampling filters. (i) Fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters are required.

(ii) Particulate filters must have a minimum diameter of 70 mm (60 mm stain diameter). Larger diameter filters are acceptable.

(iii) The dilute exhaust will be simultaneously sampled by a pair of filters (one primary and one back-up filter) during the cold-start test and by a second pair of filters during the hot-start test. The back-up filter holder shall be located no more than 4 inches (10 cm) downstream of the primary filter holder. The primary and back-up filters shall not be in contact with each other.

(iv) The recommended minimum loading on a primary 70 mm filter is 5.3 milligrams. Equivalent loadings (i.e., mass/stain area) are recommended for larger filters. For equivalency calculations assume the 70 mm filter has a 60 mm stain diameter.

(8) Methanol sampling system. The methanol sampling system, shown in Figure N98 - 2, consists of impingers (or sample collection capsules) containing known volumes of deionized water and sampling pump to draw the proportional sample through the impingers.

(9) Formaldehyde sampling system. The formaldehyde sampling system, Figure N98 - 3, consists of sample collection impingers and sampling pump to draw the proportional sample through the impingers.

10. A new § 86.1311-98 is proposed to be added to Subpart N to read as follows:

***§86.1311-98 Exhaust gas analytical system; CVS bag sample.***

(a) Schematic drawings. Figure N98 - 9 is a schematic drawing of the exhaust gas analytical system used for analyzing CVS bag samples from either Otto-cycle or diesel engines. Since various configurations can produce accurate results, exact conformance with the 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. Other components such as snubbers, which are not needed to maintain accuracy in some systems, may be excluded if their exclusion is based upon good engineering judgment.

(b) Major component description. The analytical system, Figure N98 - 9, consists of a flame ionization detector (FID) (heated for methanol-fueled (235±15 °F (113±8 °C)) and for petroleum-fueled diesel (375 ±10 °F (191 ±6 °C) engines) for the measurement of **total** hydrocarbons, nondispersive infrared analyzers (NDIR) for the measurement of carbon monoxide and carbon dioxide, and a chemiluminescence analyzer (CL) for the measurement of oxides of nitrogen. The analytical system for methanol consists of a gas chromatograph (GC), equipped with a flame ionization detector. The analysis for formaldehyde is performed using high pressure liquid chromatography (HPLC) of 2,4-dinitrophenylhydrazine (DNPH) derivatives using ultraviolet (UV) detection. **The analytical system for methane consists of a GC, equipped with two columns, and with a flame ionization detector, as described in the Society of Automotive Engineers Recommended Practice SAE J1151.** 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.

(2) The carbon monoxide (NDIR) analyzer may require a sample conditioning column containing $CaSO_4$, or desiccating silica gel to remove water vapor, and containing ascarite to remove carbon dioxide from the CO analysis stream.

(i) If CO instruments are used which are essentially free of $CO_2$ and water vapor interference, the use of the conditioning column may be deleted. (See §§86.1322 and 86.1342.)

(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.)

(c) Alternate analytical systems. Analysis systems meeting the specifications of 40 CFR Part 86 Subpart D may be used for testing required under this subpart, with the exception of §§86.346 and 86.347, provided that the Subpart D systems meet the specifications of this subpart. Heated analyzers may be used in their heated configuration.

(d) 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.

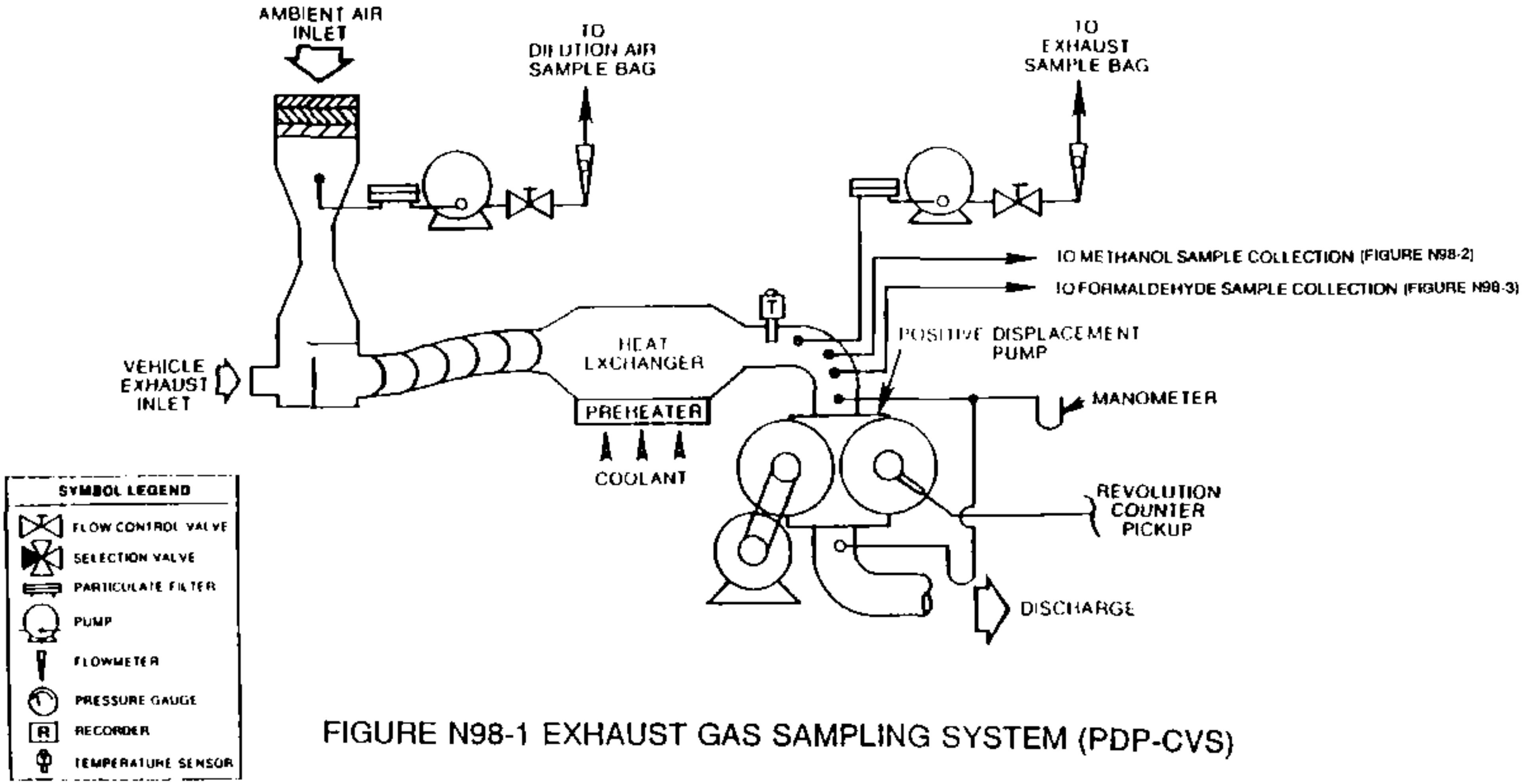


FIGURE N98-1 EXHAUST GAS SAMPLING SYSTEM (PDP-CVS)

