

**APPENDIX U**  
**HAZARDOUS MATERIALS SHIPPING PAPERS**

GUIDE FOR  
HAZARDOUS MATERIALS SHIPPING PAPERS

USE OF GUIDE - This Guide is designed for in-house use when reviewing hazardous material shipping paper requirements. It does not relieve persons from complying with the Department of Transportation (DOT) Hazardous Materials Regulations (HMR). Final authority for use of shipping papers is found in the Code of Federal Regulations (CFR) Title 49, Parts 100-177.

1. DEFINITIONS

- A. Shipping Paper - (49 CFR 17 1.8) A shipping paper is a shipping order, bill of lading, manifest, or other shipping document serving a similar purpose containing the information required by 49 CFR 172.202, 172.203 and 172.204.
- B. Hazardous Waste Manifest - (40 CFR 262.20) A hazardous waste manifest is a document (shipping paper) on which all hazardous waste is identified. A copy of the manifest must accompany each shipment of waste from the point of pick-up to the destination. The hazardous waste manifest may be used to satisfy DOT shipping paper requirements. (49 CFR 172.205).

2. SHIPPER'S RESPONSIBILITY - (49 CFR 172.200(x)) The shipper, when offering a hazardous material for transport has the responsibility to properly prepare the shipping paper.

3. HAZARDOUS MATERIALS DESCRIPTION - (49 CFR 172.202) The shipping description of a hazardous material on a shipping paper must include the following information:

- A. Proper shipping name - MAY NOT BE ABBREVIATED (49 CFR 172.101 or 49 CFR 172.102).
- B. The hazard class of the material. (See exceptions 49 CFR 172.202(x)(2))
- C. The identification number for the material (preceded by "UN" or "NA", as appropriate).
- D. Except for empty packagings, cylinders for compressed gases, and packagings of greater than 110 gallon capacity, the total quantity by weight (net or gross, as appropriate) or volume, including the unit of measure, of that hazardous material.
- E. Except as otherwise provided in the regulations, the basic description must be in the sequence shown in the 49 CFR 172.101 Hazardous Materials Table. For example, "Acetone, Flammable Liquid, UN 1090."
- F. The total quantity of the material covered by one description must appear before or after (or both before and after) the basic description.
  - (1) Abbreviations may be used to specify the type of packaging and unit of measurement of total quantity. For example, 10 ctns. Paint, Flammable Liquid, UN 1263, 500 lbs.
  - (2) Type of packaging and destination marks may be entered in any appropriate manner before or after the basic description.
- G. Technical and chemical group names may be entered in parentheses between the proper shipping name and hazard class. Example: Corrosive liquid, n.o.s. (capryryl chloride), Corrosive material, UN 1760.

4. GENERAL ENTRIES ON SHIPPING PAPERS - (49 CFR 172.201)

- A. Contents - When describing a hazardous material on the shipping paper(s), that description must conform to the following requirements:
  - (1) When a hazardous material and other materials are both described on the same shipping paper, the hazardous material description entries:
    - (a) Must be entered first (See Figure 1 on previous page), or

**BASIC DESCRIPTION**

Type of Packagings May Be Abbreviated If Used.

Proper Shipping Name      Hazard Class      Total Quantity

Identification Number

DESCRIPTION AND CLASSIFICATION	TOTAL QUANTITY	WEIGHT	RATE	CHARGES
10 Drums, Gasoline, Flammable Liquid, UN1203	4500 lbs.			
40 Cyl. Nitrogen, Non-flammable Gas, UN1066	800 lbs.			
1 Drum, Flammable Solid, n.o.s., UN1325	452 lbs.			
4 Boxes, Advertising Material, Paper, NOI	60 lbs.			
1 Roll, Paper Printing, Newsprint	690 lbs.			
12 Sets, Carbon Paper	22 lbs.			

WEIGHT ADDRESS      COD      C.O.D. FEE PREPAID COLLECT      TOTAL CHARGES      FREIGHT CHARGES

**CERTIFICATION**

HAZARDOUS MATERIALS ENTRIES LISTED FIRST

**BASIC DESCRIPTION**

Type of Packagings May Be Abbreviated If Used.

