

ever, effective January 1, 1970, the exhaust gas concentrations shall be adjusted by the ratio of  $15/[1/2(\%CO) + \%CO_2 + 10(\% \text{ Hydrocarbon})]$ .

(c) Hydrocarbons are defined as the organic constituents of vehicle exhaust as measured by a hexane-sensitized nondispersive infrared analyzer or by an equivalent method.<sup>1</sup>

(d) Carbon Monoxide shall be measured by a nondispersive infrared analyzer or by an equivalent method.

(e) Oxides of nitrogen shall be measured by the phenoldisulfonic acid method or by an equivalent method.

(f) The standards refer to a composite sample representing the driving cycle described as follows:

TABLE 1.<sup>1</sup>

| Condition                      | Rate of speed change<br>miles per hour per<br>second | Percent of total<br>time | Percent of total<br>sample volume |
|--------------------------------|------------------------------------------------------|--------------------------|-----------------------------------|
| Idle.....                      |                                                      | 15.0                     | 4.2                               |
| Cruise (miles per hour):       |                                                      |                          |                                   |
| 20.....                        |                                                      | 6.9                      | 5.0                               |
| 30.....                        |                                                      | 5.7                      | 6.1                               |
| 40.....                        |                                                      | 2.7                      | 4.2                               |
| 50.....                        |                                                      | .7                       | 1.5                               |
| Acceleration (miles per hour): |                                                      |                          |                                   |
| 0 to 60.....                   | 3.0                                                  | 1.1                      | 5.9                               |
| 0 to 25.....                   | 2.2                                                  | 10.6                     | 18.5                              |
| 15 to 30.....                  | 1.2                                                  | 25.0                     | 45.5                              |
| Deceleration (miles per hour): |                                                      |                          |                                   |
| 50 to 20.....                  | 1.2                                                  | 10.2                     | 2.9                               |
| 30 to 15.....                  | 1.4                                                  | 11.8                     | 3.3                               |
| 30 to 0.....                   | 2.5                                                  | 10.3                     | 2.9                               |
| Total.....                     |                                                      | 100.0                    | 100.0                             |

<sup>1</sup> If other test cycles are used, they must represent urban driving and the emissions must be relatable to the composite sample from the driving modes described in table 1.

Mr. DADDARIO. I expect we could continue here for some time but we will have a whole series of questions for you. We would appreciate your getting them to us. If there are any problems I am sure we can have our staff work them out.

Dr. MIDDLETON. Thank you very much, sir. I enjoyed being with you.

Mr. DADDARIO. I appreciate ever so much your cooperation, and you all being here this morning.

(Dr. Hibbard's complete prepared statement is as follows:)

PREPARED STATEMENT OF WALTER R. HIBBARD, DIRECTOR, BUREAU OF MINES,  
U.S. DEPARTMENT OF THE INTERIOR

My name is Walter Hibbard, and I am the Director of the Bureau of Mines, U.S. Department of the Interior. A biographical summary is available for the record if you so desire.

I am pleased to have the opportunity to participate in these hearings and to outline for you the activities of the Bureau of Mines that are directed toward resolution of the technical problems facing the Nation in its efforts to abate environmental pollution.

Our mission and responsibility in this important problem area is for research on the control, at the source, of pollutants produced as a result of the production, processing, handling, and utilization of the Nation's mineral and mineral fuels resources. Authority for conducting such research derives from the Bureau's organic act which states that scientific and technologic investigations shall be

<sup>1</sup> Some hydrocarbons, for example methane, ethane, propane, n-butane and acetylene, are not considered sufficiently reactive to produce photochemical smog effects. The Department is working on methods which measure the reactive organic compounds in exhaust and will restate the hydrocarbon standard in terms of reactive hydrocarbons when methods and data satisfactory to the Department are developed.