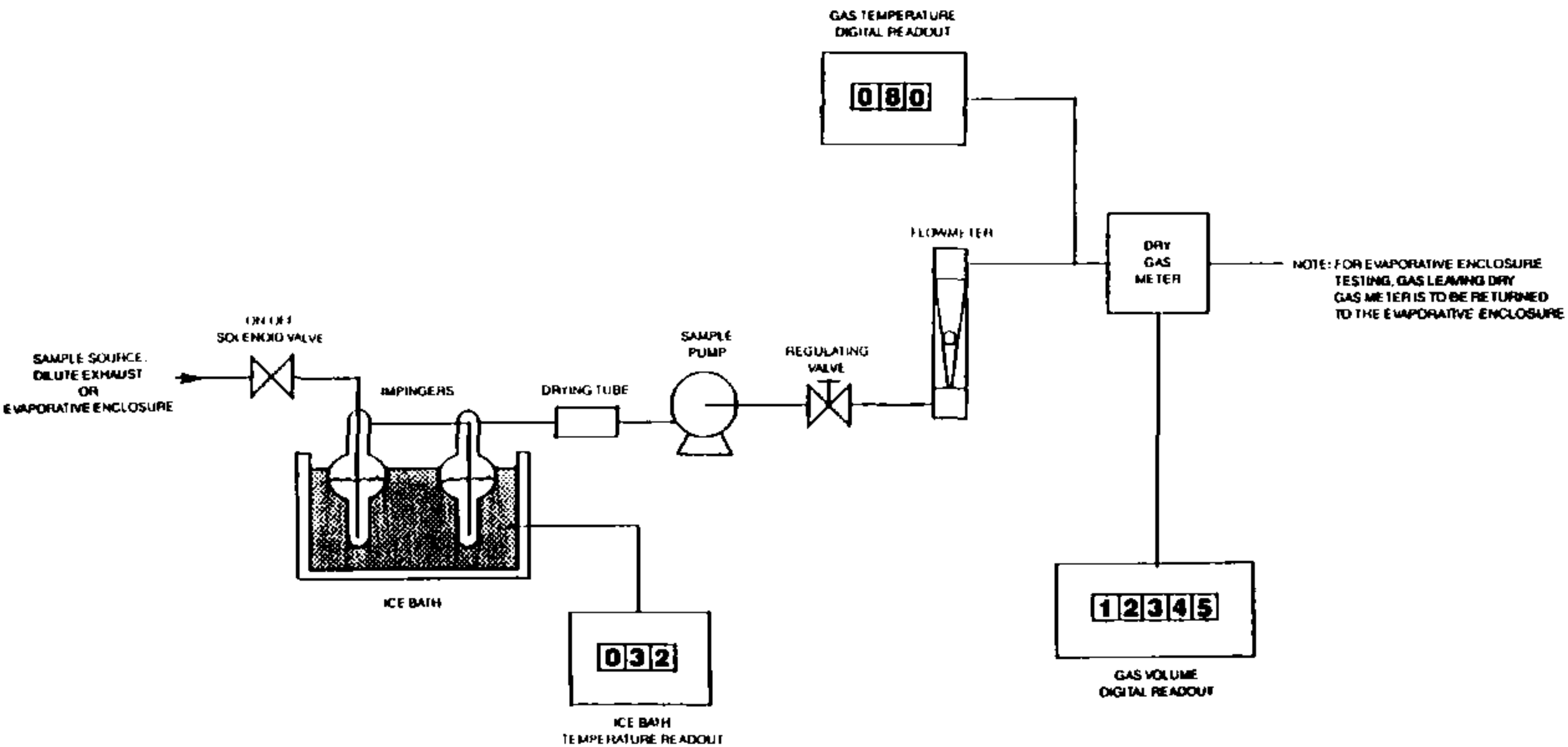


FIGURE N98-2 METHANOL SAMPLE COLLECTION FLOW SCHEMATIC

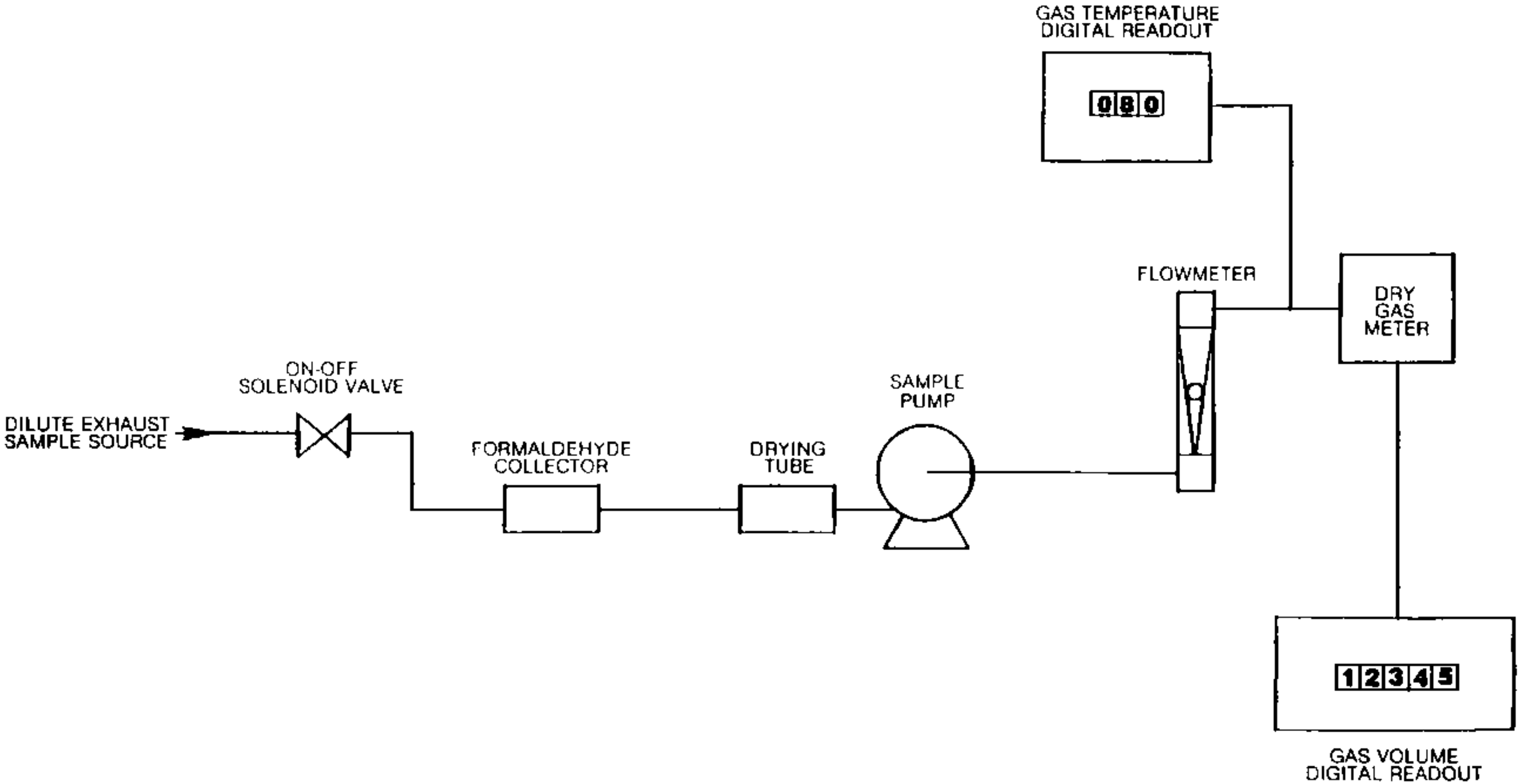


FIGURE N98-3 FORMALDEHYDE SAMPLE COLLECTION FLOW SCHEMATIC

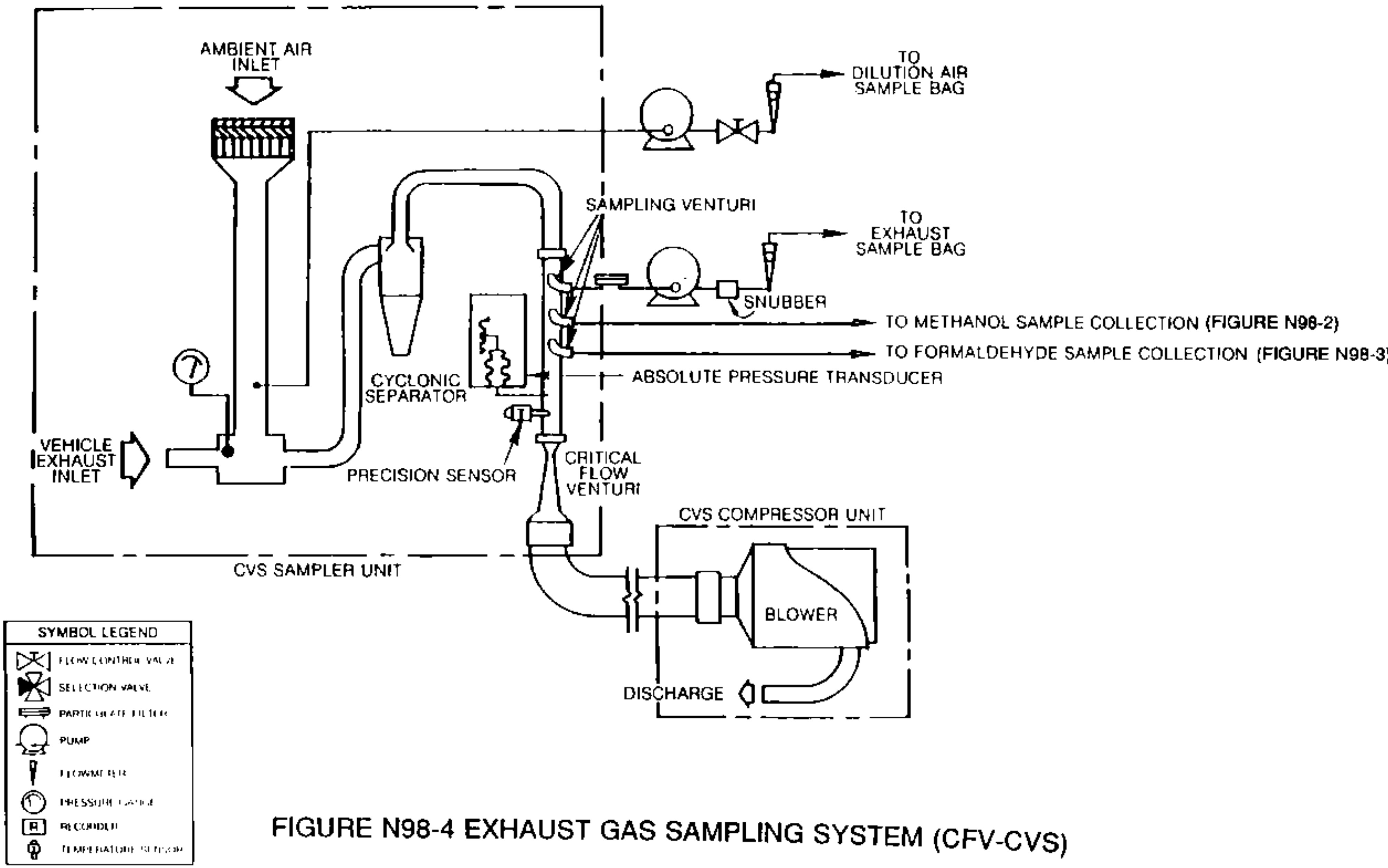


FIGURE N98-4 EXHAUST GAS SAMPLING SYSTEM (CFV-CVS)

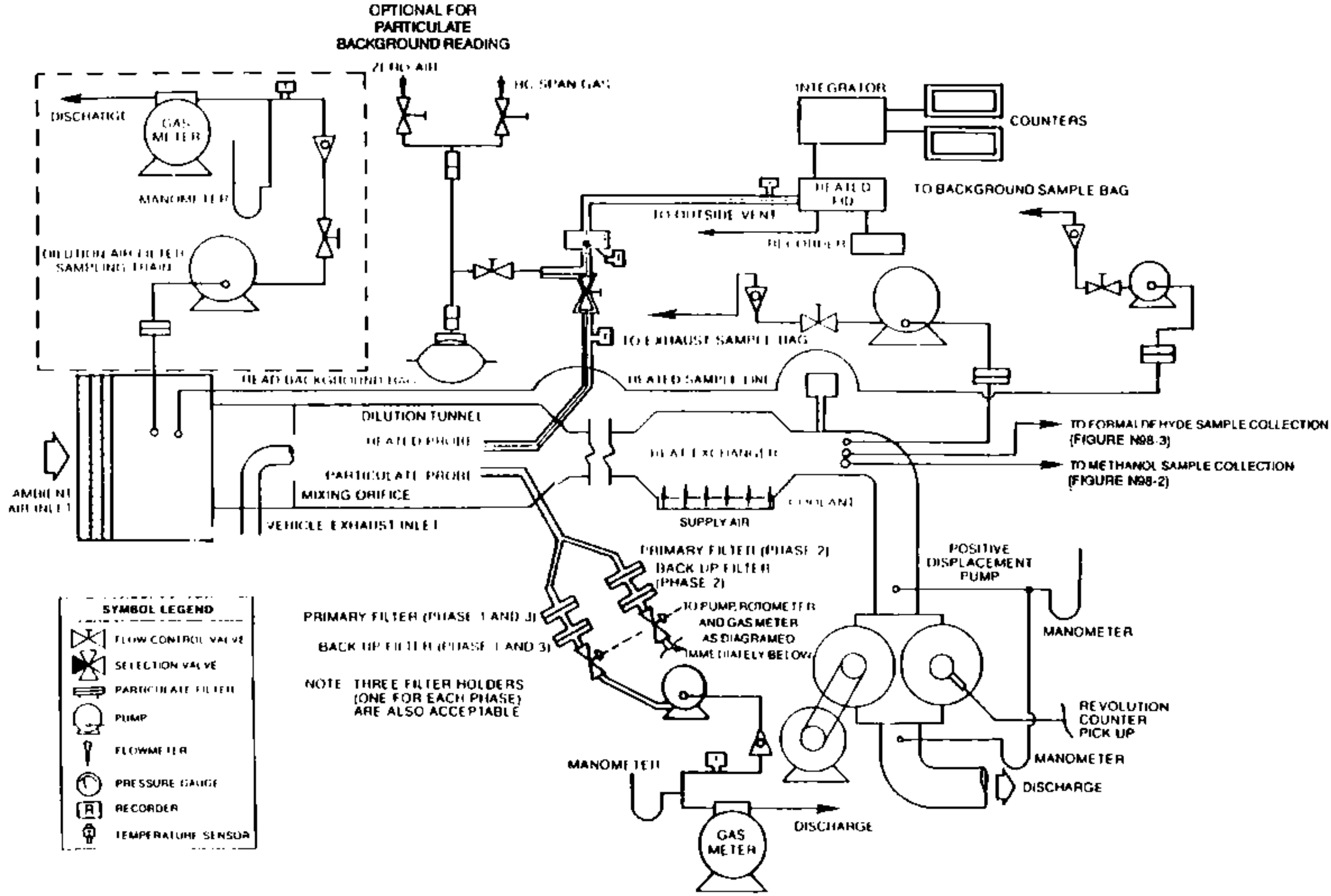


FIGURE N98-5 GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (PDP-CVS)

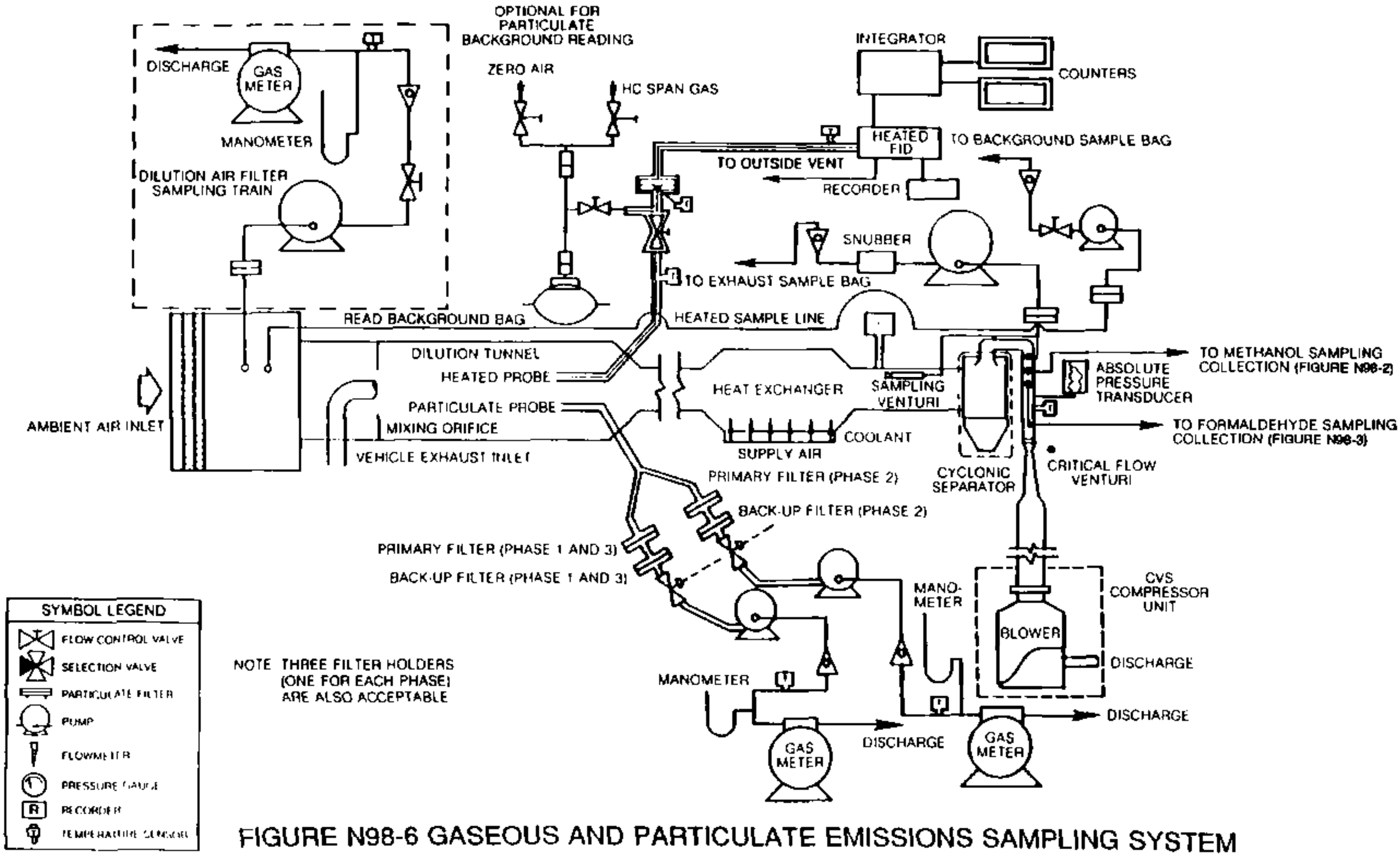


FIGURE N98-6 GASEOUS AND PARTICULATE EMISSIONS SAMPLING SYSTEM (CFV-CVS)