Proper Shipping Name      Hazard Class      Total Quantity

Identification Number

DESCRIPTION AND CLASSIFICATION	TOTAL QUANTITY	WEIGHT	RATE	CHARGES
10 Drums, Gasoline, Flammable Liquid, UN1203	4500 lbs.			
4 Boxes, Advertising Material, Paper, NOI	60 lbs.			
1 Drum, Flammable Solid, N.O.S., UN1325	452 lbs.			
12 Sets, Carbon Paper	22 lbs.			
40 Cyl. Nitrogen, Non-Flammable Gas, UN1066	800 lbs.			

WEIGHT ADDRESS      COD      C.O.D. FEE PREPAID COLLECT      TOTAL CHARGES      FREIGHT CHARGES

**CERTIFICATION**

HM Entries-Contrasting Colors

Note: Reproduction of a shipping paper may be highlighted by a highlighting pen rather than printed in a contrasting color.

HAZARDOUS MATERIALS ENTRIES-CONTRASTING COLOR

**BASIC DESCRIPTION**

Hazardous Materials HM Column      Type of Packagings May Be Abbreviated If Used.

Proper Shipping Name      Hazard Class      Total Quantity

Identification Number

HM	DESCRIPTION AND CLASSIFICATION	TOTAL QUANTITY	WEIGHT	RATE	CHARGES
	4 Boxes, Advertising Materials, Paper, N.O.I.	60 lbs.			
10	X Drums; Gasoline, Flammable Liquid, UN1203	4500 lbs.			
1	X Drum, Flammable Solid, n.o.s., UN1325	452 lbs.			
12	Sets, Carbon paper	22 lbs.			
40	X Cyl. Nitrogen, Nonflammable Gas, UN1066	800 lbs.			
1	Roll, Paper, Printing, Newsprint	690 lbs.			

WEIGHT ADDRESS      COD      C.O.D. FEE PREPAID COLLECT      TOTAL CHARGES      FREIGHT CHARGES

"This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation"

**CERTIFICATION**

HAZARDOUS MATERIALS PREFIXED BY "X" IN HM COLUMN

FIGURE 1. HAZARDOUS MATERIALS LISTED ON SHIPPING PAPERS

- (b) Must be entered in a contrasting color (or highlighted in a contrasting color) or
  - (c) Must be identified by the entry "X" placed before the proper shipping name in a column captioned "HM." The "X" may be replaced by "RQ" (Reportable quantity), if appropriate (See Figure 1 on previous page).
- (2) The required shipping description on the original shipping paper and all copies must be legible and printed (manually or mechanically) in English.
  - (3) Unless it is specifically authorized or required, the required description may NOT contain any code or abbreviation.  
NOTE: UN=United Nations; NA=North American
  - (4) A shipping paper may contain additional information concerning the material provided the information is not inconsistent with the required description. The additional information must be placed after the basic description required by 49 CFR 172.202(a).
    - (a) When appropriate, the entries "IMO" or "IMO Class" may be entered immediately before or immediately following the class entry in the basic description.
    - (b) If a material meets the definition of more than one hazard class, the additional hazard class(es) may be entered after the hazard class in the basic description.

NOTE: The International Civil Aviation Organization (ICAO) issues the "Technical Instructions for the Safe Transport of Dangerous Goods by Air" for the "International Maritime Dangerous Goods Code (IMDG)" for the international transportation of hazardous materials by air.

Code (IMDG)" for the International Maritime Organization (IMO) issues the "International Maritime Dangerous Goods Code (IDMG)" for the international transportation of hazardous materials by water.

The terms "dangerous goods" and "hazardous materials" are considered synonymous.

- B. Name of Shipper - A shipping paper for a shipment by water must contain the name of the shipper.