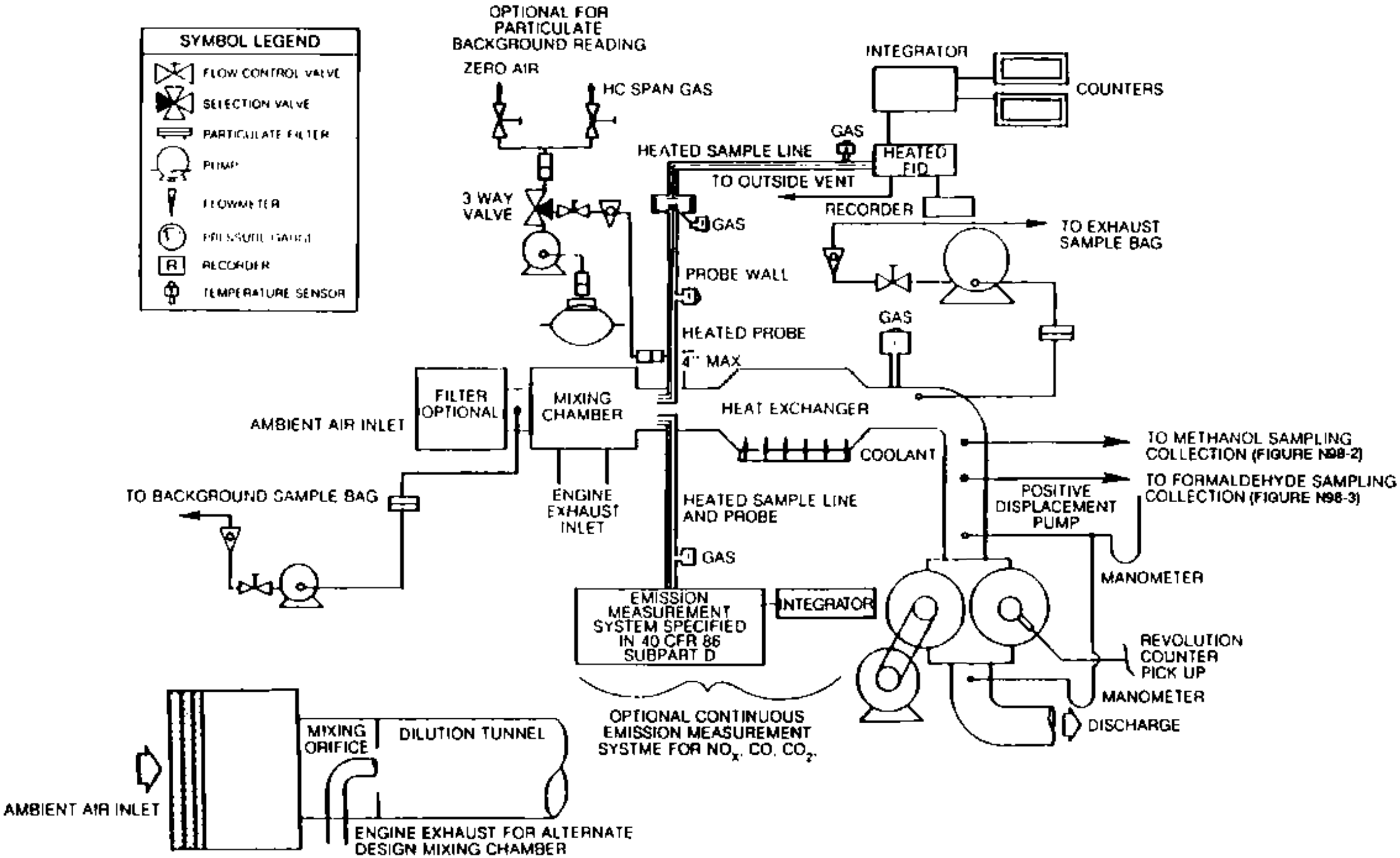


FIGURE N98-7 GASEOUS EMISSIONS SAMPLING SYSTEM (PDP-CVS)

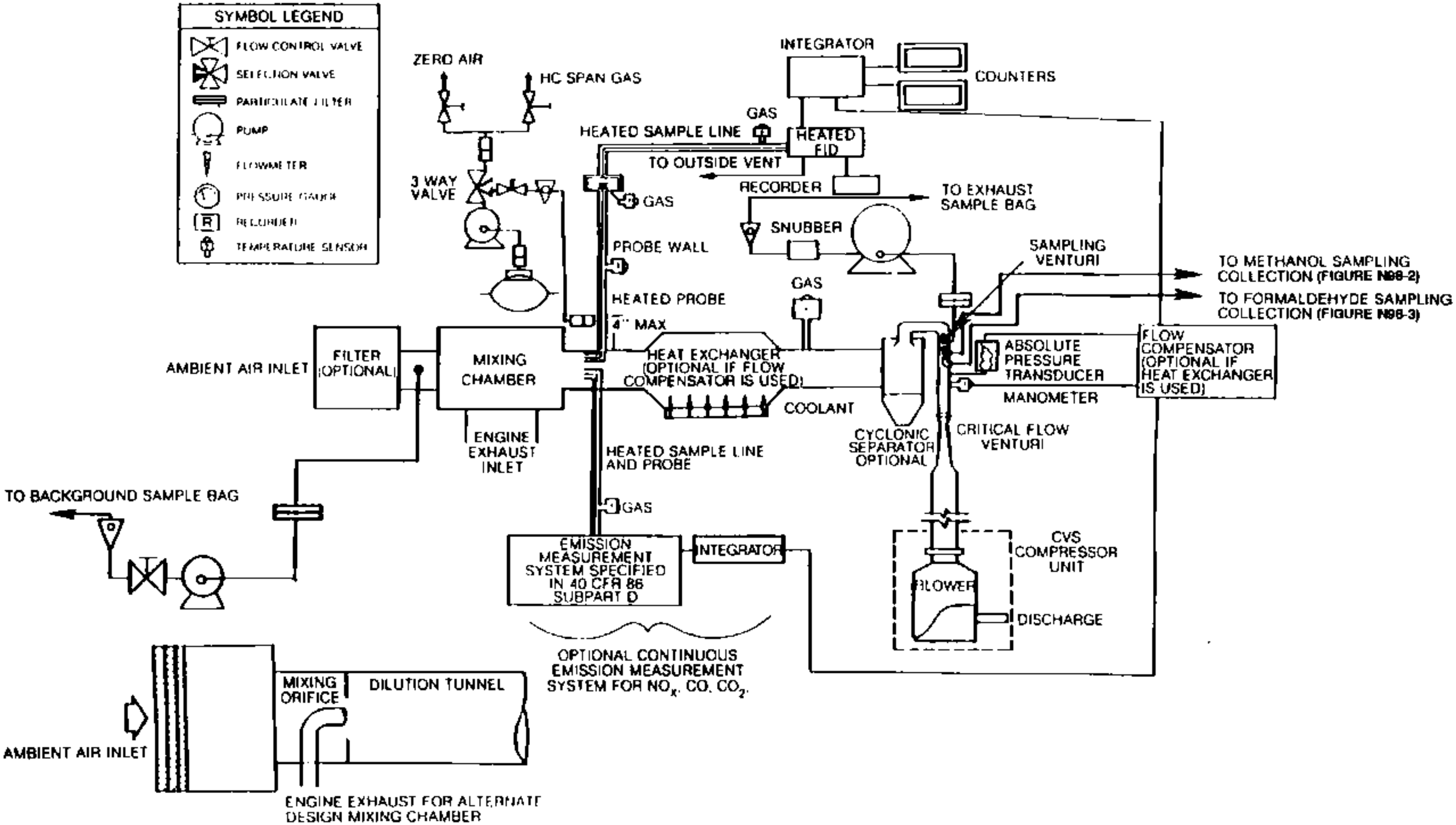


FIGURE N98-8 GASEOUS EMISSIONS SAMPLING SYSTEM (CFV-CVS)

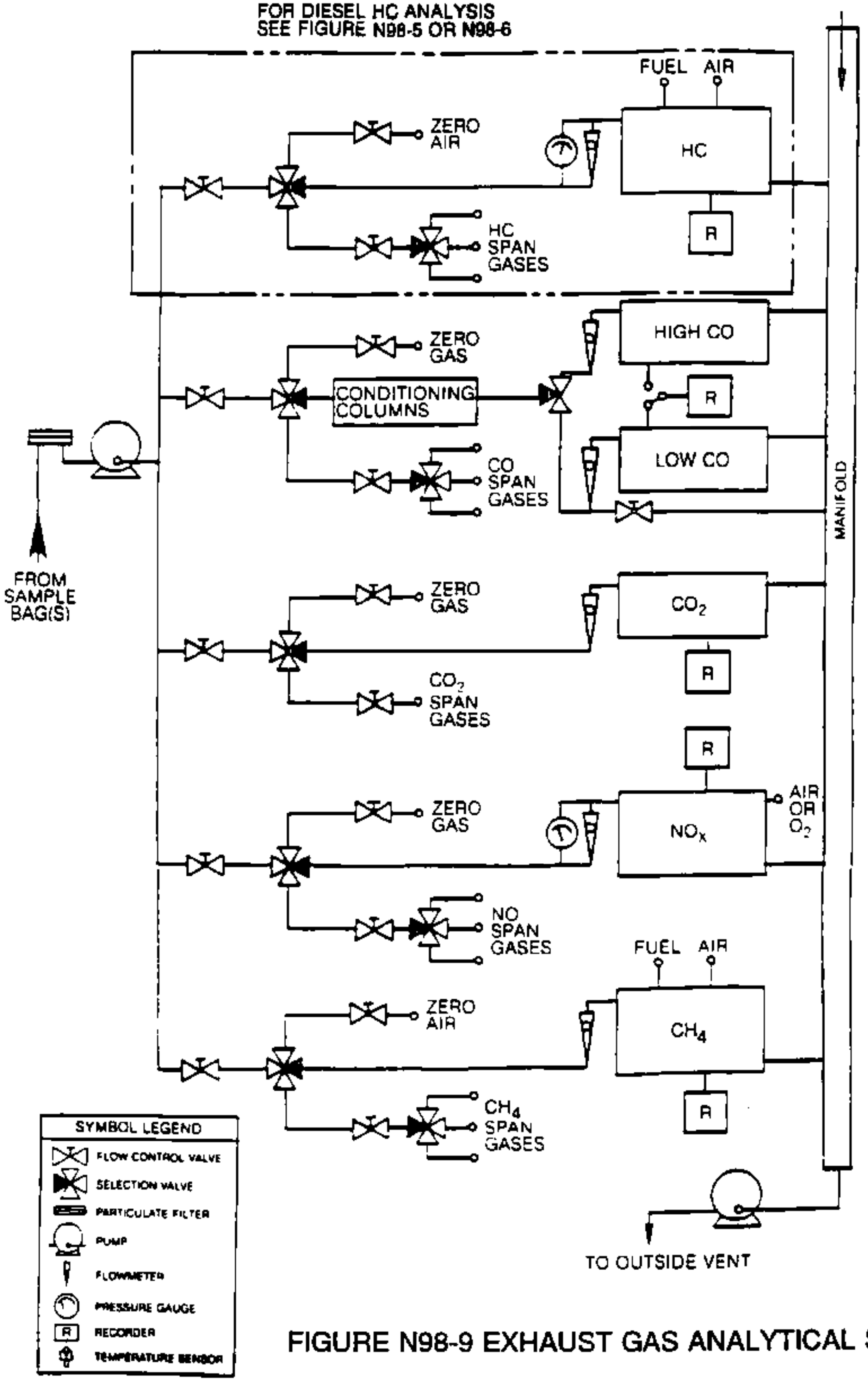


FIGURE N98-9 EXHAUST GAS ANALYTICAL SYSTEM

11. A new *§ 86.1314-98 is proposed to be added to Subpart* N *to* read as follows:

**§ 86.1314-98 Analytical gases.**

(a) Gases for the CO and CO2 analyzers shall be single blends of CO and CO2, respectively, using nitrogen as the diluent.

(b) Gases for the hydrocarbon analyzer shall be single blends of propane using air as the diluent.

(c) Gases for the NOx analyzer shall be single blends of NO named as NOx with a maximum NO2 concentration of 5 percent of the nominal value using nitrogen as the diluent.

**(d) Gases for the methane analyzer system shall be single blends of methane using air as the diluent.**

(~~d~~ **e**) 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 percent hydrogen fuel may be used with advance approval of the Administrator.

(~~e~~ **f**) 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.