#### ADDITIONAL DESCRIPTION REQUIREMENTS (49 CFR 172.203) (ALL MODES)

- A. Exemptions - Each shipping paper issued in connection with shipment made under an exemption must bear the notation "DOT-E" followed by the exemption number assigned (Example: DOT-E4648). Place the exemption number adjacent to the description to which the exemption applies.
- B. Limited Quantities - Descriptions for materials defined as "Limited Quantities" must include the words "Limited Quantities" or "Ltd. Qty." following the basic description.
- C. Hazardous Substances

- (1) If the proper shipping name (for a material that is a hazardous substance) does not identify the hazardous substance by name, the following description shall be entered, in parentheses, in association with the basic description:
  - (a) name of the hazardous substance from the Appendix to the 49 CFR 172.101 Hazardous Materials Table or
  - (b) for waste streams, the waste stream number,  
  
A "waste stream" is a hazardous waste (liquid, sludge, solid, gas) continuously generated from a manufacturing process. Such waste will be listed in either 40 CFR 261.31 or 40 CFR 261.32, and will be assigned an EPA waste stream number or
  - (c) for wastes exhibiting an EPA characteristic of ignitability, corrosivity, or reactivity, or EP

toxicity, the letters "EPA" "reactivity," or "EP toxicity," OR the corresponding "D" number as appropriate.

- (2) The letters "RQ" (Reportable Quantity) shall be entered on the shipping paper either before or after the basic description required by 49 CFR 172.202 for each hazardous substance. (See definition in 49 CFR 171.8) Example: "RQ, Cresol, Corrosive Material, UN 2076"; or "Hazardous Substance, Solid, n.o.s., ORM-E, NA 9188 (Adipic Acid), RQ."

D. **Radioactive Materials** - For additional description requirements for radioactive materials, refer to 49 CFR 172.203(d).

C. **Empty Packaging** (49 CFR 172.203(e)) - For empty packaging that still contains a residue of a hazardous material:

- (1) The description on the shipping paper may include the word(s) "RESIDUE" or "RESIDUE: Last Contained \* \* \* " in association with the basic description of the hazardous material last contained in the packaging.
- (2) For empty tank cars, see 49 CFR 174.25(c).
- (3) If a packaging, including a tank car, contains a residue that is a hazardous substance the description on the shipping paper shall be prefaced with the phrase "RESIDUE: Last Contained \* \* \* " and shall have "RQ" entered before or after the basic description.

F. **Dangerous When Wet** - Packages requiring the label "Dangerous When Wet" shall have the words "Dangerous When Wet" entered on the shipping paper adjacent to the basic description.

G. **Poisonous Materials** - Regardless of the class to which a material is assigned, if the name of the compound or principal constituent that causes a material to meet the definition of a poison is not included in the proper shipping name for the material:

- (1) The name of the compound or principal constituent shall be entered on the shipping paper adjacent to the shipping description for the material. The name of the compound or principal constituent may be either a technical name or any name for the material that is listed in the NIOSH Registry. (Registry of Toxic Effects of Chemical Substances, 1978 Edition).
- (2) If a liquid or solid material in a package meets the definition of a poison, and that fact is not disclosed in the shipping name or hazard class, the word "POISON" shall be entered on the shipping paper in association with the shipping description.
- (3) If a material meets the toxicity criteria in 49 CFR 173.3a(b)(2) for the poison by inhalation hazard, then the words "POISON - Inhalation Hazard" shall be entered on the shipping paper in association with the shipping description.

NOTE: For additional requirements and exceptions, see 49 CFR 172.203(k).

H. **Exceptions: OTHER REGULATED MATERIAL (ORM - ABC and D)** Shipping paper requirements do not apply to any material other than a hazardous waste or hazardous substance) that is:

- (1) An ORM-A, B, or C unless it is offered or intended for transportation by air or water. Then it is subject to the regulations pertaining to transportation by air or water as specified in 49 CFR 172.101 (Hazardous Materials Table) or
- (2) An ORM-D unless it is offered or intended for transportation by air.

6. **ADDITIONAL MODAL REQUIREMENTS** - In addition to the basic requirements for the shipping papers, each mode has specific requirements.

A. **Transportation by Rail**

- (1) **Shipping Papers** (49 CFR 174.24)

- (a) Except as provided in paragraph (b) of 49 CFR 174.24, no person may accept for transportation by rail any regulated hazardous material unless it is accompanied by a shipping paper prepared in a manner specified in 49 CFR 172.200, 172.201, 172.202, and 172.203. In addition, the shipping paper must include a certificate, when required by 49 CFR 172.204. If the original shipping paper containing the certificate is in the originating carrier's possession, no copy of the certificate is required on the train.
- (b) This subpart does not apply to materials classed as ORM-A, B, C or D unless it is: (a) Hazardous Substance or (b) Hazardous Waste.