(~~f~~ **g**) (1) ''Zero-grade air'' includes artificial ''air'' consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

(2) Calibration gases shall be accurate to within ±1 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(3) Span gases shall be accurate to within ±2 percent of NBS gas standards, or other gas standards which have been approved by the Administrator.

(~~g~~ **h**) The use of precision blending devices (gas dividers) to obtain the required calibration gas concentrations is acceptable, provided that the blended gases are accurate to within ±1.5 percent of NBS gas standards, or other gas standards which have been approved by the Administrator. This accuracy implies that *primary gases used for blending must be ''named'' to an accuracy of* at least ±1 percent, traceable to NBS or other approved gas standards.

12. A new § 86.1327-98 is proposed to be added to Subpart N to read as follows:

***§ 86.1327-98* Engine dynamometer test procedures; overview.**

(a) The engine dynamometer test procedure is designed to determine the brake specific emissions of **methane (may be omitted)**, **total** hydrocarbons, carbon monoxide, oxides of nitrogen, particulate (petroleum-fueled and methanol-fueled diesel engines), and methanol **(for methanol-fueled diesel engines)** and formaldehyde (for methanol-fueled diesel engines **and for some petroleum-fueled diesel engines**). The test procedure consists of a ''cold'' start test following either natural or forced cool-down periods described in §§86.1334 and 86.1335, respectively. 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 both the cold- and hot-start tests. The composite samples collected are analyzed either in bags or continuously **(except for methane)** for **total** hydrocarbons (THC), carbon monoxide (CO), carbon dioxide (CO2), **methane (CH4)**, and oxides of nitrogen (NOx), or in sample collection impingers for methanol (CH3OH) and sample collection impingers (or capsules) for formaldehyde (HCHO). Measurement of CH3OH and HCHO may be omitted for 1990 through 1994 model year methanol-fueled engines when a FID calibrated on methanol is used. A bag or continuous sample of the dilution air is similarly analyzed for background levels of **total** hydrocarbon, carbon monoxide, carbon dioxide, **methane**, and oxides of nitrogen and, if appropriate, methanol and formaldehyde. In addition, for petroleum-fueled and methanol-fueled diesel engines, particulates are collected on fluorocarbon-coated glass fiber filters or fluorocarbon-based (membrane) filters, and the dilution air may be prefiltered.

(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 §86.1342, Calculations; gaseous exhaust emissions., and §86.1343, Calculations; particulate 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 or their loading simulated if typical of the in-use application.

(5) The engine may be equipped with a production type starter.

(e) Means of engine cooling which will maintain the engine operating temperatures (e.g., temperatures of 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. Rust inhibitors and lubrication additives may be used, up to the levels recommended by the additive manufacturer. Antifreeze mixtures and other coolants typical of those approved for use by the manufacturer may be used.

(f) Exhaust system. The exhaust system shall meet the following requirements:

(1) Gasoline-fueled and methanol-fueled Otto-cycle engines. A chassis-type exhaust system shall be used. 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.

(2) Petroleum-fueled and methanol-fueled diesel engines. Either a chassis-type or a facility-type exhaust system or both systems simultaneously may be used. The exhaust backpressure or restriction shall be typical of those seen in the actual average vehicle exhaust system configuration and may be set with a valve (muffler omitted).

(i) The engine exhaust system shall meet the following requirements:

(A) The total length of the tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel should not exceed 32 feet (9.8 m).

(B) The initial portion of the exhaust system may consist of a typical in-use (i.e., length, diameter, material, etc.) chassis-type exhaust system.

(C) The distance from the exhaust manifold flange(s) to any exhaust aftertreatment device shall be the same as in the vehicle configuration unless the manufacturer is able to demonstrate equivalent performance at another location.

(D) If the exhaust system tubing from the exit of the engine exhaust manifold or turbocharger outlet to the primary dilution tunnel exceeds 12 feet (3.7 m) in length, then all tubing in excess of 12 feet (3.7 m) (chassis and/or facility type) shall be insulated.

(E) If the tubing is required to be insulated, the radial thickness of the insulation must be at least 1.0 inch. The thermal conductivity of the insulating material must have a value no greater than 0.75 BTU-in/hr/ft$^2$/°F measured at 700 °F.

(F) A smoke meter or other instrumentation may be inserted into the exhaust system tubing. If this option is exercised in the insulated portion of the tubing, then a minimal amount of tubing not to exceed 18 inches may be left uninsulated. However, no more than 12 feet of tubing can be left uninsulated in total, including the length at the smoke meter.

(ii) The facility-type exhaust system shall meet the following requirements:

(A) It must be composed of smooth tubing made of typical in-use steel or stainless steel. This tubing shall have a maximum inside diameter of 6.0 in (15 cm).

(B) Short sections (altogether not to exceed 20 percent of the entire tube length) of flexible tubing at connection points are allowed.

13. A new § 86.1340-98 is proposed to be added to Subpart N to read as follows:

**§ 86.1340-98 Exhaust sample analysis.**

(a) The analyzer response may be read by automatic data collection (ADC) equipment such as computers, data loggers, etc. If ADC equipment is used the following is required:

(1) For bag analysis, the analyzer response must be stable at greater than 99 percent of the final reading for the dilute exhaust sample bag. A single value representing the average chart deflection over a 10-second stabilized period shall be stored. For the background bag, all readings taken during the 10-second interval must be stable at the final value to within ± 1 percent of full scale.

(2) For continuous analysis systems, the ADC system must read at least two analyzer readings per second. A single value representing the average integrated concentration over a cycle shall be stored.

(3) The chart deflections or average integrated concentrations required in paragraphs (a) (1) and (2) of this section may be stored on long-term computer storage devices such as computer tapes, storage discs, punch cards, or they may be printed in a listing for storage. In either case a chart recorder is not required and records from a chart recorder, if they exist, need not be stored.

(4) If the data from ADC equipment is used as permanent records, the ADC equipment and the analyzer values as interpreted by the ADC equipment are subject to the calibration specifications in §§86.1316 through 86.1326, as if the ADC equipment were part of the analyzer.

(b) Data records from any one or a combination of analyzers may be stored as chart recorder records.

(c) Software zero and span.

(1) The use of "software" zero and span is permitted. The process of software zero and span refers to the technique of initially adjusting the analyzer zero and span responses to the calibration curve values, but for subsequent zero and span checks the analyzer response is simply recorded without adjusting the analyzer gain. The observed analyzer response recorded from the subsequent check is mathematically corrected back to the calibration curve values for zero and span. The same mathematical

correction is then applied to the analyzer's response to a sample of exhaust gas in order to compute the true sample concentration.

(2) The maximum amount of software zero and span mathematical correction is $\pm$ 10 percent of full scale chart deflection.

(3) Software zero and span may be used to switch between ranges without adjusting the gain of the analyzer.

(4) The software zero and span technique may not be used to mask analyzer drift. The observed chart deflection before and after a given time period or event shall be used for computing the drift. Software zero and span may be used after the drift has been computed to mathematically adjust any span drift so that the "after" span check may be transformed into the "before" span check for the next segment.

(d) For bag sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers; clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(2) Obtain a stable zero reading.

(3) Zero and span the analyzers with zero and span gases. The span gases shall have concentrations between 75 and 100 percent of full-scale chart deflection. The flow rates and system pressures during spanning shall be approximately the same as those encountered during sampling. A sample bag may be used to identify the required analyzer range.

(4) Re-check zero response. If this zero response differs from the zero response recorded in paragraph (d)(3) of this section by more than 1 percent of full scale, then paragraphs (d) (2), (3), and (4) of this section should be repeated.

(5) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(6) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(7) Measure THC (except diesels), CO, $CO_2$, **$CH_4$ (when $CH_4$ emissions are measured)**, and NOx sample and background concentrations in the sample bag(s) with approximately the same flow rates and pressures used in paragraph (d)(3) of this section. (Constituents measured continuously do not require bag analysis.)

(8) A post-analysis zero and span check of each range must be performed and the values recorded. The number of events that may occur between the pre and post checks is not specified. However, the difference between pre-analysis zero and span values (recorded in paragraph (d)(5) or (6) of this section) versus those recorded for the post-analysis check may not exceed the zero drift limit or the span drift limit of 2 percent of full scale chart deflection for any range used. Otherwise the test is void.

(e) For continuous sample analysis perform the following sequence:

(1) Warm-up and stabilize the analyzers; clean and/or replace filter elements, conditioning columns (if used), etc., as necessary.

(2) Leak check portions of the sampling system that operate at negative gauge pressures when sampling, and allow heated sample lines, filters, pumps, etc., to stabilize at operating temperature.

(3) Optional: Perform a hang-up check for the HFID sampling system:

(i) Zero the analyzer using zero air introduced at the analyzer port.

(ii) Flow zero air through the overflow sampling system. Check the analyzer response.

(iii) If the overflow zero response exceeds the analyzer zero response by 2 percent or more of the HFID full-scale deflection, hang-up is indicated and corrective action must be taken.

(iv) The complete system hang-up check specified in paragraph (f) of this section is recommended as a periodic check.

(4) Obtain a stable zero reading.

(5) Zero and span each range to be used on each analyzer used prior to the beginning of the cold cycle. The span gases shall have a concentration between 75 and 100 percent of full scale chart deflection. The flow rates and system pressures shall be approximately the same as those encountered during sampling. The HFID analyzer shall be zeroed and spanned through the overflow sampling system.

(6) Re-check zero response. If this zero response differs from the zero response recorded in paragraph (e)(5) of this section by more than 1 percent of full scale, then paragraphs (e) (4), (5),

and (6) of this section should be repeated.

(7) If a chart recorder is used, identify and record the most recent zero and span response as the pre-analysis values.

(8) If ADC equipment is used, electronically record the most recent zero and span response as the pre-analysis values.

(9) Measure the emissions (THC required for diesels; NOx, CO, $CO_2$ optional) continuously during the cold start cycle. Indicate the start of the test, the range(s) used, and the end of the test on the recording medium (chart paper or ADC equipment). Maintain approximately the same flow rates and system pressures used in paragraph (e)(5) of this section.

(10) Collect background THC, CO, $CO_2$, **$CH_4$ (as necessary)**, and NOx in a sample bag.

(11) Perform a post-analysis zero and span check for each range used at the conditions specified in paragraph (e)(5) of this section. Record these responses as the post-analysis values.

(12) Neither the zero drift nor the span drift between the pre-analysis and post-analysis checks on any range used may exceed 3 percent for HC, or 2 percent for NOx, CO, and $CO_2$, of full scale chart deflection, or the test is void. (If the **THC** drift is greater than 3 percent of full-scale chart deflection, **total** hydrocarbon hang-up is likely.)

(13) Determine THC background levels for the cold start cycle by introducing the background sample into the overflow sample system.

(14) Determine background levels of **$CH_4$ (if necessary)**, NOx, CO, or $CO_2$ (if necessary) by the bag technique outlined in paragraph (d) of this section.

(15) Repeat paragraphs (e) (4) through (14) of this section for the hot cycle. The post-analysis zero and span check for the cold start (or previous hot start) cycle may be used for the pre-analysis zero and span for the following hot start cycle.

(f) THC hang-up. If THC hang-up is indicated, the following sequence may be performed:

(1) Fill a clean sample bag with background air.

(2) Zero and span the HFID at the analyzer ports.

(3) Analyze the background air sample bag through the analyzer ports.

(4) Analyze the background air through the entire sample probe system.

(5) If the difference between the readings obtained is 2 percent or more of the HFID full scale deflection, clean the sample probe and the sample line.

(6) Reassemble the sample system, heat to specified temperature, and repeat the procedure in paragraphs (f) (1) through (6) of this section.

(g) For $CH_3OH$ (methanol-fueled vehicles):

(1) Introduce a reference sample of methanol (the concentration of methanol in deionized water is known, and is $C_{MR}$ in the calculations) into the gas chromatograph and measure the area of the response peak. This reference sample peak area is $A_{MR}$ in the calculations.

(2) Introduce test samples into the gas chromatograph and measure the area of the response peak. This peak area is $A_{MS}$ in the calculations.

(h) For HCHO (methanol-fueled vehicles, **and some petroleum-fueled vehicles**):

(1) Introduce a reference sample of formaldehyde (the concentration of formaldehyde as a dinitrophenylhydrazine derivative in acetonitrile ($C_{FR}$) is known) into the high pressure liquid chromatograph and measure the area of the response peak. This reference sample peak area is $A_{FR}$ in the calculations.

(2) Introduce test samples into the high pressure liquid chromatograph and measure the area of the response peak. This peak area is $A_{FS}$ in the calculations.

**(i)(1) *For Methane*. If methane emissions are measured, all procedures found in SAE J1151 must be followed.**

**(2) The FID response of a given mass of methane relative to the same mass of THC shall be determined based on good engineering judgement.**

14. A new § 86.1342-98 is proposed to be added to Subpart N to read as follows:

**§ 86.1342-98 Calculations; exhaust emissions.**

(a) The final reported transient emission test results should be computed by using the following formula:

$$A_{WM} = \frac{(1/7)(g_C) + (6/7)(g_H)}{(1/7)(BHP\text{-}hr_C) + (6/7)(BHP\text{-}hr_H)}$$

Where:

(1) $A_{WM}$ = Weighted mass emission level (THC, CO, $CO_2$, or NOx) in grams per brake horsepower-hour and, if appropriate, the weighted mass organic material hydrocarbon equivalent **and non-methane hydrocarbon emission level** in grams per brake horsepower-hour.