(2) Additional Description for Shipping Papers (49 CFR 172.203(g))

- (a) The shipping paper for a rail car containing a hazardous material must contain the notation "Placarded" followed by the name of the placard required for the rail car.
- (b) The shipping paper for each class DOT-113 tank car containing a flammable gas must contain an appropriate notation, such as "DOT-113A," and the appropriate statement "Do Not Hump or Cut Off Car While in Motion."

B. Transportation by Air

(1) Shipping Papers Aboard Aircraft (49 CFR 175.35)

During transportation aboard an aircraft, the shipment must be accompanied by a copy of the shipping papers.

(2) Notification Of Pilot-in-Command (49 CFR 175.33) - Before take off the operator of the aircraft shall give the pilot-in-command the following information in writing:

- (a) Description of hazardous material on shipping papers 49 CFR 172.202 and 172.203.
- (b) Total number of packages.
- (c) Net quantity or gross weight (See 49 CFR 175.33(a)(3) for exceptions).
- (d) Location of the hazardous material in the aircraft.
- (e) Confirmation that no damaged or leaking packages have been loaded on the aircraft (See 49 CFR 175.30(b) and (c)).

NOTE: The documents required (shipping papers and notification of pilot-in-command) may be combined into one document provided it is given to the pilot-in-command before departure of the aircraft.(49 CFR 175.35(b)).

C. Transportation by water

(1) Shipping Papers (49 CFR 176.24) - A carrier may not transport a hazardous material by vessel unless the material is properly described on the shipping paper in accordance with 49 CFR Part 172.

(2) Certificate (49 CFR 176.27)

- (a) A carrier may not transport a hazardous material by vessel unless he has received a certificate to prepared in accordance with 49 CFR 172.204.
- (b) In the case of an import or export shipment of hazardous materials which will not be transported by rail, *highway*, or air, the certification may be listed on the bill of lading or other shipping paper. The shipper must certify that the hazardous material is properly

classed, described, marked, packaged and labeled according to Part 172 or in accordance with the requirements of the IMDG Code. (See 49 CFR 171.12).

- (3) Dangerous Cargo Manifest (49 CFR 176.30) - The carrier (or his authorized representative) shall prepare a dangerous cargo manifest, list, or stowage plan. This document may only include material(s) which are subject to the requirements of CFR, Title 49, or the IMDG Code. This document must be kept in a designated holder on or near the vessel's bridge. (See 49 CFR 176.30 for details).
- (4) Exemptions (49 CFR 176.31) - Hazardous material may be transported by vessel under the authority of an exemption. A copy of the exemption MUST to be on board the vessel. It must be kept with the dangerous cargo manifest.
- (5) Additional Description for Shipping Papers - (49-CFR 172.203(i))
  - (a) Each shipment by water must have the following additional shipping paper entries:
    - i. Identification of the type of packages such as barrels, drums, cylinders, and boxes.
    - ii. The number of each type of package, including those in a freight container or on a pallet.
    - iii. The gross weight of each type of package OR the individual gross weight of each package.
  - (b) Shipping papers accompanying "n.o.s." type hazardous materials shipped from the United States by vessel to any other country must have
    - i. For a single hazardous material, the technical name in parentheses after the proper shipping name. Example, Corrosive liquid, n.o.s. (caprylyl chloride), UN1760.
    - ii. For a mixture of two or more hazardous materials, include within the parentheses the technical names of at least two (2) of the most predominately hazardous components. Example, Flammable liquid, corrosive, n.o.s. (Methyl alcohol, Potassium hydroxide) Flammable liquid, UN2924.

D. Transportation by Highway

(1) Shipping Papers (49 CFR 177.817)

- (a) General - A carrier may not transport a hazardous material unless it is accompanied by a shipping paper prepared in accordance with 49 CFR 172.201, 172.202 and 172.203.
- (b) Shipper's certification - An initial carrier may not accept hazardous materials offered for transportation unless the shipping paper describing the material includes an accurate shipper's certification. (49 CFR 172.204). Except for a hazardous waste, the certification is not required for shipments transported entirely by private carriage nor bulk shipments transported in a cargo tank supplied by the carrier. (49 CFR 177.817(b))
- (c) Changing shipments from highway to rail - When a motor carrier offers or delivers a freight container or transport vehicle to a rail carrier for further transportation, the following must be marked on the shipping paper:
  - i. A description of the freight container or transport vehicle.
  - ii. The kind of placard affixed to the freight container or transport vehicle.
- (d) Accessibility of shipping papers - Each carrier and driver of the vehicle shall ensure that the shipping paper is readily available for inspection and recognizable by authorities in the

case of an accident or for inspection. (See 49 CFR 177.817(e) for details.)