(2) $g_C$ = Mass emission level in grams or grams carbon mass equivalent, measured during the cold start test.

(3) $g_H$ = Mass emission level in grams or grams carbon mass equivalent, measured during the hot start test.

(4) $BHP\text{-}hr_C$ = Total brake horsepower-hour (brake horsepower integrated over time) for the cold start test.

(5) $BHP\text{-}hr_H$ = Total brake horsepower-hour (brake horsepower integrated over time) for the hot start test.

(b) The mass of each pollutant for the cold start test and the hot start test for bag measurements and diesel continuously heated sampling system measurements is determined from the following equations:

(1) **Total** hydrocarbon mass:

$THC_{mass} = V_{mix} \times Density_{THC} \times (THC_{conc}/10^6)$

(2) Oxides of nitrogen mass:

$NOx_{mass} = V_{mix} \times Density_{NO2} \times K_H \times (NOx_{conc}/10^6)$

(3) Carbon monoxide mass:

$CO_{mass} = V_{mix} \times Density_{CO} \times (CO_{conc}/10^6)$

(4) Carbon dioxide mass:

$CO_{2mass} = V_{mix} \times \text{Density } CO_2 \times (CO_{2conc}/10^2)$

(5) Methanol mass:

$CH3OH_{mass} = V_{mix} \times Density_{CH3OH} \times (CH3OH_{conc}/10^6)$

(6) Formaldehyde mass:

$HCHO_{mass} = V_{mix} \times Density_{HCHO} \times (HCHO_{conc}/10^6)$

(7) Organic material hydrocarbon equivalent mass:

(i) $$OMHCE = THC_{mass} + \frac{13.8756}{32.042}(CH_3OH_{Mass}) + \frac{13.8756}{30.0262}(HCHO_{Mass})$$

**(8) Methane mass:**

$CH4_{mass} = V_{mix} \times Density_{CH4} \times (CH4_{conc}/10^6)$

**(9)(i) Non-methane hydrocarbon mass:**

$NMHC_{mass} = THC_{mass} - CH4_{mass} \times R_{CH4}$

**where:**

**(ii) $R_{CH4}$ = The FID response of one gram of methane relative to one gram of THC.**

**(10) Organic material non-methane hydrocarbon equivalent mass:**

**(i)** $$OMNMHCE = NMHC_{mass} + \frac{13.8756}{32.042}(CH_3OH_{Mass}) + \frac{13.8756}{30.0262}(HCHO_{Mass})$$

(c) The mass of each pollutant for the cold start test and the hot start test for flow compensated sample systems is determined from the following equations:

(1) $$THC_{mass} = \sum_{i=1}^{n} \left[ \frac{(THC_e)_i}{10^6} \times (V_{mix})_i \times (Density_{THC}) \times WT \right]$$

$$- \frac{THC_d}{10^6}\left(1 - \frac{1}{DF}\right) \times V_{mix} \times Density_{THC}$$

(2) $$NOx_{mass} = K_H \times \sum_{i=1}^{n} \left[ \frac{(NOx_e)_i}{10^6} \times (V_{mix})_i \times Density_{NO_2} \times WT \right]$$

$$- K_H \times \frac{NOx_d}{6}\left(1 - \frac{1}{DF}\right) \times V_{mix} \times Density_{NO}$$

10 2

(3) $$CO_{mass} = \sum_{i=1}^{n} [ \frac{(CO_e)_i}{10^6} \times (V_{mix})_i \times Density_{CO} \times WT] - \frac{CO_d}{10^6} (1 - \frac{1}{DF}) \times V_{mix} \times Density_{CO}$$

(4) $$CO2_{mass} = \sum_{i=1}^{n} [ \frac{(CO_{2e})_i}{10^6} \times (V_{mix})_i \times Density_{CO_2} \times WT] - \frac{CO_{2d}}{10^6} (1 - \frac{1}{DF}) \times V_{mix} \times Density_{CO_2}$$

(d) Meaning of symbols:

(1)(i) $THC_{mass}$ = **Total** hydrocarbon emissions, in grams per test phase.

(ii) $Density_{THC}$ = Density of hydrocarbons = 16.33 g/ft$^3$ (0.5768 kg/m$^3$) for gasoline and the gasoline fraction of methanol-fuel, and may be used for petroleum and the petroleum fraction of methanol diesel fuel if desired, 16.42 g/ft$^3$(0.5800 kg/m$^3$) for #1 petroleum diesel fuel and 16.27 g/ft$^3$(0.5746 kg/m$^3$) for #2 diesel, assuming an average carbon to hydrogen ratio of 1:1.85 for gasoline, 1:1.93 for #1 petroleum diesel fuel and 1:1.80 for #2 petroleum diesel fuel at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) $THC_{conc}$ = **Total** hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent (i.e., equivalent propane x 3).

(B) $THC_{conc} = THC_e - THC_d \, (1 - (1/DF))$

Where:

(iv)(A) $THC_e$ = **Total** hydrocarbon concentration of the dilute exhaust bag sample or, for diesel continuous heated sampling systems, average hydrocarbon concentration of the dilute exhaust sample as determined from the integrated THC traces, in ppm carbon equivalent. For flow compensated systems $(THC_e)_i$ is the instantaneous concentration.

(B) For petroleum-fueled engines, $THC_e$ is the FID measurement.

(C) For methanol-fueled engines:

$THC_e = FID\ THC_e - (r)C_{CH3OHe}$

(v) FID $THC_e$ = Concentration of **total** hydrocarbons plus methanol in dilute exhaust as measured by the FID, ppm carbon equivalent.

(vi) *r* = FID response to methanol.

(vii) $C_{CH3OHe}$ = Concentration of methanol in dilute exhaust as determined from the dilute exhaust methanol sample, ppm carbon.

(viii)(A) $THC_d$ = **Total** hydrocarbon concentration of the dilution air as measured, in ppm carbon equivalent.

(B) $THC_d = FID\ THC_d - (r)C_{CH3OHd}$

(ix) FID $THC_d$ = Concentration of **total** hydrocarbons plus methanol in dilution air as measured by the FID, ppm carbon equivalent.

(x) $C_{CH3OHd}$ = Concentration of methanol in dilution air as determined from dilution air methanol sample in ppm carbon.

(2)(i) $NOx_{mass}$ = Oxides of nitrogen emissions, in grams per test phase.

(ii) $Density_{NO2}$ = Density of oxides of nitrogen is 54.16 g/ft$^3$ (1.913 kg/m$^3$), assuming they are in the form of nitrogen dioxide, at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) $NOx_{conc}$ = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in ppm.

(B) $NOx_{conc} = NOx_e - NOx_d\ [1 - (1/DF)]$

Where:

(iv) $NOx_e$ = Oxides of nitrogen concentration of the dilute exhaust bag sample as measured, in ppm. For flow compensated sample systems $(NOx_e)_i$ is the instantaneous concentration.

(v) $NOx_d$ = Oxides of nitrogen concentration of the dilution air as measured, in ppm.

(3)(i) $CO_{mass}$ = Carbon monoxide emissions, grams per test phase.

(ii) $Density_{CO}$ = Density of carbon monoxide is 32.97 $g/ft^3$ (1.164 $kg/m^3$), at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

(iii)(A) $CO_{conc}$ = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor, and $CO_2$ extraction, ppm.

(B) $CO_{conc} = CO_e - CO_d[1 - (1/DF)]$

Where:

(iv) $CO_e$ = Carbon monoxide concentration of the dilute exhaust bag sample volume corrected for water vapor and carbon dioxide extraction, in ppm. For flow compensated sample systems $(CO_e)_i$ is the instantaneous concentration.

(v)(A) $CO_e = (1 - 0.01925CO_{2e} - 0.000323R)CO_{em}$ for gasoline and petroleum diesel fuel, with hydrogen to carbon ratio of 1.85:1.

(B) $CO_e = [1 - (0.01 + 0.005HCR)\ CO_{2e} - 0.000323R]\ CO_{em}$ for methanol fuel, where HCR is hydrogen to carbon ratio as measured for the fuel used.

Where:

(vi) $CO_{em}$ = Carbon monoxide concentration of the dilute exhaust sample as measured, in ppm.

(vii)(A) $CO_{2e}$ = Carbon dioxide concentration of the dilute exhaust bag sample, in percent, if measured. For flow compensated sample systems, $(CO_{2e})_i$ is the instantaneous concentration. For cases where exhaust sampling of $CO_2$ is not performed, the following approximation is permitted:

(B) $$CO_{2_e} = \frac{44.010}{12.011 + (1.008a)} \times \frac{M'(453.6)}{Density_{CO_2}} \times \frac{100}{V_{mix}}$$

Where:

(C) a = Average carbon to hydrogen ratio, as specified by the Administrator.

(D) M′ = Fuel mass consumed during the test cycle.

(E) R = Relative humidity of the dilution air, percent.

(viii)(A) $CO_d$ = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in ppm.

(B) $CO_d = (1 - 0.000323R) CO_{dm}$

Where:

(ix) $CO_{dm}$ = 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, $CO_{em}$ must be substituted directly for $CO_e$, and $CO_{dm}$ must be substituted directly for $CO_d$.

(4)(i) $CO_{2mass}$ = Carbon dioxide emissions, in grams per test phase.

(ii) Density $CO_2$ = Density of carbon dioxide is 51.81 g/ft$^3$ (1.830 kg/m$^3$), at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.

(iii) $CO_{2conc}$ = Carbon dioxide concentration of the dilute exhaust sample corrected for background, in percent.

(iv) $CO_{2conc} = CO_{2e} - CO_{2d}\ [1-(1/DF)]$

Where:

(v) $CO_{2d}$ = Carbon dioxide concentration of the dilution air as measured, in percent.

(5)(i) $CH_3OH_{mass}$ = Methanol emissions corrected for background, in grams per test phase.

(ii) Density $_{CH3OH}$ = Density of methanol is 37.71 g/ft$^3$ (1.332 kg/m$^3$), at 68°F (20°C) and 760 mm Hg (101.3kPa) pressure.

(iii)(A) $CH_3OH_{conc}$ = Methanol concentration of the dilute exhaust corrected for background, in ppm.

(B) $CH_3OH_{conc} = C_{CH3OHe} - C_{CH3OHd}\ [1-(1/DF)]$

Where:

(iv)(A) $C_{CH3OHe}$ = Methanol concentration in the dilute exhaust, in ppm.

(B) $C_{CH3OHe}$ =

$$\frac{3.813 \times 10^{-2} \times C_{CH3OHR} \times T_{EM} \left[ (A_{S1} \times AV_{S1}) + (A_{S2} \times AV_{S2}) \right]}{A \quad \times P \quad \times V}$$

CH3OHR B EM

(v) (A) $C_{CH3OHd}$ = Methanol concentration in the dilution air, in ppm.

(B) $C_{CH3OHd}$ =

$$\frac{3.813 \times 10^{-2} \times C_{CH3OHR} \times T_{DM} [(A_{D1} \times AV_{D1}) + (A_{D2} \times AV_{D2})]}{A_{CH3OHR} \times P_B \times V_{DM}}$$

(vi) $C_{CH3OHR}$ = Concentration of methanol in standard sample for calibration of GC, mg/ml.

(vii) $A_{CH3OHR}$ = GC peak area of standard sample.

(viii) $T_{EM}$ = Temperature of methanol sample withdrawn from dilute exhaust, °R.

(ix) $T_{DM}$ = Temperature of methanol sample withdrawn from dilution air, °R.

(x) $P_B$ = Barometric pressure during test, mm Hg.

(xi) $V_{EM}$ = Volume of methanol sample withdrawn from dilute exhaust, $ft^3$.

(xii) $V_{DM}$ = Volume of methanol sample withdrawn from dilution air, $ft^3$.

(xiii) $A_S$ = GC peak area of sample drawn from dilute exhaust.

(xiv) $A_D$ = GC peak area of sample drawn from dilution air.

(xv) $AV_S$ = Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilute exhaust is drawn, ml.

(xvi) $AV_D$ = Volume of absorbing reagent (deionized water) in impinger through which methanol sample from dilution air is drawn, ml.

(xvii) 1 = first impinger.

(xviii) 2 = second impinger.

(6)(i) $HCHO_{mass}$ = Formaldehyde emissions corrected for background, grams per test phase.

(ii) $Density_{HCHO}$ = Density of formaldehyde is 35.36 g/ft$^3$ (1.249 kg/m$^3$), at 68°F (20°C) and 760 mmHg (101.3 kPa) pressure.

(iii)(A) $HCHO_{conc}$ = Formaldehyde concentration of the dilute exhaust corrected for background, ppm.

(B) $HCHO_{conc} = C_{HCHOe} - C_{HCHOd}\,[1 - (1/DF)]$

Where:

(iv)(A) $C_{HCHOe}$ = Formaldehyde concentration in dilute exhaust, ppm.

(B)
$$C_{HCHOe} = \frac{4.069 \times 10^{-2} \times C_{FDE} \times V_{AE} \times Q \times T_{EF}}{V_{SE} \times P_B}$$

(v)(A) $C_{HCHOd}$ = Formaldehyde concentration in dilution air, ppm.

(B)
$$C_{HCHOd} = \frac{4.069 \times 10^{-2} \times C_{FDA} \times V_{AA} \times Q \times T_{DF}}{V_{SA} \times P_B}$$

(vi) $C_{FDE}$ = Concentration of DNPH derivative of formaldehyde from dilute exhaust sample in sampling solution, mg/ml.

(vii) $V_{AE}$ = Volume of sampling solution for dilute exhaust formaldehyde sample, ml.

(viii)(A) Q = Ratio of molecular weights of formaldehyde to its DNPH derivative.

(B) Q = 0.1429

(ix) $T_{EF}$ = Temperature of formaldehyde sample withdrawn from dilute exhaust, °R.

(x) $V_{SE}$ = Volume of formaldehyde sample withdrawn from dilute exhaust, ft$^3$.

(xi) $P_B$ = Barometric pressure during test, mm Hg.

(xii) $C_{FDA}$ = Concentration of DNPH derivative of formaldehyde from dilution air sample in sampling solution, mg/ml.

(xiii) $V_{AA}$ = Volume of sampling solution for dilution air formaldehyde sample, ml.

(xiv) $T_{DF}$ = Temperature of formaldehyde sample withdrawn from dilution air, °R.

(xv) $V_{SA}$ = Volume of formaldehyde sample withdrawn from dilution air, $ft^3$.

**(7)(i) $CH_{4mass}$ = Methane emissions, in grams per test phase.**

**(ii) Density $CH_4$ = Density of methane is 18.88 g/$ft^3$ (0.6669 kg/$m^3$), at 68°F (20°C) and 760 mm Hg (101.3 kPa) pressure.**

**(iii) $CH_{4conc}$ = Methane concentration of the dilute exhaust sample corrected for background, in ppm.**

**(iv) $CH_{4conc} = CH_{4e} - CH_{4d}\,[1-(1/DF)]$**

**Where:**

**(v) $CH_{4d}$ = Methane concentration of the dilution air as measured, in ppm.**

(8)(i) $DF = 13.4/[CO_{2e}+(THC_e+CO_e)10^{-4}]$ for petroleum-fueled vehicles, or $DF = 13.4/CO_{2e}$

(ii) $$DF = \frac{100 \times \dfrac{x}{x + y/2 + 3.76(x + y/4 - z/2)}}{CO_{2e} + (HC_e + CO_e + CH_3OH_e)\ 10^{-4}}$$

for methanol-fueled vehicles, where fuel composition is $C_xH_yO_z$ as measured for the fuel used.

(9)(i) $K_H$ = Humidity correction factor.

(ii) For gasoline-fueled and methanol -fueled diesel engines: $K_H = 1/[1-0.0047\ (H-75)]$ (or for SI units, $K_H = 1/[1-0.0329(H-10.71)]$).

(iii) For petroleum-fueled and methanol-fueled diesel engines: $K_H = 1/[1-0.0026\ (H-75)]$ (or for SI units $= 1/[1-0.0182\ (H-10.71)]$).

Where:

(iv)(A) H = Absolute humidity of the engine intake air in grains (grams) of water per pound (kilogram) of dry air.

(B)(1) $H = [(43.478)R_i \times P_d]/[P_B - (P_d \times R_i/100)]$

(2) For SI units,
$H = [(6.211)R_i \times P_d]/[P_B - (P_d \times R_i/100)]$

(C) $R_i$ = Relative humidity of the engine intake air, percent.

(D) $P_d$ = Saturated vapor pressure, in mm Hg (kPa) at the engine intake air dry bulb temperature.

(E) $P_B$ = Barometric pressure, in mm Hg (kPa).

(10)(i) $V_{mix}$ = 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).

(ii) $(V_{mix})_i$ = Instantaneous dilute exhaust volumetric flow rate (for compensated flow systems), $ft^3/sec$.

(iii) T = Time interval (seconds) between samples in flow compensated systems.

(iv) T = Total sampling time (seconds).

(v) For PDP-CVS:

(A) $$V_{mix} = V_o \times \frac{N(P_B - P_4)(528)}{(760)(T_p)}$$

(B) For SI units, $$V_{mix} = V_o \times \frac{N(P_B - P_4)(293)}{(101.3)(T_p)}$$

Where:

(vi) $V_o$ = 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.

(vii) N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

(viii) $P_B$ = Barometric pressure, mm Hg (kPa).

(ix) $P_4$ = Pressure depression below atmospheric measured at the inlet to the positive displacement pump, in mm Hg (kPa) (during an idle mode).

(x) $T_p$ = Average temperature of dilute exhaust entering positive displacement pump during test, °R(°K).

(e) Sample calculation of mass values of exhaust emissions:

(1) Assume the following test results for a gasoline engine:

| | Cold Start Cycle Test Results | Hot Start Cycle Test Results |
|---|---|---|
| $V_{mix}$ | 6924. $ft^3$ | 6873. $ft^3$ |
| R | 30.2 percent | 30.2 percent |
| $R_i$ | 30.2 percent | 30.2 percent |
| $P_B$ | 735. mm Hg | 735. mm Hg |
| $P_d$ | 22.676 mm Hg | 22.676 mm Hg |
| $THC_e$ | 132.07 ppm C equiv. | 86.13 ppm C equiv. |
| $NOx_e$ | 7.86 ppm | 10.98 ppm |
| $COe_m$ | 171.22 ppm | 114.28 ppm |
| $CO_{2e}$ | 0.178 percent | 0.381 percent |
| $THC_d$ | 3.60 ppm C equiv. | 8.70 ppm C equiv. |
| $NOx_d$ | 0.0 ppm | 0.10 ppm |
| $CO_{dm}$ | 0.89 ppm | 0.89 ppm |
| $CO_{2d}$ | 0.0 percent | 0.038 percent |
| **$CH_{4e}$** | **12.50 ppm** | **8.81 ppm** |
| **$CH_{4d}$** | **1.01 ppm** | **1.01 ppm** |
| BHP-hr | 0.259 | 0.347 |

Then:

(2) <u>Cold Start Test</u>:

(i) $H = [(43.478)(30.2)(22.676)]/[735-(22.676)(30.2)/100]$

$= 41$ grains of water per pound of dry air.

(ii) $K_H = 1/[1 - 0.0047(41-75)] = 0.862$

(iii) $CO_e = [1 - 0.01925(.178) - 0.000323(30.2)]171.22$

$= 169.0$ ppm

(iv) $CO_d = [1 - 0.000323(30.2)]0.89 = 0.881$ ppm

(v) $DF = 13.4/[.178 + (132.07 + 169.0)(10^{-4})]$

$= 64.390$

(vi) $HC_{conc} = 132.07 - 3.6[1-(1/64.390)]$

$= 128.5$ ppm

(vii) $HC_{mass} = 6924(16.33)(128.5/10^6)$

$= 14.53$ grams

(viii) $NOx_{conc} = 7.86 - 0.0[1 - (1/64.390)]$

$= 7.86$ ppm

(ix) $NOx_{mass} = 6924(54.16)(.862)(7.86/10^6)$

$= 2.54$ grams

(x) $CO_{conc} = 169.0 - .881[1 - (1/64.390)]$

$= 168.0$ ppm

(xi) $CO_{mass} = 6924(32.97)(168.0/10^6)$

$= 38.35$ grams

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(xii) $CO_{2conc}$ = .178 - 0[1 - 1/64.390)] = 0.178%

(xiii) $CO_{2mass}$ = 6924(51.81)(.178/100) = 639 grams

**(xiv) $CH_{4conc}$ = 12.50 - 1.01[1 - 1/64.390)] = 11.51**

**(xv) $CH_{4mass}$ = 6924(18.88)(11.51/$10^6$) = 1.50 grams**

**(xvi) $NMHC_{mass}$ = 13.03**

(3) Hot start test: Similar calculations result in the following:

(i) $HC_{mass}$ = 8.72 grams

(ii) $NOx_{mass}$ = 3.49 grams

(iii) $CO_{mass}$ = 25.70 grams

(iv) $CO_{2mass}$ = 1226 grams

**(v) $CH_{4mass}$ = 1.01 grams**

**(vi) $NMHC_{mass}$ = 7.81**

(4) Weighted mass emission results:

(i) $$THC_{wm} = \frac{1/7(14.53) + 6/7(8.72)}{1/7(0.259) + 6/7(0.347)}$$

$$= 28.6 \text{ grams/BHP-hr}$$

(ii) $$NOx_{wm} = \frac{1/7(2.54) + 6/7(3.49)}{1/7(0.259) + 6/7(0.347)}$$

$$= 10.0 \text{ grams/BHP-hr}$$

(iii) $$CO_{wm} = \frac{1/7(38.35) + 6/7(25.70)}{1/7(0.259) + 6/7(0.347)}$$

$$= 82.2 \text{ grams/BHP-hr}$$

(iv) $$CO_{2wm} = \frac{1/7(639) + 6/7(1226)}{1/7(0.259) + 6/7(0.347)}$$

$$= 3415 \text{ grams/BHP-hr}$$

**(v)** $$NMHC_{wm} = \frac{1/7(13.03) + 6/7(7.81)}{1/7(0.259) + 6/7(0.347)}$$

$$= 25.6 \text{ grams/BHP-hr}$$

(f) The final reported brake-specific fuel consumption (BSFC) shall be computed by use of the following formula:

$$BSFC = \frac{1/7(M_C) + 6/7(M_H)}{1/7(BHP\text{-}hr_C) + 6/7(BHP\text{-}hr_H)}$$

Where:

(1) BSFC = brake-specific fuel consumption in pounds of fuel per brake horsepower-hour (lbs/BHP-hr).

(2) $M_C$ = mass of fuel, in lbs, used by the engine during the cold start test.

(3) $M_H$ = mass of fuel, in lbs, used by the engine during the hot start test.

(4) $BHP\text{-}hr_C$ = total brake horsepower-hours (brake horsepower integrated with respect to time) for the cold start test.

(5) $BHP\text{-}hr_H$ = total brake horsepower-hours (brake horsepower integrated with respect to time) for the hot start test.

(g)(1) The mass of fuel for the cold start and hot start test is determined from mass fuel flow measurements made during the tests, or from the following equation:

$$M = (G_s/R_2)(1/453.6)$$

(2) Meaning of symbols:

(i) M = Mass of fuel, in lbs, used by the engine during the cold or hot start test.

(ii) $G_s$ = Grams of carbon measured during the cold or hot start test:

$$G_s = \left[\frac{12.011}{12.011 + a(1.008)}\right] HC_{mass} + 0.429CO_{mass} + 0.273CO_{2_{mass}}$$

Where:

(iii) $THC_{mass}$ = **Total h**ydrocarbon emissions, in grams, for cold or hot start test.

(iv) $CO_{mass}$ = Carbon monoxide emissions, in grams, for cold or hot start test.

(v) $CO_{2mass}$ = Carbon dioxide emissions, in grams, for cold or hot start test.

(vi) a = The atomic hydrogen to carbon ratio of the fuel.

(vii)(A) $R_2$ = The grams of carbon in the fuel per gram of fuel.

(B) $R_2 = 12.011/[12.011 + a\ (1.008)\ ]$

(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 |

| | | |
|---|---|---|
| a | 1.85 | 1.85 |
| $THC_{mass}$ (grams) | 37.08 | 28.82 |
| $CO_{mass}$ (grams) | 357.69 | 350.33 |
| $CO_{2mass}$ (grams) | 5,419.62 | 5,361.32 |

Then:

(i) $G_s$ for cold start test = [12.011/(12.011 + (1.008)(1.85))](37.08) + 0.429(357.69) + 0.273(5419.62)

= 1665.10 grams

(ii) $G_s$ for hot start test = [12.011/(12.011 + (1.008)(1.85))](28.82) + 0.429(350.33) + 0.273(5361.32)

= 1638.88 grams

(iii) $R_2$ = 12.011/[12.011 + (1.008)1.85] = 0.866

(iv)(A) $M_c$ = (1665.10/.866)(1/453.6) = 4.24 lbs (calculated), or

(B) = 4.24 lbs (directly measured).

(v)(A) $M_H$ = (1638.88/.866)(1/453.6) = 4.17 lbs (calculated), or

(B) = 4.17 lbs (directly measured).

(2) Brake-specific fuel consumption results:

$$BSFC = \frac{(1/7)\ (4.24) + (6/7)\ (4.17)}{(1/7)\ (6.945) + (6/7)\ (7.078)} = 0.592 \text{ lbs of fuel/BHP-hr}$$

(i) For dilute sampling systems which require conversion of as-measured dry concentrations to wet concentrations, the following equation shall be used for any combination of bagged, continuous, or fuel mass-approximated sample measurements (except for CO measurements made through conditioning columns, as explained in paragraph (d)(3) of this section):

Wet concentration = $K_w$ x dry concentration.