- (2) ADDITIONAL DESCRIPTION FOR SHIPPING PAPERS - For Anhydrous ammonia, see 49 CFR 172.203(h)(1); for Liquefied petroleum gas, see 49 CFR 172.203(h)(2); and for exemptions, see 49 CFR 172.203(a).

7. SHIPPER'S CERTIFICATION (49 CFR 172.204)

A. General

- (1) Except as provided in paragraphs (b) and (c) of 49 CFR 172.204, each person who offers a hazardous material for transportation shall certify that the material offered for transportation is in accordance with the regulations. This requirement is accomplished by printing (manually or mechanically) the following statement on the shipping paper (See 49 CFR 172.204(x)):

"This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.\*"

NOTE: \* The words "herein-named" may be substituted for the words "above-named."

NOTE: For hazardous waste shipments, the words "and the EPA" must be added to the end of the certification. (40 CFR 262.21(b))

B. Air Transportation

- (1) General - Certification containing the following language may be used in place of the certification required by paragraph A(1) above:

"I hereby certify that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and in proper condition for carriage by air according to applicable national governmental regulations."

- (2) Certificate in Duplicate - Each person who offers a hazardous material to an aircraft operator for transportation by air shall provide two (2) copies of the certificate. (49 CFR 175.30(x)(2))

- (3) Passenger and Cargo Aircraft - If hazardous materials are offered for transportation by air, the person who offers the hazardous material must add to the certificate the following statement:

"This shipment is within the limitations prescribed for passenger/cargo-only aircraft." (delete nonapplicable)

- (4) Radioactive Material - Each person who offers any radioactive material for transportation aboard a passenger-carrying aircraft shall sign (mechanically or manually) a printed certificate stating that the shipment contains radioactive material intended for use in, or incident to, research, medical diagnosis or treatment. (49 CFR 172.204(x)(4))

- C. Signature - The certifications required above must be legibly signed (mechanically or manually) by a principal, officer, partner or employee of the shipper or his agent. (49 CFR 172.204(d))

- D. Exceptions - Except for a hazardous waste, no certification is required for hazardous material offered for transportation by motor vehicle and transported: (49 CFR 172.204(b)).

- (1) In a cargo tank supplied by the carrier or
- (2) By the shipper as a private carrier, except for a hazardous material that is to be reshipped or transferred from one carrier to another.
- (3) No certification is required for the return of an empty tank car which previously contained a hazardous material and which has not been cleaned or purged.

## HAZARDOUS WASTE MANIFEST

The following information has been abstracted from the Code of Federal Regulations (CFR), Title 49, Part 100-177 and CFR, Title 40, Part 262.

### 1. DEFINITIONS

- A. Hazardous Waste Manifest (40 CFR 262.20) A hazardous waste manifest is a shipping document on which all hazardous wastes are identified.
- B. Shipping Paper - A shipping paper is a bill of lading, manifest, or other shipping document serving a similar purpose and containing the information required by 49 CFR 172.202, 172.203 and 172.204.