Where:

(ii)(A) $K_w = 1 - .00925CO_{2_e}(') - \frac{1.608 \times H'}{7000 + H'}$

(B) For SI units, $K_w = 1 - .00925CO_{2_e}(') - \frac{1.608 \times H'}{1000 + H'}$

(iii) $CO_{2_e}(')$ = either $CO_{2_e}$ or $CO_{2_e}'$ as applicable.

(iv)(A) $H'$ = Absolute humidity of the CVS dilution air, in grains (grams) of water per lb (kg) of dry air.

(B) $H' = [(43.478)R_i' \times P_d']/[P_B - (P_d' \times R_i'/100)]$

(C) For SI units,

$H' = [(6.211)R_i' \times P_d']/[P_B - (P_d' \times R_i'/100)]$

(v) $R_i'$ = Relative humidity of the CVS dilution air, in percent.

(vi) $P_d$= Saturated vapor pressure, in mm Hg (kPa) at the ambient dry bulb temperature of the CVS dilution air.

(vii) $P_B$ = Barometric pressure, mm Hg (kPa).

15. A new § 86.1344-98 is proposed to be added to Subpart N to read as follows:

**§ 86.1344-98 Required information.**

(a) The required test data shall be grouped into the following three general categories:

(1) Engine set-up and descriptive data. These data must be provided to the EPA supervisor of engine testing for each engine sent to the Administrator for confirmatory testing prior to the initiation of engine set-up. These data are necessary to ensure that EPA test personnel have the correct data in order to set up and test the engine in a timely and proper manner. These data are not required for tests performed by the manufacturers.

(2) Pre-test data. These data are general test data that must be recorded for each test. The data are of a more descriptive nature such as identification of the test engine, test site number, etc. As such, these data can be recorded at any time within 24 hours of the test.

(3) Test data. These data are physical test data that must be recorded at the time of testing.

(b) When requested, data shall be supplied in the format specified by the Administrator.

(c) Engine set-up data. Because specific test facilities may change with time, the specific data parameters and number of items may vary. The Application Format for Certification for the applicable model year will specify the exact requirements. In general, the following types of data will be required:

(1) Engine manufacturer.

(2) Engine system combination.

(3) Engine code and CID.

(4) Engine identification number.

(5) Applicable engine model year.

(6) Engine fuel type.

(7) Recommended oil type.

(8) Exhaust pipe configuration, pipe sizes, etc.

(9) Curb or low idle speed.

(10) Dynamometer idle speed. (Automatic transmission engines only.)

(11) Engine parameter specifications such as spark timing, operating temperature, advance curves, etc.

(12) Engine performance data, such as maximum BHP, previously measured rated rpm, fuel consumption, governed speed, etc.

(13) Recommended start-up procedure.

(14) Maximum safe engine operating speed.

(15) Number of hours of operation accumulated on engine.

(16) Manufacturer's recommended inlet depression limit and typical in-use inlet depression level.

(17) Exhaust system:

(i) Petroleum-fueled and methanol-fueled diesel engines:

(A) Header pipe inside diameter.

(B) Tailpipe inside diameter.

(C) Minimum distance in-use between the exhaust manifold flange and the exit of the chassis exhaust system.

(D) Manufacturer's recommended maximum exhaust backpressure limit for the engine.

(E) Typical backpressure, as determined by typical application of the engine.

(F) Minimum backpressure required to meet applicable noise regulations.

(ii) Gasoline-fueled and methanol-fueled Otto-cycle engines: Typical in-use backpressure in vehicle exhaust system.

(d) Pre-test data. The following data shall be recorded, and reported to the Administrator for each test conducted for compliance with the provisions of CFR Part 86, Subpart A:

(1) Engine-system combination.

(2) Engine identification.

(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 N84-10).

(6) Identification and specifications of test fuel used.

(7) Date of most recent analytical assembly calibration.

(8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, calibration curve number, etc. As long as this information is traceable, it may be summarized by system or analyzer identification numbers.

(e) Test data. The physical parameters necessary to compute the test results and ensure accuracy of the results shall be recorded for each test conducted for compliance with the provisions of 40 CFR Part 86, Subpart A. Additional test data may be recorded at the discretion of the manufacturer. Extreme details of the test measurements such as analyzer chart deflections will generally not be required on a routine basis to be reported to the Administrator for each test, unless a dispute about the accuracy of the data arises. The following types of data shall be required to be reported to the Administrator. The Application Format for Certification for the applicable model year will specify the exact requirements which may change slightly from year to year with the addition or deletion of certain items.

(1) Date and time of day.

(2) Test number.

(3) Engine intake air or test cell temperature.

(4) Barometric pressure. (A central laboratory barometer may be used: Provided, that individual test cell barometric pressures are shown to be within ± 0.1 percent of the barometric pressure at the central barometer location.)

(5) Engine intake or test cell and CVS dilution air humidity.

(6) Maximum torque versus speed curve as determined in §86.1332, with minimum and maximum engine speeds, and a description of the mapping technique used.

(7) Measured maximum horsepower and maximum torque speeds.

(8) Measured maximum horsepower and torque.

(9) Measured high idle engine speed (governed petroleum-fueled and methanol-fueled diesel engines only).

(10) Measured fuel consumption at maximum power and torque (petroleum-fueled and methanol-fueled diesel engines only).

(11) Cold-soak time interval and cool down procedures.

(12) Temperature set point of the heated continuous analysis system components (if applicable).

(13) Test cycle validation statistics as specified in §86.1341 for each test phase (cold and hot).

(14) Total CVS flow rate with dilution factor for each test phase (cold and hot).

(15) Temperature of the dilute exhaust mixture and secondary dilution air (in the case of a double dilution system) at the inlet to the respective gas meter(s) or flow instrumentation used for particulate sampling.

(16) The maximum temperature of the dilute exhaust mixture immediately ahead of the particulate filter.

(17) Sample concentrations (background corrected) for THC, CO, $CO_2$, **CH4 (if measured)**, and NOx for each test phase (cold and hot).

(18) For methanol-fueled vehicles:

(i) Volume of sample passed through the methanol sampling system and the volume of deionized water in each impinger.

(ii) The methanol concentration in the reference sample and the peak area from the GC analysis of the reference sample.

(iii) The peak area of the GC analyses of the test samples (methanol).

~~(iv) Volume of sample passed through the formaldehyde sampling system.~~

~~(v) The formaldehyde concentration in the reference sample and the peak area from the LC analysis of the reference sample.~~

~~(vi) The peak area of the LC analysis of the test sample (formaldehyde).~~

(~~vii~~ iv) Specification of the methanol-fuel used during testing.

**(19)** ***For methanol-fueled and some petroleum-fueled vehicles:***

**(i) Volume of sample passed through the formaldehyde sampling system.**

**(ii) The formaldehyde concentration in the reference sample and the peak area from the LC analysis of the reference sample.**

**(iii) The peak area of the LC analysis of the test sample (formaldehyde).**

(~~19~~ **20**) The stabilized pre-test weight and post-test weight of each particulate sample and back-up filter or pair of filters.

(21~~0~~) Brake specific emissions (g/BHP-hr) for **THC**, **CH4**, CO, NOx and, if applicable, OMHCE, $CH_3OH$ and HCHO for methanol-fueled vehicles for each test phase (cold and hot).

(22~~1~~) The weighted (cold and hot) brake specific emissions (g/BHP-hr) for the total test.

(23~~2~~) The weighted (cold and hot) carbon balance or mass-measured brake specific fuel consumption for the total test.

(24~~3~~) The number of hours of operation accumulated on the engine after completing the test sequences described in Figure N84-10.

**PART 88-CLEAN FUEL VEHICLES**

16. The authority citation for part 88 is revised to read as follows:

**Authority**: Secs. 241, 242, 243, 244, 245, 246, 247, 249, 301(a), Clean Air Act as Amended; 42 U.S.C. 7581, 7582, 7583, 7584, 7585, 7586, 7587, 7589, and 7601(a).

17. The table of contents of part 88, subparts A and C are revised to read as follows:

**Subpart A-Emission Standards for Clean-Fuel Vehicles**

Sec.



**Subpart C-Centrally Fueled Fleets Program**

Sec.

19. A new § 88.102-94 is proposed to be added to Subpart A to read as follows:

**§ 88.102-94 Definitions.**

The definitions in 40 CFR part 86 of this chapter also apply to this subpart, except if they are also defined in this section. The definitions of this section apply to all of part 88.

(a) *Dual fuel vehicle (or engine)* means any motor vehicle (or motor vehicle engine) engineered and designed to be operated on two different fuels, but not on a mixture of the fuels.

(b) *Flexible fuel vehicle (or engine)* means any motor vehicle (or motor vehicle engine) engineered and designed to be operated on any mixture of two or more different fuels.

(c) *Low-Emission Vehicle* means any light-duty vehicle (LDV) or light-duty truck (LDT) conforming to the applicable Low-Emission Vehicle standard, or any heavy-duty vehicle with an engine conforming to the applicable Low-Emission Vehicle standard.

(d) *Non-methane hydrocarbon equivalent* means the sum of the carbon mass emissions of non-oxygenated non-methane hydrocarbons plus the carbon mass emissions of alcohols, aldehydes, or other organic compounds which are separately measured in accordance with the applicable test procedures of Part 86, expressed as gasoline-fueled vehicle non-methane hydrocarbons. In the case of exhaust emissions, the hydrogen-to-carbon ratio of the equivalent hydrocarbon is 1.85:1. In the case of diurnal and hot soak emissions, the hydrogen-to-carbon ratios of the equivalent hydrocarbons are 2.33:1 and 2.2:1 respectively.

(e) *Non-methane organic gas* is defined as in § 241(3), Clean Air Act Amendments (CAAA) (42 U.S.C. 7581(3)).

(f) *Transitional Low-Emission Vehicle* means any light-duty vehicle or light-duty truck conforming to the applicable Transitional Low-Emission Vehicle standard.

(g) *Ultra Low-Emission Vehicle* means any LDV or LDT truck conforming to the applicable Ultra Low-Emission Vehicle standard, or any heavy-duty vehicle (HDV) with an engine conforming to the applicable Ultra Low-Emission Vehicle standard.

(h) *Zero-Emission Vehicle* means any LDV or LDT conforming to the applicable Zero-Emission Vehicle standard, or any heavy-duty vehicle conforming to the applicable Zero-Emission Vehicle standard.

20. A new § 88.103-94 is proposed to be added to Subpart A to read as follows:

**§ 88.103-94 Abbreviations.**

The abbreviations of part 86 of this chapter also apply to this subpart. The abbreviations in this section apply to all of part 88.

HCHO--Formaldehyde.
LDT--Light-Duty Truck.
LDV--Light-Duty Vehicle.
LEV--Low-Emission Vehicle.
LVW--Loaded Vehicle Weight.
NMHC--Non-Methane Hydrocarbon.
NMHCE--Non-Methane Hydrocarbon Equivalent
NMOG--Non-Methane Organic Gas.
TLEV--Transitional Low-Emission Vehicle.
TW--Test Weight.
ULEV--Ultra Low-Emission Vehicle.
ZEV--Zero-Emission Vehicle.

21. A new § 88.105-94 is proposed to be added to Subpart A to read as follows:

**§ 88.105-94 Clean-fuel fleet emission standards for 1998 and later model year heavy-duty engines.**

(a)(1) Exhaust emissions from engines used in 1998 and later model year heavy-duty low emission vehicles shall not exceed the following:

(i) *The combined emissions of oxides of nitrogen and nonmethane hydrocarbons (or nonmethane hyrdocarbon equivalent).* 3.5 grams per brake horsepower-hour.

(b)(1) Exhaust emissions from engines used in 1998 and later model year ultra-low emission heavy-duty vehicles shall not exceed the following:

(i) *The combined emissions of oxides of nitrogen and nonmethane hydrocarbons (or nonmethane hyrdocarbon equivalent)*. 2.5 grams per brake horsepower-hour.

(ii) *Carbon monoxide.* 7.2 grams per brake horsepower-hour.

(iii) *Particulate.* 0.05 grams per brake horsepower-hour as measured under the applicable test procedure of Part 86.

(iv) *Formaldehyde.* 0.05 grams per brake horsepower-hour, as measured under the applicable test procedure of Part 86.

(c) The standards set forth in (a) and (b) of this section refer to the exhaust emitted while the vehicle is being tested in accordance with the applicable test procedures set forth in Part 86, Subpart N.

(d) A ZEV has a standard of zero emissions for nonmethane hydrocarbons, oxides of nitrogen, carbon monoxide, formaldehyde, and particulates.

(1) A vehicle shall be certified as a ZEV if it is determined by engineering analysis that the vehicle satisfies the following conditions:

(i) All primary and auxiliary equipment and engines must have no emissions of nonmethane hydrocarbons, oxides of nitrogen, carbon monoxide, formaldehyde, and particulates.