### DOT HAZARDOUS MATERIALS MANIFEST REQUIREMENT (49 CFR. 172.205)

- A. No person may offer, transport, transfer or deliver a hazardous waste unless a hazardous waste manifest is prepared, signed, carried and given as required of that person (49 CFR 172.205(a)).
- B. The shipper (generator) must prepare the manifest in accordance with the EPA Regulations, 40 CFR, Part 262.
- C. The original copy of the manifest must be dated by, and bear the handwritten signature of the person representing the:
  - (1) Shipper (generator) of waste at the time it is offered for transportation.
  - (2) Initial carrier accepting the waste for transportation.
- D. A copy of the manifest must be dated by, and bear the handwritten signature of the person representing:
  - (1) Each subsequent carrier accepting the waste for transportation, at the time of acceptance; and
  - (2) Upon receipt, the designated facility receiving the waste.
- E. A copy of the manifest bearing all required dates and signature must be:
  - (1) Given to a person representing each carrier accepting the waste for transportation.
  - (2) Carried during transportation in the same manner as required for shipping papers.
  - (3) Given to a person representing the designated facility receiving the waste.
  - (4) Returned to the shipper (generator) by the carrier that transported the waste from the United States to a foreign destination with a notation of the date of the departure from the United States.
  - (5) Retained by the shipper (generator) and by the initial and each subsequent carrier for three (3) years from the date the waste was accepted by the initial carrier. Each retained copy must bear all required signatures and dates up to and including those entered by the next person who received the waste.
- F. The requirements of 49 CFR 172.205(d) and E (3) above do not apply to a rail carrier when waste is delivered to a designated facility by railroad if:
  - (1) All of the information required to be entered on the manifest (except generator and carrier identification numbers and the generator's certification) is entered on the shipping paper carried in accordance with 49 CFR 174.26(c).
  - (2) The delivering rail carrier obtains and retains a receipt for the waste that is dated and bears the

handwritten signature of the person representing the designated facility.

(3) A copy of the shipping paper is retained for three (3) years by each railroad transporting the waste.

G. The person delivering a hazardous waste to an initial rail carrier shall send a copy of the manifest, dated and signed by a representative of the rail carrier, to the person representing the designated facility.

H. A hazardous waste manifest required by 40 CFR Part 262 containing all the information required by 49 CFR Subpart C (Shipping Papers), may be used as the shipping paper.

3. THE MANIFEST-GENERAL REQUIREMENTS (40 CFR 262.20)

A. A generator (shipper) who transports, or offers for transportation, hazardous waste for off-site treatment, storage, or disposal must prepare a manifest before transporting the waste off-site.

B. A generator (shipper) must designate on the manifest one facility which is permitted to handle the waste described on the manifest.

C. A generator (shipper) may also designate on the manifest one alternate facility which is permitted to handle the waste in the event an emergency prevents delivery to the primary designated facility.

D. If the transporter (carrier) is unable to deliver the waste to the designated facility, the generator must either designate another facility or instruct the transporter to return the waste.

4. MANIFEST INFORMATION (40 CFR 262.21)

A. The manifest must contain:

(1) Manifest document number.

(2) Generator's (Shipper's) name, mailing address, telephone number, and the EPA identification number.

(3) Name and EPA identification number of each transporter (carrier).

(4) Name, address and EPA identification number of the designated facility and an alternate facility, if any;

(5) Description of the waste(s) (e.g. proper shipping name required by 49 CFR 172.101, 172.202, and 172.203.)

(6) Total quantity of each hazardous waste by units of weight or volume, and the type and number of containers loaded into or onto the transport vehicle.

B. Certification(40 CFR 262.21(b)) The following certification must appear on the manifest:

"This is to certify that the above named materials are properly classified, described, packaged, marked, labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and the EPA."

5. COPIES OF MANIFEST REQUIRED (40 CFR 262.22)

The manifest must consist of at least the number of copies required to provide the generator (shipper), each transporter (carrier) and the owner or operator of the designated facility with one copy for their records and another copy to be returned to the owner.

6. USE OF THE MANIFEST (40 CFR 262.23)

A. The generator must:

(1) Sign the manifest certification b hand.

(2) Obtain the handwritten signature~ initial transporter and date of acceptance of manifest.

(3) Retain one copy in accordance with 40 CFR 262.40(a).

B. The generator must give the transporter the remaining copies of the manifest.

C. For shipment of hazardous waste within the United States solely by water (bulk shipments only) or railroad, see 40 CFR 262.23(c) and (d).

NOTE: Copies of the manifest are not required for each transporter. For special provisions for water (bulk shipment only) or rail transporters, See 40 CFR 263.20(e) and (f).

NOTE: This material may be reproduced without special permission from this office. Any comments or recommendations should be sent to:

Training Resources Branch, DHM-51  
Federal/State and Private Sector Initiatives Division  
Office of Hazardous Materials Transportation  
Research and Special Programs Administration  
U.S. Department of Transportation  
Washington, D.C. 20590

Revised December 1987