(ii) The vehicle fuel system(s) must not contain either carbon or nitrogen compounds (including air) which when burned form the above regulated exhaust emissions.

(iii) The vehicle fuel system(s) and any auxiliary engine(s) must have no evaporative emissions.

(e) All heavy-duty engines used in low emission, ultra-low emission, or zero emission vehicles shall also comply with all applicable standards and requirements of Part 86, except exhaust emission standards for total hydrocarbons.

22. A new § 88.302-92 is proposed to be added to Subpart C to read as follows:

**§ 88.302-92 Definitions.**

The definitions in 40 CFR part 86 of this chapter also apply to this subpart, except if they are also defined in this part. The definitions of this section apply to all of part 88. All terms used in this part but not defined herein shall have the meaning assigned to them in the Clean Air Act.

(a) *Capable of being centrally fueled* means it is practically and economically feasible to refuel the covered fleet vehicles at a location that is owned, operated, or controlled by the covered fleet operator, or is under contract with the covered fleet operator, notwithstanding the requirements of the Clean Fuel Fleet Program. Fleets which have been centrally fueled at any time since November 15, 1990, and fleets which consist of vehicles that do not travel further than their operational range before returning to such common location more than 50 percent of the time, are presumed to be capable of being centrally fueled. The fact that one or more vehicles in a fleet are not capable of being centrally fueled does not exempt that fleet from the program.

For the purpose of this definition, EPA is proposing to treat *location* in the same manner as described in the definition of "centrally fueled."

(b) *Centrally fueled* means that a fleet vehicle is refueled at least 75 percent of the time (as measured by average fleet operations) at a location that is owned, operated, or controlled by the covered fleet operator, or is under contract with the covered fleet operator.

For the purpose of this definition, *location* means any building, structure, facility, or installation (i) which belong to the same person, (ii) which are located on one or more contiguous properties, (iii) which are under the control of the same person, and (iv) which contain a refueling pump or pumps for the use of the vehicles owned or controlled by that person.

(c) *Combination heavy-duty vehicle* means a vehicle with a GVWR greater than 8,500 pounds (3,900 kilograms) which is comprised of a truck-tractor and one or more pieces of trailered equipment. The truck-tractor is a self-propelled motor vehicle built on one chassis which encompasses the engine, passenger compartment, and a means of coupling to a cargo carrying trailer(s). The truck-tractor itself is not designed to carry cargo.

(d)(1) *Control*, when it is used to join all entities under common management, means any one or a combination of the following:

(i) a person or firm leases, operates, supervises or in 51 percent or greater part owns facilities used by another person or firm;

(ii) a third person or firm has equity ownership of 51 percent or more in each of two or more firms;

(iii) two or more firms have common corporate officers, in whole or in part, who are responsible for the overall direction of the companies.

(2) *Control*, when it is used to refer to the management of vehicles, means a person has the authority to decide who can operate a particular vehicle, and the purposes for which the vehicle can be operated.

(3) *Control*, when it is used to refer to the management of people, means a person has the authority to direct the activities of another person in a precise situation, such as at the workplace.

(e) *Covered fleet operator* means a person who operates a fleet of at least ten *covered fleet vehicles* (as defined in section 241(6) of the Act) which fleet is either primarily operated within the covered area (even if the covered fleet vehicles are garaged outside of it) or is centrally fueled, or garaged and maintained, at a site within the covered area.

For purposes of this definition, the vehicle types described in the definition of *covered fleet* (section 241(5) of the Act) as exempt from the program will not be counted toward the ten-vehicle criterion.

For purposes of this definition, *operated within a covered area* means a fleet which is operated from a covered area, or spends 75 percent or more of total fleet operating time in a covered area.

Covered fleet operators shall be able to appeal to their state to modify their reported figures on the number of covered fleet vehicles. States shall be allowed to require that the state be updated by covered fleet operators of these figures.

(f) *Dealer demonstration vehicle* means a vehicle that is operated by a motor vehicle dealer (as defined in section 216(4) of the Act) solely for the purpose of promoting motor vehicle sales or permitting potential purchasers to drive the vehicle for prepurchase or prelease evaluation.

(g) *Emergency vehicle* means any vehicle that is legally authorized by a governmental authority to exceed the speed limit to transport people and equipment to and from situations in which speed is required to save lives or property, such as a rescue vehicle, fire truck, or ambulance.

(h) *Inherently Low-Emission Vehicle* means any LDV or LDT conforming to the applicable Inherently Low-Emission Vehicle standard, or any HDV with an engine conforming to the applicable Inherently Low-Emission Vehicle standard. No dual-fuel or flexible-fuel vehicles shall be considered Inherently Low-Emission Vehicles unless they are certified to the applicable standard(s) on all fuel types for which they are designed to operate.

(i) *Law enforcement vehicle* means any vehicle which is primarily operated by a civilian or military police officer or sheriff, or by personnel of the Federal Bureau of Investigation, the Drug Enforcement Administration, or other agencies of the federal government, or by state highway patrols, or other similar law enforcement agencies, and which is used for the purpose of law enforcement activities including, but not limited to, chase, apprehension, surveillance, or patrol of people engaged in or potentially engaged in unlawful activities. For federal law enforcement vehicles, the definition contained in Executive Order 12759, Section 11: Alternative Fueled Vehicle for the Federal Fleet, Guidance Document for Federal Agencies, shall apply.

(j) *Model year*, as it applies to the clean fuel vehicle fleet purchase requirements, means September 1 through August 31.

(k) *Motor vehicles held for lease or rental to the general public* means a vehicle that is owned or controlled primarily for the purpose of short-term rental or extended-term leasing (with or without maintenance), without a driver, pursuant to a contract.

(l) *New covered fleet vehicle* means a vehicle that has not been previously controlled by the current purchaser, regardless of the model year, except as follows: (1) vehicles that were manufactured before the start of the fleet program for such vehicle's weight class are not considered new; (2) vehicles transferred due to the purchase of a company not previously controlled by the purchaser, or as part of an employee transfer; (3) vehicles transferred for seasonal requirements (i.e. less than 120 days). States are permitted to discontinue the use of the third exception for fleet operators who abuse the discretion afforded them. This definition of new covered fleet vehicle is distinct from the definition of new vehicle as it applies to manufacturer certification, including the certification of vehicles to the clean fuel standards.

(m) *Owned or operated, leased or otherwise controlled by such person* means either of the following:

(1) such person holds the beneficial title to such vehicle, or

(2) such person uses the vehicle for transportation purposes pursuant to a contract or similar arrangement, and the term of such contract or similar arrangement is for a period of 120 days or more.

(n) *Partially-Covered Fleet* pertains to a vehicle fleet in a covered area which contains both covered fleet vehicles and non-covered fleet vehicles, i.e., exempt from covered fleet purchase requirements.

(o) *Person* includes an individual, corporation, partnership, association, State, municipality, political subdivision of a State, and any agency, department, or instrumentality of the United States and any officer, agent, or employee thereof.

(p) *Single-unit heavy-duty vehicle* means a self-propelled motor vehicle with a GVWR greater than 8,500 pounds (3,900 kilograms) built on one chassis which encompasses the engine, passenger compartment, and cargo carrying function, and not coupled to trailered equipment. All buses, whether or not they are articulated, are considered single-unit vehicles.

(q) *Under normal conditions garaged at personal residence* means a vehicle that, when it is not in use, is normally parked at the personal residence of the individual who usually operates it, rather than at a central refueling, maintenance, and/or business location. Such vehicles are not considered capable of central fueling.

(r) *Vehicle used for motor vehicle manufacturer product evaluations and tests* means a vehicle that is owned and operated by a motor vehicle manufacturer (as defined in section 216(1) of the Act) solely for the purpose of evaluating the performance of such vehicle for engineering, research and development, or quality control reasons.

23. A new § 88.305-94 is proposed to be added to Subpart C to read as follows:

**§ 88.305-94 Clean-fuel vehicle labeling requirements for heavy-duty vehicles.**

(a) All clean-fuel heavy-duty engines and vehicles used as LEVs, ULEVs, and ZEVs that are also regulated under Part 86 shall comply with the labeling requirements of §86.095-35 (or later applicable sections), and shall also include an unconditional statement on the label indicating that the engine or vehicle is a LEV, ULEV, or ZEV, and meets all of the applicable requirements of Part 88.

(b) All clean-fuel heavy-duty vehicles not regulated under Part 86 shall have a permanent legible label affixed to the engine or vehicle in a readily visible location, which contains the following information:

(1) The label heading: vehicle emissions classification information (e.g., "This is a Low Emission Vehicle");

(2) Full corporate name and trademark of the manufacturer;

(3) A statement that this engine or vehicle meets all applicable requirements of the U.S. Environmental Protection Agency clean-fueled vehicles program, as described in 40 CFR Part 88, but not necessarily those requirements found in 40 CFR Part 86.

24. A new § 88.306-94 is proposed to be added to Subpart C to read as follows:

**§ 88.306-94 Requirements for a converted vehicle to qualify as a clean-fuel fleet vehicle.**

(a) Converted engines or vehicles which satisfy the requirements of this section shall be considered clean fuel fleet vehicles.

(b) The engine or vehicle must be converted using a conversion configuration which has been certified according to the provisions of 40 CFR 86.092-14 using applicable emission standards from part 88 for clean-fuel engines and vehicles

(c) In order for a converted engine or vehicle to qualify as an ultra-low emission or zero emission vehicle, the conversion configuration used to convert the engine or vehicle must have been certified at levels meeting the applicable ultra-low or zero emission vehicle standards found in this subpart.

(c) *Enforcement.* Any person who converts conventional engines or vehicles to clean-fuel engines or vehicles pursuant to the provisions of this section, shall be considered a manufacturer for purposes of Clean Air Act sections 206 and 207 and related enforcement provisions.

(d) *Tampering.* The conversion from an engine or vehicle capable of operating on gasoline or diesel fuel only, to a clean-fuel engine or vehicle shall not be considered a violation of the tampering provisions of Clean Air Act section 203(a)(3), if such conversion complies with the provisions of this subpart.

(e) *Data Collection.* The converter is responsible for maintaining records of each engine and vehicle converted for use in the Clean Fuel Fleets program for a period of 10 years. The records are to include the engine or vehicle make, engine or vehicle model, engine or vehicle model year, and engine or vehicle identification number of converted engines and vehicles; the brand names and part numbers of the parts included in the conversion configuration; the date of the conversion and the facility at which the conversion was performed.

25. Section 88.308-94 of Subpart C is proposed to be revised to read as follows:

**§ 88.308-94 Programmatic requirements for clean-fuel fleet vehicles.**

(a) Dual-fuel and flexible-fuel vehicles. (1) Covered fleets. Within a covered fleet, a dual-fuel or flexible-fuel fleet vehicle shall be operated using only the fuel(s) on which it was certified as a clean-fuel fleet vehicle. If the vehicle is certified in two or more clean-fuel vehicle categories, e.g., LEV and ULEV, for various fuels, it is assumed that the vehicle will be operated under the least stringent clean-fuel vehicle standard, and clean-fuel fleet vehicle credits will be awarded based on this lower status, i.e., LEV.

(2) The fleet owner may be awarded clean-fuel fleet vehicle credit at the higher, or highest, clean-fuel vehicle status if the fleet owner complies with both of the following:

(i) The dual-fuel/flexible-fuel vehicle must be operated at all times on the fuel source on which the vehicle was certified for the higher, or highest, standard, and

(ii) The fleet owner pledges to fuel and maintain the vehicle in compliance with the stricter, or strictest, clean-fuel vehicle standard.

(3) Exempt or partially-exempt fleets. If an exempt or partially-exempt fleet owner purchases a dual-fuel or flexible-fuel fleet vehicle to generate clean-fuel fleet vehicle credits, then the vehicle shall be operated using only the fuel(s) on which it was certified as a clean-fuel fleet vehicle. Clean-fuel fleet vehicle credits will be awarded based on the lowest standard for which the vehicle is certified, unless the fleet owner complies as directed in paragraph (2) of this subsection.

(b) *Distributed Fleets.* For purposes of this section, distributed fleets are fleets which are owned by one person (as defined above), but are operated from different locations within a covered area. A distributed fleet is considered to be a covered fleet for the purposes of the clean fuel vehicle fleet program as follows:

(1) If the total distributed fleet consists of less than ten vehicles, then it is not considered to be a covered fleet.

(2) If the total distributed fleet consists of ten or more vehicles, and they are all centrally fueled, then the fleets is

considered to be a covered fleet.

(3) If the total distributed fleet consists of ten or more vehicles which operate primarily in the covered area, but portions of that fleet operate out of separate facilities and one or more of the subfleets consist of less than ten vehicles, then as long as ten or more vehicles are centrally fueled or capable of being centrally fueled at least some of the time, those vehicles are subject to the requirements of the program.

(c) *Multi-State Nonattainment Areas.* The states comprising a multi-State nonattainment area shall promulgate a single, coordinated clean fuel vehicle fleet program.